

欢迎来烟台 Welcome to Yantai

»LOICZ OPEN SCIENCE CONFERENCE 2011«



**Coastal Systems, Global Change
and Sustainability**

12th - 15th September, 2011

Yantai, China



Helmholtz-Zentrum
Geesthacht
Centre for Materials and Coastal Research

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八仙过海地 群英相会时 风云变幻际 陆海究何为

Where the fairies crossed the sea, from places we meet.
When the globe is changing, into the coast we seek.



Ping Shi

Host of the International LOICZ Open Science Conference 2011
Director of the Yantai Institute of Coastal Zone Research

WELCOME AND ACKNOWLEDGEMENTS

Alice Newton

Chairperson of the LOICZ Scientific Steering Committee

It is with great pleasure to welcome you all to the 2011 LOICZ Open Science Conference “Coastal Systems, Global Change and Sustainability” in Yantai. This conference would not have been possible without the hard work of many people and the generous sponsorship that we have received. Special thanks are due to the Chinese Academy of Sciences (CAS) and the Yantai Institute of Coastal Zone Research (YIC), Helmholtz-Zentrum Geesthacht (HZG), the International Oceanographic Commission of UNESCO, the World Meteorological Organization (WMO), Weather and Disaster Risk Reduction Services Department, the Scientific Committee on Oceanic Research (SCOR), the International Arctic Science Committee (IASC), United Nations University (UNU), the Earth System Science Partnership (ESSP), the Nature Science Fund of China (NSFC), Haicheng High-tec Company and Yantai City Government, South China Sea Institute of Oceanology, Xiamen University, China East Normal University, Australian CSIRO and the France LENSs Institute for their generosity, as well as the conference international scientific and organizing committees who have given their valuable time. Thank you to Ping Shi of the LOICZ East Asia Regional Node at the Institute of Coastal Zone Research for agreeing to host us here in Yantai. Thank you also to Dongyan Liu and the whole team in Yantai who have devoted an enormous amount of time to the preparation. Praise is also due to Marcus Lange and all the LOICZ IPO team at Geesthacht for their continued efforts.



LOICZ considers capacity building to be central to achieving sustainability of coastal systems and coastal people and has organized a Young LOICZ Forum with this Open Science Conference. Here a motivated multinational and multidisciplinary group of 25 young researchers and managers from all over the world will work and discuss coastal change issues, approaches, new concepts and of course the science with high ranking specialists. This forum wouldn't have been possible without the strong support by the Asia-Pacific Network for Global Change Research (APN), the Scientific Committee on Oceanic Research (SCOR) and the Yantai Institute of Coastal Zone Research (YIC). For organizing the YLF special thanks are due to Cheng Tang from the LOICZ Regional Node East Asia in Yantai and Juergen Weichselgartner from the LOICZ IPO for their dedication that has let this Young LOICZ Forum materialize.

I would also like to thank all the countless other contributors whom I have not named but who have made this event possible.

So let me say again a warm welcome to all the conference delegates and especially to our keynote speakers conveners and co-conveners who are central in shaping the scientific scope and perspectives in this exciting conference. The last LOICZ Open Science Conference was

held in the Netherlands at Egmont aan Zee in 2005. The conference was an important milestone marking the conclusion of LOICZ I and the inauguration of a second phase of LOICZ that embarked to explore and integrate the concepts of human interaction with nature. The Open Science Conference 2011 in Yantai is the first open conference of LOICZ looking into coastal change from this holistic social ecological systems perspective. It aims to synthesize the scientific topics LOICZ has been working on and which were largely conceptual in nature, Linking Social-Ecological Systems in the Coastal Zone, Assessing and Predicting Impact of Environmental Change on Coastal Ecosystems, Linking Governance and Science in Coastal Regions. Building on experiences made here and in general in LOICZ since 1993 in the Yantai conference we will also launch the new LOICZ scientific hotspots of coastal change. These hotspots are expected to be our research priorities in the years to come and I will present them in detail later.

I wish you all a very successful and interesting conference here in Yantai!



Alice Newton

(Chairperson of the LOICZ Scientific Steering Committee)

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Sunday 11 Sep. 2011	Monday 12 Sep. 2011					Tuesday 13 Sep. 2011					
	07:30-8:30 Registration					08:30-12:30 10:20-10:40 Tea break					
	Room Shanghai					Room Shanghai	Room Yantai	Room Hong Kong	Room Dalian	Room Qingdao	
	8:30-12:30 Opening Ceremony and Plenary Presentations					A4: Small Island Developing States	C4: Bridging the Science-Policy Gap	D4: The Application of Remote Sensing on Tracking the Change of Coastal Zone Environment			D7: Estuaries and Coastal Seas: Interactions, Front and Climate
	B3: Observation, Monitoring and Modeling					B3: Observation, Monitoring and Modeling	C2: Megacities and Resilience in the Coastal Zone (IGBP Synthesis)	D2: Case Studies of long term Change or Stability in Coastal Ecosystems	D2: Case Studies of long term Change or Stability in Coastal Ecosystems	D1: Plant Biodiversity in Coastal Zone Area and intensive Utilization	D5: The Application of Isotopes to track Pollution Sources from Land to Ocean
	12:30-13:30 Lunch					12:30-13:30 Lunch					
	13:30-18:30 max		15:20-15:40 Tea break			Room Shanghai	Room Yantai	Room Hong Kong	Room Dalian	Room Qingdao	
	Room Shanghai	Room Yantai	Room Hong Kong	Room Dalian	Room Qingdao	A3: Changing Land Use in the Coast: Present and Future	A2: Arctic Coastal Processes, Peoples and Societies (Physical, Eco- logical and Socio-Economic Perspectives)	D3: Coastal eco-environments from a microbial perspective	C1/A5: Planning and Governance in Coastal and Marine Areas (LOICZ Synthesis)		
	B1: Nutrient Accounting in Coastal Waters and Watersheds (LOICZ Synthesis)					A1: Linking Regional Dynamics in Coastal and Marine Social-ecological Systems to Global Sustainability (LOICZ Synthesis)					
	14:00-18:00 Registration opens					18:30-20:30 Welcome Banquet at Golden Gulf Hotel Banquet Hall					18:30-20:30 Poster Session with Refreshments
	18:30-20:30 Ice-Breaker Reception										

« LOICZ SCIENCE CONFERENCE 2011 »

Welcome to Yantai

Wednesday 14 Sep. 2011					Thursday 15 Sep. 2011
08:30-12:30 10:20-10:40 Tea break					10:30-10:50 Tea break
Room Shanghai	Room Yantai	Room HongKong	Room Dalian	Room Qingdao	Room Shanghai
				B5: Eutrophication, Hypoxia and Algal Blooms	Concluding Plenary Session
				A6: Ecosystem Goods and Services and Environmental Economics	08:30-9:30 Rapporteurs of LOICZ Synthesis Sessions
				B6: Coastal Biogeochemical Cycles and Climate Change	09:30-10:30 Rapporteurs of Track A-D Sessions
				C3: Coastal Hazards, Inherability and Adaptation	10:50-12:05 Rapporteurs of Hotspots
				B2: Catchment-Estuary – Nature and Human Interaction	12:05-12:20 Rapporteurs of Megacities-Workshop (IGBP Synthesis)
				C3: Coastal Hazards, Vulnerability and Adaptation	Concluding Remarks
12:30-13:30 Lunch					12:30-13:30 Lunch
13:30-18:30 max 15:20-15:40 Tea break					Field Trips
Room Shanghai	Room Yantai	Room HongKong	Room Dalian	Room Qingdao	
				A6: Ecosystem Goods and Services and Environmental Economics	D6: Climate Extremes and Carbon Biogeochemistry in Large-River Delta Front Estuaries
				B6: Coastal Biogeochemical Cycles and Climate Change	A7: Coastal and Marine Sectors: Managing Change
18:30-20:30 Conference Dinner at Haitian Hotel Award Ceremony (Posters and Young LOICZ Forum)					

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photo: Dongyan Liu, Yantai view from airplane



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AIM, SCOPE AND STRUCTURE OF THE CONFERENCE

Aim of the conference

The aim of the LOICZ OSC 2011 “Coastal Systems, Global Change and Sustainability” is to bring together international researchers and users involved in land-ocean interaction and change issues. The conference will show-case the width and scope of coastal scales and related ongoing research, it shall assist to build community in this highly interdisciplinary field, and to inspire new research, theory and concept building and applied science. It is integrative in nature, amalgamating different experiences world views and disciplinary “angles” to generate new levels of understanding and improve decision making in policy and practice.

LOICZ has particularly invited coastal practitioners and early stage researchers to a special forum preceding and parallel to the conference, to explore innovative approaches and concepts - the Young LOICZ Forum (YLF). It is a well-balanced combination of OSC sessions, targeted formal training and open discussions on relevant global environmental change topics. The YLF brings together senior scientists and international organizations with early-career researchers and young coastal managers from various countries (<http://www.loicz-osc2011.org/page.asp?id=85>).

Scope of the Conference

The LOICZ OSC is arranged around the overarching topic on “Coastal vulnerability and sustainability to support adaptation to global change”. Three major pillars are:

- a) The synthesis of past years of LOICZ' process and conceptual research, including social-ecological system concepts and assessments on multiple scales, the theory and practical application of governance baseline assessments, application and findings of biogeochemical assessment and modeling and the interaction of fluxes and change with coastal ecosystems.
- b) The design, agenda setting and community formation for future scientific hotspots of critical coastal change to be addressed by LOICZ. These new priority areas are expected to provide state-of-the-art understanding of current and future coastal system change in the Arctic, urbanized coastal zones and megacities, islands and river-mouths-systems, including estuaries and deltas. Ecological economics, observation and modeling are critical cross cutting areas the conference aims to look into. This part of the conference is expected to pave the way for LOICZ' future global coastal vulnerability research in the Earth system context.
- c) Sessions providing insight into the regional East, South East and South Asian coastal system change as well as national research priorities and recent findings. We look forward to getting a broad scope overview of and insight in coastal change research and special features characteristic for this region. It also hoped to build new networks and avenues for collective research with regional experts and institutions in future.

The scientific scope of the conference also responds to and is motivated by recent years' global discussions of the scientific and research funders communities on future challenges for Earth system sciences, priorities and structural requirements. They reflect in ICSU's visioning process



(<http://www.icsu-visioning.org>) and the resulting five grand challenges (forecasting, observing, confining, responding, innovating) as well as in the conclusions drawn by a set of major national research funding agencies (the Belmont Forum). The Belmont forum concluded the key charge for future Earth system research “to deliver knowledge needed for action to avoid and adapt to detrimental environmental change including extreme hazardous events.” In this context coastal vulnerability has been identified to rank on top of the issues to be addressed (<http://www.igfagcr.org/index.php/challenge>).

Structure

In light of this global discourse LOICZ has invited contributions to the following four major tracks in each of which the presentation of studies of vulnerability, dynamics and resilience of land-ocean systems and communities at local, regional and/or larger scales are explicitly was encouraged:

Track A: Social-Ecological Systems and Scales

Track B: Fluxes and Biogeochemistry

Track C: Coastal Vulnerability and Governance

Track D: Case Studies and Method Application

Organized along these four tracks the conference elaborates on a wide variety of scientific issues which are both disciplinary and as highly interdisciplinary with a strong focus on social and natural sciences and their working together. They all map well onto the challenges outlined above. A few examples to be addressed are (non exhaustive): Social-ecological systems and scales (incl. spatial temporal and institutional aspects), Vulnerability, resilience, and adaptive capacity, Earth Observation and Monitoring, Assessing, Modeling and Scenario Building, Coastal Economics, Ecosystem Goods and Services, Science-Practice-Policy Interface and Knowledge Transfer, Coastal Gover-

nance, River-Mouth Systems, Coastal Urbanization, Arctic coasts and Island coasts.

Subsequent to the opening in plenary, scientific sessions will run in parallel at 5 different locations at the time. While a few sessions will run for more than half a day most of them are currently scheduled to fit a half day timeframe.

In recognition of the challenge parallel events inherently bring for people who want to switch between sessions we kindly ask the conveners to chair the sessions closely according to the program.

Session conveners are asked to find assisting rapporteurs to take note of key findings of the sessions and main discussion points. Conveners/rapporteurs will be asked to report back to the full plenary on the last conference day (Morning session of Thursday 15th September).

Posters will be displayed throughout the conference with a special session scheduled on Tuesday 13th September. During this evening poster session we ask authors to be available for questions. Refreshments will be served. We encourage you to spend time with the posters and the excellent science displayed.

A specific set of events will be dedicated to the IGBP Synthesis on Coastal Megacities (see special announcements for detail).

In the final plenary discussion on Thursday we expect to get initial insight into the status of synthesis, an initial agenda for future hotspots and a good regional picture of coastal change and human dimensions.



CEO LOICZ IPO

(on behalf of the Conference Organizers)

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INTERNATIONAL/ LOCAL SCIENTIFIC ORGANIZING COMMITTEE

INTERNATIONAL SCIENTIFIC ORGANIZING COMMITTEE

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Dongyan Liu (Conference Manager)

Ping Shi

Cheng Tang

Yang Xiao

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Ellen-Barbe Goldberg

Christiane Hagemann

Hartwig Kremer

Marcus Lange (Conference Manager)

Juergen Weichselgartner

Alice Newton

NILU-Center of Ecology and Economics, Norway

GRAPHIC & LAYOUT

Bianca Seth, Helmholtz-Zentrum Geesthacht



欢迎来烟台 Welcome to Yantai

Yantai, located in the north of Shandong Peninsula ($36^{\circ}16' \text{--} 38^{\circ}23\text{N}$, $119^{\circ}34' \text{--} 121^{\circ}67'\text{E}$), bordering on the Yellow Sea and the Bohai Sea. Yantai city has a long history and it was called Zhifu in ancient. In 200 B.C. the first emperor of China once shot fish here with bows drawn and arrows set, forming afterwards "the fish shooting platform". For fighting against the sea rovers, the Ming Dynasty set up the beacon fire stand in 1398 and Chinese "Yantai" hereby achieved its nomenclature. Yantai became one of the first ports in China that opened up to the outside in 1861. About 17 countries setup their consulates in Yantai from 1862 to 1930. Meanwhile, banks, churches, schools and post offices were set up to serve the increasing foreign affairs. Now most of the relics are preserved and renovated and are open to public. In 1983, Yantai City was set up. In 1984, the State Council approved Yantai as one of first 14 coastal cities in China opening to the outside world.

Geographically, Yantai is on hilly land. The plains scattered along the coast covering 23% of its total area. Yantai has a temperate climate with mild winters and moderate summers. The annual average temperature is about 12.9°C and the average annual rainfall is about 622 mm. Over 200 frost-free days can be expected in a year and the city combined with the graceful islands, fascinating gulfs and blue waters with golden sands. Thus it is considered as a well-known summer resort in China.

There are more than 300 companies involved in electronics industries and about 180 companies involved in textile industries. Moreover, Yantai also has a vast rural hinterland and the area of under cultivation exceeds 450,000 hectares. In 2007, the total quantity of the aquatic products was 2.05 million tons; the fruit quantity was 3.96 million tons and the vegetable quantity was 2.73 million tons. In 2007, the GDP of Yantai is 288 billion Yuan, ranked the second richest city in Shandong province.



photo: Illustration of the Yantai Waterfront

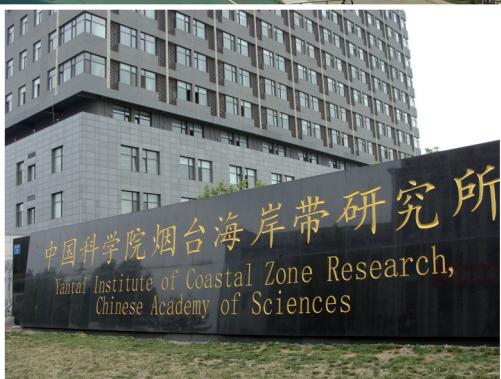
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CONFERENCE INFORMATION



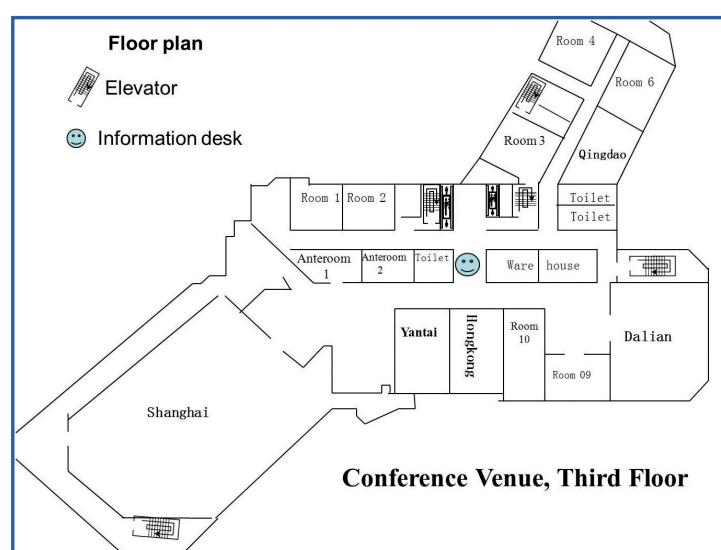
© photos: Marcus Lange



Host of the OSC
Yantai Institute of Coastal Zone Research



Main Conference Room



CONFERENCE VENUE



烟台财会培训中心
Yantai Finance and
Accounting Training Center
Venue of the YLF



Oriental Haitian Hotel

No. 12 Haiyun Road, Laishan District, Yantai,

Tel.: +86-535-6888199

烟台财会培训中心 (东方海天酒店)

烟台莱山区海韵路12号



东方海天酒店
Oriental Haitian Hotel
OSC Venue

© photos: Yang Xiao

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GETTING TO THE CONFERENCE VENUE

TRANSPORTATION

Shuttle buses to and from the Conference Venue:

- on 11 September, 2011 at 11:00 am/ 16:00 pm/ 21:00 pm from the Airport to the Conference Venue and
- on 15 September, 2011 at 13:30 pm/ 15:30 pm/ 18:30 pm from the Conference Venue to the Airport.

At any time of the first day of the conference (12 September, 2011) there will be volunteers guiding your way to the transportation services with a direct connection to the conference venue.

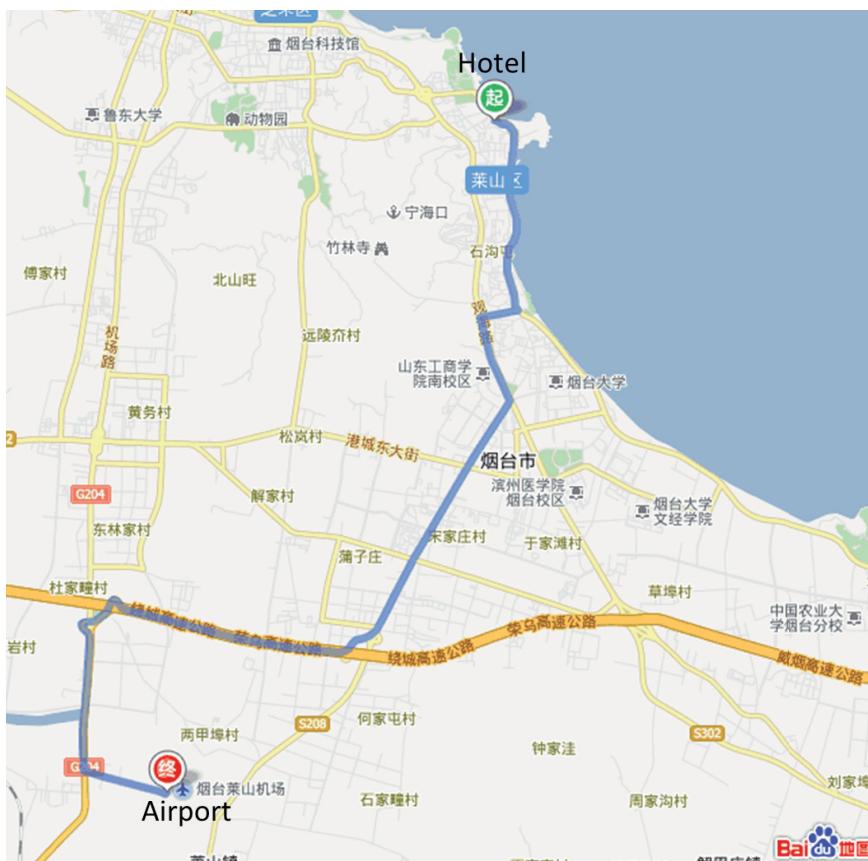
TAXI SERVICES

The price for a taxi from the Airport to the Conference Venue will be around 70 RMB

For assistance, please use the following information:

[Please take me to Oriental Haitian Hotel.](#)

请送我去东方海天酒店。



source: google maps



REGISTRATION & INFORMATION DESK

The registration desk will be open on 11 September, 2011, in the afternoon in the lobby of the Oriental Haitian Hotel, and from 12 – 15 September, 2011, on the 3rd Floor. Internet and printers will be available there. The conference staff will offer support during the entire conference.

CONGRESS LANGUAGE

The official language of the LOICZ OSC 2011 is English. Simultaneous interpretation is not provided. It is therefore expected that authors are able to present their research more or less fluently in English.

RULES OF CONDUCT

Smoking is prohibited in the entire conference centre except in the areas designated for smokers.

It is prohibited to copy any presentation from the desktops in the lecture rooms. Please switch off any mobile phones in the lecture rooms. It is prohibited to take photos of any scientific material at the conference.

INSURANCES

The organizers cannot accept liability for personal accident, loss or damage to private property, which may be incurred as a result of the participation in the LOICZ OSC 2011. Participants are, therefore, advised to arrange appropriate insurance cover. This should extend not only to travel but also to cancellation costs and any other material.

INFORMATION ON FIELD TRIPS

(15th afternoon and 16th September, 2011)

Route 1:

15th afternoon - the Yantai city tour; 20 USD

* You cannot join city tour if you will visit the Yellow River Delta, because Route 4 will leave on 15th afternoon.

Route 2:

One day trip on 16th - Penglai Pavillion + Mous Manor; 80 USD

Route 3:

One day trip on 16th - Weihai + Liugong Island; 80 USD

** You can only choose up one of Route 2 and 3.

Route 4:

One and half day trip on 15th afternoon and 16th; Excursion to Yellow River Delta - you will leave in the afternoon of 15th and stay one night in Dongying city. You will visit the Yellow River Delta Park on 16th and return to Yantai on 16th night; The Food and accommodation will be covered during trip; 200 USD

*** You can not choose Route 1, 2 and 3 if you will go to Route 4.

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KEYNOTE SPEAKERS AND PRESENTATION TITLES

JÖRN BIRKMANN

United Nations University -
Institute for Environment and
Human Security

»Challenges for adaptive
coastal governance: scales,
knowledge and power«



FRANCISCUS COLIJN

Institute for Coastal Research,
Helmholtz Centre Geesthacht,
Germany

»Coastal observatories: their
role in coastal research«



CHEN-TUNG ARTHUR CHEN

Institute of Marine Geology and
Chemistry, National Sun Yat-sen
University, Taiwan

»Cross-boundary exchanges
of carbon and nitrogen in the marginal seas«



MINHAN DAI

State Key lab of Marine
Environmental Science,
Xiamen University, China

»Influx and export of dissolved organic carbon in
the marginal seas - implications for global ocean
carbon cycling«



DELIANG CHEN

International Council for Science (ICSU), France

»Visioning: towards a new
initiative on earth system
research for global sustainability«



A DONG

Department of Sea Area and
Island Management, State
Oceanic Administration of
China »Marine Functional
Zoning (MFZ) in China«



LUIS CHÍCHARO

Centre of Marine Sciences of
Algarve, University of Algarve

»Ecohydrology: a tool for
sustaining ecosystem functions and services between
river basin and coast under global changes:
the Guadiana (SE Portugal) case study«



CHRISTINE DUPUY

University of La Rochelle, France

»The flowcam : a methodology for studying the nano-microplanktonic communities«



JOAO GOMES FERREIRA

Dept. Environmental Sciences
and Technology, New University
of Lisbon, Portugal

»Beyond biomass: ecosystem interactions of eutrophication, with an emphasis on shellfish aquaculture and IMTA«





KEITA FURUKAWA

Marine and Coastal Department, National Institute for Land and Infrastructure Management, Japan

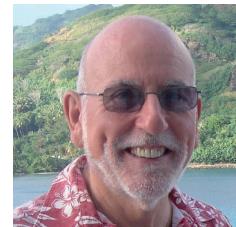
»Lessons learned in attempting to restore the Tokyo Bay ecosystem«



JOHN EDWARD HAY

The University of the South Pacific, Rarotonga, Cook Islands, South Pacific

»Small Island Developing States: coastal systems, global change and sustainability«



MARION GLASER

Leibniz Center for Tropical Marine Ecology, Bremen, Germany

»Coastal and marine social-ecological systems, cross-level feedbacks, regional and global sustainability: linking global to regional sustainability analysis in marine and coastal social-ecological systems«



YUICHI HAYAMI

Institute of Lowland and Marine Research, Saga University, Japan

»Environmental change in the Ariake Sea: reclamation, material transport and hypoxia«



BRUCE GLAVOVIC

Natural Hazards Planning, Resource and Environmental Planning Programme, Massey University, New Zealand

»Coastal disaster narratives:

Learning from Katrina, the BP Oil Spill and Climate Change«



ROBERT HOWARTH

Department of Ecology & Evolutionary Biology, Corson Hall, Cornell University, USA

»The future of coastal N pollution: a start towards evaluating the relative influences of climate, agriculture, and energy and trade policies«



MIKHAIL GRIGORIEV

Permafrost Institute, Siberian Branch, Russian Academy of Sciences, Russia

»Coastal permafrost processes within the Siberian Arctic region«



YIHANG JIANG

UNDP/GEF Yellow Sea Project Management office

»Potential management solutions on ecosystem-based approach: the Yellow Sea example from science to management«



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JAMES R. KAHN

Department of Economics
and Environmental Studies
Program, Washington and Lee
University, USA; Tropical Fisheries
at the Federal University of
Amazonas, Brasil

»Think globally but model locally: the use of panel
data in estimating behavioral models of the relationships
between human behavior and environmental change«



SHUH-JI KAO

Research Center for Environmental Changes, Academia
Sinica, Taiwan

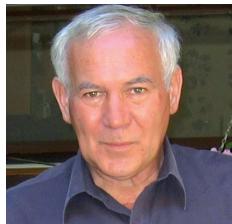
»Climate-driven isotopic speciation of sedimentary C/N
in seas receiving sediments from turbid rivers«



MERVYN LYNCH

Remote Sensing and Satellite
Research Group, Curtin University,
Perth, Australia

»Hyperspectral sensing for
environmental monitoring
and marine management«



FRANK MAES

Department of Public International Law & Maritime
Institute, Ghent University, Belgium

»Local ecological fisheries knowledge in support of
decision-making and marine spatial planning«



ALICE NEWTON

NILU-Center of Ecology
and Economics, Norway
»A vision towards coastal
sustainability«



MARK PELLING

Department of Geography,
King's College London, UK
»Tension between resilience
and sustainability in a rapidly
urbanizing coastal zone,
Quintana Roo, Mexico«



RASMUS OLE RASMUSSEN

NORDREGIO – Nordic Centre
for Spatial Development Stockholm,
Sweden

»Megatrends in Arctic Development«



PIERRE JEAN RICHARD

CNRS and University of La
Rochelle, France

»Use of nitrogen isotopic
signatures of nutrients and
macroalgae as indicators of anthropogenic inputs
in coastal areas«



JOYASHREE ROY

Global Change Programme and
JU JU-SYLFF Project, Jadavpur
University, India

»How sensitive policies and
implementation are to ecosystem services in Indian Sundarbans«



PEIJUN SHI

State Key Laboratory of Earth Surface Processes and Resource Ecology, Beijing Normal University, China
»Research on integrated disaster risk governance of coastal zone in the context of global environmental change«



JAMES P.M. SYVITSKI

CSDMS Integration Facility, INSTAAR, University of Colorado, USA »Deltas under climate change: the challenges of adaptation«



SANDRA SHUMWAY

Department of Marine Sciences, University of Connecticut, USA
»Bivalve shellfish aquaculture and eutrophication«



PETER THOMPSON

CSIRO Marine and Atmospheric Research, Hobart, Australia
»Long term trends in Australian temperate, coastal waters and their implications for phytoplankton.«



JILAN SU

State Key Lab of Satellite Ocean Environment Dynamics, Second Institute of Oceanography, State Oceanic Administration of China
»Ecosystem issues facing sustainable development of China's ocean and coasts«



HOUJIE WANG

College of Marine Geosciences, Ocean University of China, China
»Human disturbances on the catchment-estuary system of the Yellow River«



TIMOTHY STOJANOVIC

School of Geography and Geosciences and Scottish Oceans Institute, University of St Andrews, UK
»Developing a baseline of European coastal governance«



RUSONG WANG

Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing
»Social-economic-natural complex ecosystem approach and its application to Hainan eco-province planning«



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SCIENTIFIC SESSIONS

SESSION DESCRIPTIONS

TRACK



SOCIAL-ECOLOGICAL SYSTEMS AND SCALES



» Linking regional Dynamics in Coastal and Marine Social-Ecological Systems to Global Sustainability (LOICZ Synthesis) «

Convener:

Marion Glaser & Bernhard Glaeser

This session links integrated and locally informed social-ecological analysis to global sustainability issues. It focuses on coastal and marine social-ecological systems (CM-SES) in different climate zones. Contributions should focus on one or both of the following two questions: 1) How do we link and present natural and social science data and forms of knowledge other than research (e.g., local, traditional, administrative/decision-maker knowledge)? and 2) How do we link the analysis of culture- and place-specific system features and dynamics to major geographical, political and bio-territorial and to global (environmental) change processes?



» Arctic Coastal Processes, Peoples and Societies (Physical, Ecological and Socio-Economic Perspectives) (Hotspot) «

Convener:

Joan Nyman Larsen & Volker Rachold

The coastal zone is the interface through which land-ocean exchanges in the Arctic are mediated and it is the site of most of the human settlements and activity that occurs at high latitudes. Arctic coasts are highly variable and their dynamics are a function of interactions between environmental forcing, coastal geology, coastal biology and human activity. Thus, at the Arctic coastal margin, perhaps more than anywhere else, numerous and varied physical, ecological and socio-economic processes and states exist within a web of interrelationships.

The objective of this session is to discuss these interrelationships in terms of the viability of coastal communities, their vulnerability, and policies and strategies for adaptation to local and global change. We are soliciting contributions both on physical processes, ecological perspectives and ecosystem services and on social, economic and governance aspects, including the following topics:

- (1) Physical perspectives: High-frequency environmental forcing (atmospheric and oceanographic), sea-level changes, on/offshore permafrost dynamics and gas hydrate stability, sea-ice dynamics, biogeochemical transformations, sediment dynamics, etc.;

- (2) Ecological perspectives: Ecosystem services and biodiversity, including coastal ecosystems, habitats, species etc.;
- (3) Socioeconomic perspectives: socioeconomic transformations, including market and non-market sectors; economic wellbeing and local economic impacts; fisheries, hydrocarbon exploitation, marine shipping, and related risks and prospects for coastal communities; community vulnerability and adaptation; governance and institutions, etc;

A₃

» Changing Land Use in the Coast: Present and Future «

Convener: *Masumi Yamamuro*

Economic development often integrates industries in the coast, which induces urban development worldwide. Increased demands alter the coast, i.e., damming estuaries. Increased waste also facilitates the deterioration of the coast through land reclamation and supplying marine litter. Dredging the port area induces the hypoxia and land reclamation. This session introduces the present status and discusses the future perspective for sustainable use of the coast under urbanization.

A₄

» Small Island Developing States (Hotspot) «

Convener: *Beate M.W. Ratter*
& Donald L. Forbes

Extreme weather events and natural hazards such as hurricanes, floods and droughts can have far-reaching consequences, in particular in small island developing countries. Anticipated consequences of the continued warming of the earth include rising sea levels and the possible flooding of low-lying islands, as projected in the IPCC AR4 in 2007 for the coming forty years. Meanwhile there remains uncertainty about the magnitude of future warming and recent published studies suggest that sea-level rise may greatly exceed the projections in the AR4. However, some scientists expect a revision and more robust projections, when downscaling models about the mean sea level on a regional scale. The impacts of these climate trends will first be felt in extreme events, which therefore require careful attention along with the potential for climate surprises. The small populations and limited resources of many island states may limit the technical capacity of island institutions to deal with these challenges under conditions in which past experience (traditional knowledge) may be a poor guide to the future.



A⁵

merged with C1 under C1/A5

A⁶

» Ecosystem Goods
and Services and
Environmental Economics «

Convener: Joyashree Roy & Shang Chen

Coastal ecosystems are unique and are particularly exposed to both natural and anthropogenic stresses. In traditional economic development concepts this uniqueness has either been ignored or largely undervalued. The multiplicity of ecological functions have either not been integrated with the economic system or not understood properly. To contribute to the development of sustainability policies supporting coastal management examination of the ecological-economic linkages and social-distributional aspects of the coastal systems are pertinent.

Coastal systems however also reflect the changing dynamics of the planet over geological time scale and represent research potential to understand Earth system scale processes and change. Economic gain driven human intervention in coastal zones sometimes includes driving forces even far upstream at river basin level has much implication for distortions in ecosystem services and material flows.

One question is what needs to be the scope of coastal social ecological systems in terms of their capacity to provide goods and services to society? To what extend are existing economic systems and institutions able to capture coastal values and to cope with pressures on the underlying ecosystem support functions? These questions are important to understand. So a system approach to the valuing of coastal ecosystems (including a distinction between categories such as provisioning, regulating, cultural and supporting services or direct use values and non-use values) is essential in the context of the sustainable development concept. The high variability of coastal systems will certainly ask for a whole set of answers since a one size fits all kind of solution to sustainability might not be realistic.

Historically, economic development driven socio political choices have led to many irreversible interventions in coastal ecosystems. Under future climate change scenarios reflecting different potential developments of the Earth and social systems various alternative interventions are in the offing. It is therefore important to understand cross-regional experiences (e.g. on regional sea scale). An inventorisation of coastal ecosystems along their ecological functions, threats, opportunities, adaptation challenges and experiments with sustainable practices needs to rely on values reflecting a comparable metric and thus to inform current and future decision making. Structuring tools allowing the distinction between goods and service categories such as provisioning, regulating, cultural and supporting services or direct use values and non-use values can lay the basis for a much needed stock taking.



In this context the scientific session at the LOICZ OSC 2011 besides its stock taking efforts also aims to give an insight into state-of-the-art methods and approaches to value coastal ecosystem services. Thought may also be given to the emerging issue of compensation for changes and losses in ecosystem functions and services. Case studies can underline the practical application of different approaches.



» Coastal and Marine Sectors: Managing Change «

Convener: **Valerie Cummins &
Anne Marie O'Hagan**

As the land sea interface, the coastal zone represents a point of convergence for sectors of the economy dependent on the marine environment for natural resources and transport. Despite 30 years of theory and practice from around the world, concerning the need for Integrated Coastal Zone Management, and more recently, Maritime Spatial Planning, coastal and marine sectors tend to be developed in silos, with little regard for other sea use activities. The profile of these activities is changing, leading to conflicts of use and to the deterioration of the environment upon which they depend (e.g. over-fishing). At the same time, the expansion of emerging sectors, such as ocean energy, marine bio-discovery and cruise tourism, provide major opportunities for economic development. We have reached a critical juncture in society, whereby the scale and rate of change in traditional and new sectors, requires innovative

approaches to management. The aims of this session are: (i) to map the key global trends that characterise marine and coastal sectors at this point in the 21st Century, including fishing and aquaculture, ports and shipping, offshore energy and marine tourism; (ii) to understand how marine science, technology and innovation are influencing the development of these economic sectors; and (iii) to identify the opportunities and constraints for industry participation in approaches to change management, such as adaptive co-management.

This session addresses the constraints, challenges, and potential strategies for coping with existing and upcoming coastal hazards in the context of climate change and extreme events. Solutions may be found in technical (hard or soft engineering), institutional, political or other approaches. Furthermore, there is a need to understand the multiple sources of hazards and threats, some of which originate with global climate change attributable to greenhouse gas emissions, while others may be due to maladaptive activities in the local environment. Thus an assignment of obligation to the major emitters without changing local mal adaptation could fail to avert serious impacts. Small islands may be both victims and agents of environmental crisis. It is important to reduce vulnerability, to seek affordable adaptation strategies, to support joint efforts on the international scene, and to build resilience by incorporating adaptation needs and options into the awareness and behaviour of small islands residents.

TRACK



FLUXES AND BIOGEOCHEMISTRY



» Nutrient Accounting
in Coastal Waters
and Watersheds
(LOICZ Synthesis) «

Convener:

Dennis Swaney

Coastal nutrient budgets, such as those developed in LOICZ, have been useful in assessing the relationships between nutrient fluxes and the ecosystem metabolism of coastal waters worldwide, and are proving to be helpful in assessing and managing the impacts of coastal activities on water quality. On the coastal watershed side, simple accounting methodologies are proving useful in assessing the relationships between human activities in watersheds and nitrogen loads to coastal waters. This session presents ongoing work in these areas, including new methodologies, and applications of these approaches to the science and management of nitrogen and its consequences to the environmental quality of coastal waters.



» Catchment-Estuary:
Nature and
Human Interaction «
(Hotspot) «

Convener:

*Zhongyuan Chen &
Yoshiki Saito*

Estuaries and deltas provide abundant natural resources and ecosystem services for human society and the areas around them are often densely populated and becoming increasingly so. Over 50% of the world population now resides in the coastal region, particularly river-mouth system: estuaries and deltas, engaging in industrial, agricultural and tertiary activities. Estuaries & deltas bridge the catchments and the ocean, and are the foci of an intensive interaction between human and nature. In the past decades, the anthropogenic impact on the functioning of the estuarine & deltaic ecosystem has increased relentlessly and has become significant enough to affect measurably the ecohealth of these systems. This impact comprises changes in land-use, water impoundment, excessive discharge of industrial and domestic waste waters, nutrients from agricultural fertilizer and domestic sources, as well as large-scale engineering hardening of the coast, large-scale land reclamation primarily of tidal wetlands, and ground-water pumping resulting in land subsidence. An additional concern is the looming climate change at global and regional scales. Restoring or at least preventing further degradation of the estuarine and deltaic ecohealth has become a great concern for sustaining our society.

Historically land-clearing has resulted in increasing sediment loads that create turbid waters that buffered the estuary from excessive eutrophication, while more recent large-scale damming may flip the estuarine waters from highly turbid to very low turbidity. As a result the estuary is losing its ‘filtering’ function, leading to degradation of its physical setting. Additionally, there are many other bio-chemical-physical processes in the estuary beyond our current knowledge. Also the change of sediment discharge has been impacting deltaic coasts, resulting in coastal erosion, wetland & mangrove loss. To fill in this knowledge gap, interdisciplinary, collaborative, scientific studies are needed of these changing estuaries and deltas. This session aims at establishing a network of the engineering and scientific community by providing a forum to share and disseminate relevant knowledge.

B³

» Observation,
Monitoring and Modelling «

Convener:

*Remi Laane &
Franciscus Colijn*

In 2010 the turning point is reached: more than 50% of the human population is living close to the coast. More and more use is made of the coastal (eco)systems. The natural (climate change) and man-made pressure increased the material and energy fluxes through coastal zones enormously the last decades. The impact on the (eco) system and on economical resources have been documented for many coastal areas. To

describe and predict the man-made impact there is an urgent need for coastal observatories (e.g., Remote Sensing, Ferry boxes, Smart Moorings), monitoring strategies and models. Many countries all over the world are starting to explore coastal observatories with innovative techniques and methods. The integration of results from observatories and those of models will play an important role in cost effective monitoring and predicting man made impact in coastal areas. In general, there is an urgent need for standardized and accessible data, information and knowledge.

B⁴

» Estuarine and
Coastal Ecohydrology
(Hotspot) «

Convener: *Luis Chicharo*

This session focuses on the science of ecohydrology as the continuum from the watershed to estuary to coastal waters. Ecohydrology integrates different branches of environmental science, including ecology and hydrology, and merges this with engineering to find practical solutions to increase the capacity of the aquatic environment to cope with human impacts. The solutions often involve improving the capacity of the environment to absorb human impacts through modified and improved natural hydrological processes. In contrast with purely technological solutions, ecohydrology works from within ecosystems. Ecohydrology recognises that environmental degradation can only be remedied by restoring some of the working of the ecosystem and helping the partially restored system to improve itself naturally.

B⁵

» Eutrophication,
Hypoxia and Algal Blooms «

Convener:

*Alice Newton &
Sandra Shumway*

Eutrophication of coastal waters is an issue affecting the quality of coastal waters and their uses globally. The causes of eutrophication are varied, from naturally productive waters, such as in upwelling zones, to eutrophication by human activities, such as domestic and industrial discharges as well as agricultural runoff and animal rearing. The consequences of eutrophication are also varied and include hypoxia, as well as algal blooms. Phytoplankton (algal) blooms can affect water clarity and in some cases are harmful or toxic, e.g., some dinoflagellates, diatoms and cyanobacteria. Blooms of macrophytic algae, especially nitrophylllic species, can also occur in such great quantities as to cause serious problems. Tourism, aquaculture and fisheries are some of the sectors that are affected by loss of water quality. Submissions are invited that explore the linkages between the economic sectors that are drivers of eutrophication, the consequent change in the state of the environment and ecosystem, how this impacts ecosystem goods and services and human welfare, as well as innovative responses to these problems.

B⁶

» Coastal Biogeochemical
Cycles and Climate Change «

Convener:

*Chen-Tung Arthur Chen &
Christiane Lancelot*

Biogeochemical processes in coastal systems are both affected by, and contribute to, climate change. For example, climate can change freshwater, sediment, and nutrient inputs from land, as well as change circulation at the ocean-coastal interface. Climate related changes in these and other inputs can affect ecosystem dynamics (e.g., production, biodiversity, aquaculture, trace gas production/consumption, net carbon fluxes) within coastal systems. At the same time, many of these processes can contribute to climate change (e.g., changes in trace gas production/consumption, net carbon source/sink). Where and to what extent do coastal systems interface with climate change? This session seeks to develop an integrated view of coastal systems in terms of the affects of, and contribution to, climate change. Papers were invited from across a range of coastal systems (deltas, bays, estuaries, marshes, continental shelves). Papers addressing a combination of climate and other stresses are also strongly encouraged.

TRACK



COASTAL VULNERABILITY AND GOVERNANCE



A⁵

» Planning and Governance
in coastal and Marine Areas
(LOICZ Synthesis) «

Convener:

*Andreas Kannen &
Valerie Cummins*

Economic, environmental and demographic pressures are converging sharply in the coastal regions. On land as well as in the sea this leads to increased use of coastal and marine space creating fundamental challenges for coastal and marine planning and management and the related governance structures. Increased urbanization, shipping and trade, overfishing, aquaculture, tourism and renewable as well as non-renewable energies are key drivers of change in many coastal and marine areas worldwide. From a governance perspective this creates sometimes complex spatial and institutional patterns, which relate to fragmented policies and a multitude of interests and conflicts among different actors. In this context coastal governance and integrating forms of planning and decision making are becoming increasingly important and are also evolving rapidly. Marine Spatial Planning (MSP) is a tool increasingly promoted and established to deal with such problems in an integrated way. However, which type of issues and conflicts can be successfully dealt with by spatial planning? What type of (additional) measures might be needed to improve MSP in the context of fragmented policies and the

multiple scales involved in many economic, social and ecological processes? What are the challenges for the existing and for future governance systems?

This session will probe the responses of governance systems to change in coastal ecosystems using examples and case studies from different parts of the world, in particular China, South Asia and Europe. Papers address challenges related to coastal and marine governance in the light of global and regional change, approaches to deal with upcoming drivers such as renewable energies, case studies of planning mechanisms such as zoning and discuss stakeholder participation and cross-border cooperation. Based on the presentations the session aims to stimulate a debate concerning further development of coastal and marine governance and supporting scientific approaches.



» Megacities and Resilience
in the Coastal Zone «
(also part of IGBP Synthesis)
(Hotspot) «

Convener:

*Mark Pelling &
Bruce Glavovic*

Large urban centres world-wide are growing in population and attracting economic and physical capital just as recognition of their exposure to climate change related hazards is being recognized. Do these hazards, and other internal environmental pressures such as subsidence, impose a limit on urban development? The logic of risk management suggests so but empirical evidence suggests not. This session will explore what it is about



large and megacities that allows expansion and in particular focus on tensions between the success of cities in acting as engines for economic growth and the possibility that the drivers of this success may be also undermine long-term resilience as development closes options for flexibility and adaptive management.



» Coastal Hazards, Vulnerability, and Adaptation «

Convener: *Bruce Glavovic & Ramachandran Ramesh*

Coastal communities are at the frontline of humanity's struggle to come to grips with the reality of global change, including climate change. Consequently, there is a compelling need to better understand the nature of coastal vulnerability, resilience and adaptive capacity. Moreover, practical steps need to be taken to reduce vulnerability, build resilience and facilitate adaptation of coastal communities at risk. This session presents (i) a synthesis of our current understanding of the concepts of vulnerability, resilience and adaptive capacity in the context of a changing coastal environment; (ii) a series of case studies focusing on practical lessons learned from real-world endeavours to adapt to a change; and (iii) a synthesis of practical steps that coastal communities can take to assess vulnerability, build resilience and adapt to change.



» Bridging the Science-Policy Gap «

Convener: *Fabrice Renaud & Juergen Weichselgartner*

Even excellent science is not necessarily used effectively in the development of management actions or policy. One major reason is a disconnect between scientists, resource managers and policy makers, specifically the different priorities and vocabulary of these groups. One way to assist in bridging this gap is the development of key scientific syntheses, including key visuals and graphics, to facilitate a discourse as well as stronger linkages between science and management.



TRACK



CASE STUDIES AND METHOD APPLICATION



» Plant biodiversity in coastal zone area and intensive utilization «

Convener:

Song Qin, Sung-Min Boo & P. Ang

The costal zone area is crowded with population development and economy growth. Biodiversity is degrading sharply with increase of human activities especially for construction of artificial coastlines. Preservation and restoration of plant ecosystem is key important of sustainable development of coastal environment. The aim of this session is to discuss effects of global and regional environmental change on coastal plant biodiversity, as well as successive utilization strategy on changing plant resources. The lectures and discussion in the session will cover topics from, e.g. how to survey, evaluate, maintain/recover or even reconstruct plant resources and flora ecosystem, to how to make both intensive and extensive utilization of changing plant resources.



» Case Studies of long term Change or Stability in Coastal Ecosystems

Convener:

John Keesing & Peter Thompson

Until recently most of our understanding of how marine systems worked came more from comparing across ecosystems rather than the study of temporal variation. With the recognition of climate change and greater observing capabilities our ability to apportion variation into seasonal, annual and long time scale components has made it apparent that temporal variation can also provide significant insights into ecosystem function. In fact the long term trends in seasonally detrended data provide the best tools to estimate and predict the impacts of climate change. In this session, the stability of coastal ecosystem using the long term cases studies will be discussed and evaluated.



» Coastal Eco-environments from a Microbial Perspective «

Convener:

Christine Dupuy & Jun Gong

Climate change, sea level rise and human activities affect coastal biota, ecosystem structure and functions in multiple pathways including marine and soil food webs and biogeochemical cycles, in which microorganisms, cultivated and yet uncultivated, provide important ecosystem services such as nutrient regeneration, decontamination, and



regulation of trace gas emission. This session discusses the linkage of diversity, function, distribution, interactions and responses of microbes with coastal processes in the changing world.



» The Application of Remote Sensing on Tracking the Change of Coastal Zone Environment «

Convener: M. Lynch & C. Chen

There are complicated processes in coastal zone environment and they exhibit different temporal and spatial scales. Therefore, efficient monitoring becomes a major challenge both for research on and management for coastal zone environment. Remote sensing data are widely used to measure the states and variations of coastlines and topographies, beaches and mudflats, water constituents and ecosystems, etc. Different sensors and algorithms with different combinations are used for different applications, with successes and limitations. Therefore, this session is intended to promote exchange on ideas, methodologies, and applications of remote sensing technology on coastal environment, including:

- 1) Algorithms for processing, retrieving, analyzing of remote sensing data and information.
- 2) Process studies on coastal zone environment based on remote sensing information.
- 3) Applications of remote sensing information to coastal zone monitoring, planning, and assessment.



» The Application of Isotopes to track Pollution Sources from Land to Ocean «

Convener: Pierre Richard & Jing Zhang

Besides the negative impacts of their own economical development and urbanization coastal zones are largely affected by multiple contaminations as dissolved or particulate matter inputs from watersheds. Isotopic measurements have proven to constitute a powerful tool to decipher the origin and behavior of pollutants in the environment. This session is open to applications of isotopes that aim at tracking sources of both organic and inorganic contaminations, past or present, in estuarine and coastal zones. Contributions based on diverse approaches (direct measurement, using living sentinel organisms or animal remains) or developing a basis to interpret environmental changes are welcome.





» Climate Extremes and Carbon Biogeochemistry in Large-River Delta-Front Estuaries «

Convener:

*Minhan Dai,
Thomas S. Bianchi &
Jianping Gan*

One of the likely consequences of future climate change is an increase of the frequency and severity of extreme weather events. These extreme events can have serious and devastating impacts on humans and natural ecosystems. The direct impacts of extreme events on humans are well documented. The impacts of extreme climate events on natural ecosystems are equally profound, affecting for example the transport of dissolved and particulate materials from terrestrial environments to the coastal ocean, causing severe and lasting changes in coastal ecosystem. Large deltaic estuaries (LDEs) associated with the world's 25 largest rivers drain approximately half of the continental surface and transport approximately 50% of the fresh water and 40% of the particulate materials entering the ocean. These systems have experienced considerable changes over recent decades. Among others, eutrophication has become a worldwide problem in coastal waters, likely caused by the combined effect of anthropogenic nutrient enrichment in the upland river basins and changes in weather patterns associated with climate variability/change. Both have a profound effect on the delivery of nutrients to coastal ecosystems, thus altering biogeochemical cycles of the Earth system, representing the most important scientific and technological challenges in the 21st century. The current lack of knowledge and understanding of biogeo-

chemical processes occurring at the ocean margins has left them largely ignored in most of the previous global assessments of the oceanic carbon cycle. The current generation of climate models used to project future climate change does not fully resolve physical and biogeochemical processes at the ocean margins, and thus are incapable of addressing this issue.

One of the grand challenges in predicting future changes in extreme climate events and their impact on natural ecosystems is that these changes involve multi-scale interactions among various Earth system processes from global-to-basin scale to fine local scale. These complex interactions also exhibit strong regional dependencies that require detailed understanding and modeling at local scales. Therefore, to make fundamental progress on improving our understanding and modeling capability of these interactions a regional Earth system approach that includes not only physical interactions and feedbacks, but also chemical and biological processes among the atmosphere, the land surface, the oceans, and humans is essential. This session called contributions related to all aspects on how extreme climate events (e.g., floods, drought) impact linkages between watershed and coastal carbon biogeochemistry. Both case studies of large river deltaic systems and comparative studies in between were welcomed.

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» Estuaries and Coastal Seas:
Interactions, Front and
Climate «

Convener: Dongxiao Wang &
Wenping Gong

Through river discharge, estuaries profoundly affect thermal, freshwater, and nutrient balance of coastal seas. Estuarine zones of the coastal seas are loci of frontal zones (estuarine fronts) that feature complex physical, chemical and biological processes, leading to elevated biological productivity and diversity in estuaries and nearby coastal seas. Large rivers integrate thermal signal (e.g. terrestrial warming) over their vast watersheds and deliver this signal to respective estuaries, where riverine thermal signal is injected into adjacent coastal seas. Evidence mount of accelerated warming of large estuaries and coastal seas (Ho et al., 2005; Belkin, 2009). Of all coastal seas, the China Seas and European Seas feature the fastest rates of climate warming, $>1^{\circ}\text{C}$ over 25 years.

Presentations were solicited on:

- 1) Estuarine fronts: Their physics, chemistry, biology, and geology.
- 2) Circulation in estuaries and coastal seas.
- 3) Interactions between estuaries and coastal seas.
- 4) Climate change in estuaries and coastal seas.
- 5) Typhoon impact on the coastal ocean, especially in the China Seas.

Selected presentations will be published in 2012 in a special volume of a leading peer-reviewed journal such as the Journal of Marine Systems, Continental Shelf Research, or Progress in Oceanography.



Welcome to Yantai



ROOM SHANGHAI

CONFERENCE PROGRAM

OPENING

(Chair: Alice Newton & Ping Shi)

Time	Agenda					
7:30-8:30	Registration					
8:30-8:35	Mayor of Yantai City					
8:35-8:40	Alice Newton (LOICZ Chairperson)					
8:40-8:45	Head of Chinese Academy of Sciences (CAS)					
8:45-8:50	Hartwig Kremer (LOICZ CEO)					
8:50-8:55	Juergen Weichselgartner (LOICZ Senior Science Coordinator)					
Get together Conference Photo						
Plenary Presentations						
	Speaker	Country/Region	Title			
9:30-10:00	Deliang Chen	FRANCE	Visioning: Towards a new Initiative on Earth System Research			
10:00-10:30	Alice Newton	NORWAY, PORTUGAL	A Vision Towards Coastal Sustainability			
10:30-11:00	Tea Break					
11:00-11:30	Jilan Su	CHINA (MAINLAND)	Ecosystem Issues Facing Sustainable Development of China's Ocean and Coasts			
11:30-12:00	Franciscus Colijn & Kay Emeis	GERMANY	Sea Use Change: Challenges for German Marine Science. Helmholtz-Zentrum Geesthacht, host of the LOICZ IPO			
12:00-12:30	James P.M. Syvitski	USA	The Anthropocene: Are We There Yet?			
12:30-13:30	Lunch					



» Linking regional Dynamics in Coastal
and Marine Social-Ecological Systems
to Global Sustainability (LOICZ Synthesis) «

Convener: Marion Glaser & Bernhard Glaeser

Time	Speaker	Country/Region	Title
13:30-13:55	Marion Glaser (Keynote Speaker)	GERMANY	Coastal and Marine Social-Ecological Systems, cross-level Feedbacks, regional and global Sustainability: Linking global to regional Sustainability Analysis in Marine and Coastal Social-Ecological Systems
13:55-14:20	Rusong Wang (Keynote Speaker)	CHINA (MAINLAND)	Social-Economic-Natural Complex Ecosystem Approach and its Application to Hainan Eco-province Planning
14:20-14:35	Joan Nymand Larsen	ICELAND	Social-Ecological Issues on Arctic Coasts and their multi-level Driving Forces
14:35-14:50	Chia-Chi Wu	GERMANY	Common Pool Resources Management in Linked Social-Ecological Systems: A Case of Penghu Archipelago, Taiwan
14:50-15:05	Panwad Wongthong	AUSTRALIA	Reef-related Tourism and Integrated Coastal Management
15:05-15:20	Antonio Carlos Diegues	BRAZIL	New Approaches to Marine Conservation and coastal Planning in the Tropics
15:20-15:40			Tea Break
15:40-15:55	Lorraine McFadden	UNITED KINGDOM	Systems: 'Easy' in Theory but what about Practice? Issues of Scale and Interdisciplinarity in a Systems Application within the Odra/Oder River Basin
15:55-16:10	Gabrielle Mossot	FRANCE	Integrating Knowledge Sources in Social-Ecological Projects: Lessons learnt from a French Case Study
16:10-16:25	Anke Schmidt	GERMANY	Transdisciplinary Evaluation of Different Coastal Adaptation Strategies: Integrating regional Perceptions of Scientists, Practitioners and the Public
16:25-16:40	Tim van Oijen	NETHERLANDS	The Wadden Sea Region, a Hotspot for the Analysis of Changing Human-nature Interactions
16:40-16:55	Karl Buckmeier	SWEDEN	North European Coasts and Islands – Cross-scale Coastal Management, culture- and Place-specific Social-Ecological Systems, Global Environmental Change
16:55-17:10	Bernhard Glaeser	GERMANY	Global Change and Coastal Threats: The Indonesian Case
17:10-17:55			A1 Discussion

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» 12TH SEP, MONDAY AFTERNOON «

ROOM
YANTAI
B1

» Nutrient Accounting in Coastal
Waters and Watersheds (LOICZ Synthesis) «

Convenor: Dennis Swaney

Time	Speaker	Country/Region	Title
13:30-13:55	Robert Howarth (Keynote Speaker) Video Presentation	USA	The Future of Coastal N Pollution: A Start towards Evaluating the relative Influences of Climate, Agriculture, and Energy and Trade Policies
13:55-14:10	Pei Ma	CHINA (MAINLAND)	Riverine N ₂ O concentrations, exports to estuary and emissions to atmosphere from the Changjiang River in response to increasing nitrogen loads
14:10-14:25	Jiezhong Wu	CHINA (MAINLAND)	Storms Runoff of Nitrogen in the North Jiulong River in Southeast China
14:25-14:40	Zhen Han	USA	A Nitrogen Budget for China at the Province Level
14:40-14:55	Shin-Ichi Onodera	JAPAN	Spatial Variation in Nutrient and Submarine Groundwater Discharge in a largest Tidal Flat of Seto Inland Sea, western Japan
14:55-15:10	Bongghi Hong	USA	Tools for calculating NANI (Net Anthropogenic Nitrogen Input) in the Watersheds of US and Europe
15:10-15:25	Remi Laane	NETHERLANDS	Accuracy and Precision in annual Loads form various Compounds from Rivers to the Coastal Zone
15:25-15:45			Tea Break
15:45-16:00	AL- Ramanathan	INDIA	Sources and fate of organic matter in Pichavarm Mangrove of East coast of India
16:00-16:15	Ai Li	CHINA (HONG KONG)	Identification of coastal Water Quality by statistical Analysis Methods in Qingduizi Bay, Northern Yellow Sea
16:15-16:30	Kumar Banerjee	INDIA	Seasonal Budgeting of Carbon, Nitrogen and Phosphorus from Ganges (Hooghly) Estuary, India: A LOICZ Approach
16:30-17:00			B1 Discussion



Convenor: Andreas Kannen & Valerie Cummins

Time	Speaker	Country/Region	Title
13:30-13:55	Timothy Stojanovic (Keynote Speaker)	UNITED KINGDOM,	Developing a Baseline of European Coastal Governance
13:55-14:20	A Dong (Keynote Speaker)	CHINA (MAINLAND)	Marine Functional Zoning (MFZ) in China
14:20-14:35	Barbara Neumann	GERMANY	Shifts in maritime Boundaries due to Sea-level Rise - legal Implications and potential Conflicts
14:35-14:50	Bruce Christopher Glavovic	NEW ZEALAND	The Coastal Innovation Paradox and Imperative: Reframing Coastal Governance
14:50-15:05	Andreas Kannen	GERMANY	Social-Ecological Systems (SES) and Scales in the North Sea
15:05-15:20	Anne Marie O'Hagan	IRELAND	Planning for Ocean Energy Development in the EU: Spatial needs and future Requirements
15:20-15:40			Tea Break
15:40-15:55	Zhengxian Yang	CHINA (MAINLAND)	Research on Coastal Principal Function Zoning: A Case Study on Wenzhou, China
15:55-16:10	Rong Mu	CHINA (MAINLAND)	Coastal Principal Functional Zoning (CPFZ) in China
16:10-16:25	Betty Nelly Queffelec	BELGIUM	Maritime Spatial Planning in a cross-border Context: The Belgian/French Experience
16:25-16:40	Xiyong Hou	CHINA (MAINLAND)	The Spatialized Markov Method for Land-Use Change Simulation: A Case Study in Shandong province, China
16:40-16:55	Darius Bartlett	IRELAND	Seeing another's Perspective: The Role of spatialised fuzzy cognitive Mapping and Visualisation in Conflict Resolution, Stakeholder Participation and Knowledge Integration for Marine Spatial Planning
16:55-17:10	Evi Siti Sofiyah	INDONESIA	Jakarta Bay Indonesia: Identifying strategic issues for governance reform
17:10-17:25	Indah Susilowati	INDONESIA	Ecosystem-based Fisheries Management (EBFM) to Secure the Vulnerable Fisheries of Central Java Province-Indonesia: An adaptive Strategy to Solve the Climate Change Phenomena
17:30-18:00			C1/A5 Discussion

欢迎来烟台

» 12TH SEP, MONDAY AFTERNOON «

ROOM
DALIAN

D3

» Coastal Eco-environments
from a Microbial Perspective «

Convener: Christine Dupuy & Jun Gong

Time	Speaker	Country/Region	Title
13:30-13:55	Dupuy Christine (Keynote Speaker)	FRANCE	The Flowcam : A Methodology for Studying the Nano-microplanktonic Communities
13:55-14:10	Guo-ying Du	CHINA (MAINLAND)	Migratory Response of estuarine Benthic Diatoms to Light and Temperature
14:10-14:25	Md Nymul Islam	BANGLADESH	Micro-environmental Change in the coastal Area of Bangladesh: A Case Study in the Southern Coast at Shitakunda, Chittagong, Bangladesh
14:25-14:40	Chaofeng Lin	AUSTRALIA	Evidence for Bacterial Iron(II) Oxidation in Surface and Ground Waters of a Circumneutral-pH, subtropical coastal Ecosystem
14:40-14:55	Jun Gong	CHINA (MAINLAND)	Abundances and Distribution of Nitrogen-Cycling Microbes in Estuarine Sediments of the Laizhou Bay, China
14:55-15:10	Hélène Agogué	FRANCE	Resuspension of Sediment Prokaryotic Communities during physical Erosion Process: An experimental Approach
15:10-15:25	Fu Lin Sun	CHINA (MAINLAND)	Distribution of Cyanobacterial Diversity of the Pearl River Estuary Sediments in different Monsoons
15:25-15:40			Tea Break
15:40-15:55	Weiwei Zhang	CHINA (MAINLAND)	Degradation of organic Pollutants by Bacteria and its potential Application in Bioremediation
15:55-16:10	Suman Manna	INDIA	Interplay of physicochemical and biological Components in Sundarban estuarine Ecosystem, India
16:10-16:25	Min Wang	CHINA (MAINLAND)	Study of the Genetic Diversity of Picoeukaryotes in the Adeliae Bay of the Antarctic waters
16:25-17:00			D3 Discussion

ROOM QINGDAO

» Changing Land Use in the Coast:
Present and Future «



Convener: Masumi Yamamuro

Time	Speaker	Country/Region	Title
13:30-13:55	Yuichi Hayami (Keynote Speaker)	JAPAN	Environmental Change in the Ariake Sea: Reclamation, Material Transport and Hypoxia
13:55-14:10	Zhen Zhao	GERMANY	Levels and distribution of Dechlorane Plus in sediments from three coastal bays, North China
14:10-14:25	Satoquo Seino	JAPAN	Development of Coastal Zone Management involving Drift Litter on Ocean Beaches and the local Knowledge of local Communities on Small Islands
14:25-14:40	A. K. M. Ruhul Amin Sarker	BANGLADESH	Community Based Aquaculture in Waterlogged Area: Autonomous Income Generating Option for Climate Vulnerability in Southeast Coast of Bangladesh
14:40-14:55	Akeem Olawale Olaniyi	MALAYSIA	Effects of Economic Transformations and Growth on Population and Land Use Dynamics of Coastal Areas of Selangor
14:55-15:10	César Augusto Marques da Silva	BRAZIL	Climate Change, Vulnerability, Adaptation and Economic Development: Challenges and Conflicts in São Paulo Coast Zone, Brazil
15:10-15:25	A3 Discussion		
15:25-15:40	Tea Break		

ROOM QINGDAO

» Arctic Coastal Processes, Peoples and Societies (Physical, Ecological and Socio-Economic Perspectives) (Hotspot) «



Convener: Joan Nyman Larsen & Volker Rachold

15:40-16:05	Rasmus Ole Rasmussen (Keynote Speaker)	SWEDEN	Megatrends in Arctic Development
16:05-16:30	Mikhail Grigoriev (Keynote Speaker)	RUSSIA	Coastal Permafrost Processes within the Siberian Arctic Region
16:30-16:45	Nicole Coture	CANADA	River-Ocean Interactions at the Mouth of the Sediment-laden Mackenzie River, Beaufort Sea Coast, Canada
16:45-17:00	Joan Nyman Larsen	ICELAND	Assessing socio-economic Development in the Arctic: Arctic Human Development Report (AHDR-II): Regional Processes and Global Linkages
17:00-17:15	Donald Forbes	CANADA	State of the Arctic Coast 2010 – Scientific Review and Outlook
17:15-18:00	A2 Discussion		

» 12TH SEP, MONDAY AFTERNOON «

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» 13TH SEP, TUESDAY MORNING «

ROOM
SHANGHAI

B³

» Observation, Monitoring and Modelling «

Convener: Remi Laane & Franciscus Colijn

Time	Speaker	Country/Region	Title
8:30-8:55	Franciscus Colijn (Keynote Speaker)	GERMANY	Coastal Observatories: Their Role in Coastal Research
8:55-9:10	Junjie Deng	CHINA (MAINLAND)	Monitoring of Coastal Changes in the Pomeranian Bay, Southern Baltic Sea – A Methodological Approach
9:10-9:25	Jicai Zhang	CHINA (MAINLAND)	Numerical Prediction on the Response of Salinity Regime to proposed engineered Lagoons for Terra Ceia River and Frog Creek, Florida
9:25-9:40	Peinan Zheng	CHINA (MAINLAND)	Study on the Propagation of nuclear Pollutants in Japan from Ocean Circulation
9:40-9:55	Mitsuyo Saito	JAPAN	Observational Evaluation of Submarine Groundwater Discharge (SGD) in Central Part of the Seto Inland Sea, Japan
9:55-10:10	Shin-ichi Onodera	JAPAN	Estimation of Seawater Recirculation and Mixing with Groundwater in an intertidal Slope, using ^{222}Rn , ^{18}O , and Nutrient
10:10-10:25	Xiaodan Wu	CHINA (MAINLAND)	Coupled Modelling of Surface Runoff and Storm Overflow induced Waterlogging in the City of Shanghai
10:25-10:40			Tea Break
10:40-10:55	John Icely	PORTUGAL	Recent Improvements in Monitoring Ocean Colour in Coastal Waters by Earth Observation
10:55-11:10	Jianfeng Feng	CHINA (MAINLAND)	Effect of combined Nutrient Input on the Bohai Bay Ecosystem: A comparative Analysis
11:10-11:25	Qing Wang	CHINA (MAINLAND)	Responses of Thioredoxin 1 (Trx1) and Thioredoxin-related Protein 14 (Trp14) mRNAs to Cadmium and Copper Stresses in <i>Venerupis philippinarum</i>
11:25-11:40	Li Li	CHINA (MAINLAND)	Comparison and Assessment of Satellite derived Chlorophyll Concentration at the Yellow Sea and the East China Sea
11:40-11:55	Peng Zhan	CHINA (MAINLAND)	A Numerical Study of Marine Ecosystem Dynamics in the Jiaozhou Bay
11:55-12:10	Yaru Li	CHINA (MAINLAND)	Numerical Simulation of current Circulation and Ecosystem Dynamics in the Offshore Area of the Yangtze River Estuary
12:10-12:25	Guangcai Zhong	GERMANY	Distribution and Air-sea Exchange of Current-use Pesticides (CUPs) from East Asia to the Arctic
12:30-13:30			Lunch

» Bridging the Science-Policy Gap «



ROOM
YANTAI

Convener: Fabrice Renaud & Juergen Weichselgartner

Time	Speaker	Country/Region	Title
8:30-8:55	Jörn Birkmann (Keynote Speaker)	GERMANY	Challenges for Adaptive Coastal Governance: Scales, Knowledge and Power
8:55-9:10	Juergen Weichselgartner	GERMANY	Bridging the Science-Policy-Practice Interface: From Vulnerability Assessment to Action
9:10-9:25	Lorraine McFadden	UNITED KINGDOM	Fostering a successful social learning Process: Reflections on a multi-disciplinary and science-policy orientated Research Project
9:25-9:40	Ramesh Ramachandran	INDIA	Science-Policy Link for Coastal Management in India
9:40-9:55	Murray Rudd	UNITED KINGDOM	International Coastal Scientists' Prioritization of Research Needs for Coastal Management and Conservation
9:55-10:10	Valerie Cummins	IRELAND	The Role of Sustainability Science in Integrated Coastal Zone Management
10:25-10:40	Tea Break		
10:40-10:55	Fabrice Gilles Renaud	GERMANY	Resilience and Shifts in Agro-ecosystems facing increasing Salinity Intrusion in Ben Tre Province, Mekong Delta
10:55-11:10	Lutchmeeduth Bullywon	Mauritius	Developing An Integrated Coastal Zone Management Framework To Better Adapting To Climate Change Impacts: the Case Of Mauritius as a Small Island Developing State
11:10-12:00	C4 Discussion		
12:30-13:30	Lunch		

» 13TH SEP, TUESDAY MORNING «

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» 13TH SEP, TUESDAY MORNING «

ROOM
HONG KONG

A⁴

» Small Island Developing States
(Hotspot) «

Convenor: Beate M.W. Ratter & Donald L. Forbes

Time	Speaker	Country/Region	Title
8:30-8:55	John Edward Hay (Keynote Speaker)	COOK ISLANDS	Small Island Developing States: Coastal Systems, Global Change and Sustainability
8:55-9:10	Donald Forbes	CANADA	Physical Basis of Coastal Adaptation in Small Island Developing States
9:10-9:25	Roger McLean	AUSTRALIA	Means and Extremes of Climate and Sea Level as Drivers of Coastal Change in Small Island States: Need for a Change in Emphasis in Research, Planning and Coastal Management
9:25-9:40	Asheshwor Man Shrestha	NEPAL	Climate Change Adaptation Policy Tools for Tourism in Small Islands - the Case of Palau
9:40-9:55	Naomi Biribo	AUSTRALIA	Historical Shoreline Changes of Reef Islands around Tarawa Atoll, Kiribati
9:55-10:10	Virginie Duvat	FRANCE	Assessing the Vulnerability of Atoll States to Coastal Hazards: a South Tarawa Case Study (Kiribati, Pacific Ocean)
10:10-10:40			Tea Break
10:40-10:55	Virginie Duvat	FRANCE	Vulnerability and Barriers to Adaptation in Small Island Developing States: The Case Study of Kiribati (Pacific Ocean)
10:55-11:10	Donald Forbes	CANADA	Managing adaptation to environmental change in small islands and analogous coastal communities
11:10-11:40	Beate Ratter	GERMANY	Strategic Research Priorities for Small-Island Research - Stimulus for Discussion
11:40-12:30			A4 Discussion
12:30-13:30			Lunch

» Case Studies of long term Change
or Stability in Coastal Ecosystems «



Convener: John Keesing & Peter Thompson

Time	Speaker	Country/Region	Title
8:30-8:55	Yihang Jiang (Keynote Speaker)	SOUTH KOREA	Potential Management Solutions on Ecosystem-based Approach: The Yellow Sea Example from Science to Management
8:55-9:20	Peter Thompson (Keynote Speaker)	AUSTRALIA	Long term Trends in Australian Temperate, Coastal Waters and their Implications for Phytoplankton.
9:20-9:35	You-Shao Wang	CHINA (MAINLAND)	Human Effects on China Coastal Ecosystems — a case Study of Daya Bay
9:35-9:50	Ernesto A. Chavez	MEXICO	Impact of Climate Change on the Eastern Pacific Fisheries
9:50-10:05	Jing Zhang	CHINA (MAINLAND)	Biogeochemistry in the Continuum from Watersheds to the Continental Margins: Case Studies from Changjiang (Yangtze River)
10:05-10:20	Alireza Salehipour Milani	IRAN	Assessing Distribution Patterns, Extent, and Current Condition of Mangrove in Iranian Coast of Persian Gulf
10:20-10:40			Tea Break
10:40-10:55	Julius Ibukun Agboola	JAPAN	Decadal Variation of Water Quality in three contrasting Coastal Systems of Ishikawa Coast, Japan: Drivers and Trends
10:55-11:10	Ha Trieu Hung Liu	GERMANY	Natural and anthropogenic Impacts on the Community Structure and Function at Cixi Wetland in Hangzhou Bay, China – preliminary Results
11:10-11:25	Britta Schaffelke	AUSTRALIA	A long-term Time Series shows that Catchment Activity affects marine Water Quality in the inshore Great Barrier lagoon
11:25-11:40	Aboulghasem Roohi	IRAN	Climate Changes and the role of new exotic/invasive Species Mnemiopsisleidyi in the Caspian Sea Biodiversity
11:40-11:55	John Gallagher	AUSTRALIA	The three Ages of Health: Natural and Anthropogenic Variance of Seagrass and micro-algal Abundance over the last 83 years
11:55-12:10	Ameneh Sajjadi	IRAN	Climate Changes and the Role of Wind Vector on Nudolaria Algae Bloom in the Caspian Sea
12:10-12:25	Nhon Hoai Dang	VIETNAM	Sedimentation Rates and Accumulation Metals in Coastal Sediment of Hai Phong Coastal Area, Viet Nam
12:30-13:30			Lunch

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» 13TH SEP, TUESDAY MORNING «

ROOM
QINGDAO D7

» Estuaries and Coastal Seas:
Interactions, Front and Climate «

Conveners: Dongxiao Wang, Wenping Gong & Igor M. Belkin

Time	Speaker	Country/Region	Title
8:30-8:55	Wei Zhou	CHINA (MAINLAND)	A model Study of Processes of tidal Mixing and Stratification in the Pearl River Estuary
8:55-9:10	Zhe Liu	CHINA (MAINLAND)	Age of Freshwater discharged from the Yellow River in the Bohai Sea: A Model Study
9:10-9:25	Zhongya Cai	CHINA (MAINLAND)	Diagnostic Simulation of Thermohaline Circulation in Jiaozhou Bay with synchronous In-situ Observation Data
9:25-9:40	Wenping Gong	CHINA (MAINLAND)	Saline Intrusion in the Pearl River Estuary
9:40-9:55	Dekun Huang	CHINA (MAINLAND)	Modern Sedimentation Rate, Source and Transport of Sediments in the Changjiang Estuary and the East China Sea using Radionuclides
9:55-10:10	Michal Tomczak	POLAND	Climate and Environmental Change during Holocene and their present Interaction - example from the Beibu Gulf, South China Sea
10:10-10:40			Tea Break
10:40-10:55	Ayansiina Ayanlade	UNITED KINGDOM	Climate Extreme and Flood Occurrence in Coastal Environment of Nigeria
10:55-11:20			D7 Discussion

» Observation, Monitoring and Modelling «

(continued)

Convener: Remi Laane & Franciscus Colijn

Time	Speaker	Country/Region	Title
13:30-13:45	Wilhelm Petersen	GERMANY	FerryBox – Nine Years of Experiences in Continuous Water Quality Observations in the North Sea
13:45-14:00	Jun Li	CHINA (MAINLAND)	Organochlorine Pesticides in Seawater and Atmosphere of the Marginal Sea of China
14:00-14:15	Xiang Liu	CHINA (MAINLAND)	Air-water Exchange and Air Deposition of Polycyclic aromatic Hydrocarbons (PAHs) to the Pearl River Estuary, a subtropical Bay, South China
14:15-14:30	Jiawang Ding	CHINA (MAINLAND)	Chemical Sensors and Biosensors for On-Site Detection of Environmental Pollutants in Seawater
14:30-14:45	Xiaoli Liu	CHINA (MAINLAND)	Metabolic Profiling of cadmium-induced Effects in one Pioneer intertidal Halophyte Suaeda salsa by NMR-based Metabolomics
14:45-15:00	Lingxin Chen	CHINA (MAINLAND)	Nanomaterial-based Chemosensors for sensitive Detection of heavy Metal Ions
15:00-15:15	Danling Tang	CHINA (MAINLAND)	Remote Sensing Observations relevant to natural Hazard Impacts marine biological Environments
15:20-15:40			Tea Break
15:40-15:55	Roberto Mayerle	GERMANY	Development of a Coastal Monitoring System for the Management of Jeddah Coastline, Saudi Arabia
15:55-16:10	Lamona Irmudyawati Bernawis	INDONESIA	Investigation on Climate Change Responses on Indonesian Seawater Properties by using ARGO Data
16:10-16:25	Harini Santhanam	INDIA	Studies on the Use of stable isotopic Analysis for the Reconstruction of past environmental Conditions of Pulicat Lagoon, South East India
16:25-16:40	William Zhang	CHINA (MAINLAND)	The Application of Cloud Computing and Internet of thing to Ocean Environmental Monitoring
16:40-16:55	Chris Goding	AUSTRALIA	Implementing a real time, online coastal water quality monitoring system
16:55-17:20			B3 Discussion

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» TUESDAY EVENING « » 13TH SEP, TUESDAY AFTERNOON «

ROOM
YANTAI C²

» Megacities and Resilience in the Coastal Zone
(part of IGBP Synthesis on Coastal Megacities)
(Hotspot) «

Convener: Mark Pelling & Bruce Glavovic

Time	Speaker	Country/Region	Title
13:30-13:55	Mark Pelling (Keynote Speaker)	UNITED KINGDOM	Tension between resilience and sustainability in a rapidly urbanizing coastal zone, Quintana Roo, Mexico
13:55-14:20	Peijun Shi (Keynote Speaker)	CHINA (MAINLAND)	Research on Integrated Disaster Risk Governance of Coastal Zone in the Context of Global Environmental Change
14:20-14:35	Xue Han	CHINA (MAINLAND)	The Research on Effects of the leading Cities in Shandong Peninsula Urban Agglomeration for regional Urbanization
14:35-14:50	Antje Bruns	GERMANY	Climate Change and Coastal Cities of the Future: Challenges for the sustainable use of Energy and Water
14:50-15:05	Debarati Chakraborty	INDIA	An integrated Plan for Coastal Area in the Context of Urbanization and Climate Change
15:05-15:20	Qingnian Yu	CHINA (MAINLAND)	Will Sea Level Rise lead to Migration in the Megacities? A case study of Shanghai City
15:20-15:40			Tea Break
15:40-16:30			C2 Discussion leading to Megacities Workshop (IGBP Synthesis)

IGBP Synthesis in Coastal Megacities

Megacities-Workshop Part I

chaired by Mark Pelling

(on invitation only)

IGBP carries out a synthesis on coastal megacities. The dedicated sessions addressing this synthesis and engaging a global and regional group of experts will take place in association to this LOICZ OSC. In following up on Session C2 a megacities synthesis session will take place in Room B hereafter. This session is by invitation only and will be chaired by Mark Pelling.

The following topics will be addressed:

- Impacts of megacities on the coastal environment, ecosystem goods and services, economy and welfare
- Impacts of pollution on human health
- Effects of global environmental change (e.g. sea level rise) on megacities
- Contributions to environmental changes at regional and global scales
- Policy/technological responses for reducing risk from natural hazard and pollution
- Co-benefits or cancellation of benefits from risk management for climate change mitigation and development
- Using past and present knowledge to assess future risk for and the impacts of megacities.

Please take notice of special announcements to be made during the OSC.

» The Application of Remote Sensing
on Tracking the Change
of Coastal Environment «



ROOM
HONG KONG

Convener: M. Lynch & C. Chen

Time	Speaker	Country/Region	Title
13:30-13:55	Mervyn Lynch (Keynote Speaker)	AUSTRALIA	Hyperspectral Sensing for Environmental Monitoring and Marine Management
13:55-14:20	Rongxing Li	CHINA (MAINLAND)	Review on Precision and Quantitative Remote Sensing for Polar Ice Sheet Monitoring and Sea Level Change
14:20-14:35	Ayansiina Ayanlade	UNITED KINGDOM	Monitoring Coastline Change in the Niger Delta of Nigeria: A Remote Sensing Approach.
14:35-14:50	Shubo Fang	CHINA (MAINLAND)	A Habitat-oriented Approach to detect the ecological Hotspots and prioritize them for Management by Ranking the ecological Risks Levels on Chinese Yellow Sea Coast
14:50-15:05	Qingshui Lu	CHINA (MAINLAND)	Examining the Effects of Increasing Land Price on Urban Sprawl in China Coastal Provinces during 1990-2010
15:05-15:20	Razvan Doru Mateescu	ROMANIA	Remote Sensing and GIS for ICZM Process Implementation on Romanian Black Sea Coastal Zone
15:20-15:40			Tea Break
15:40-15:55	Hui Feng	USA	Validation of MODIS Ocean Color and aerosol Property Retrievals on the Northeastern United States Coastal Ocean
15:55-16:10	Sufen Wang	CHINA (MAINLAND)	Preliminary Remote Sensing Observation of Sea Surface Temperature increase during <i>Ulva prolifera</i> Blooms
16:10-16:25	Chuqun Chen	CHINA (MAINLAND)	Advance in Remotely-sensed Detection of Water quality
16:25-16:40	Xianghong Di	CHINA (MAINLAND)	Spatial-temporal Dynamics of Land Use and Land Cover Change from 1996 to 2006 in the Coastal Zone, USA
16:40-16:55	Jie Guo	CHINA (MAINLAND)	A Model of High Speed Retrieval by Cross-Polarized ENVISAT-ASAR
16:55-17:10	Xianqiang He	CHINA MAINLAND	Annual Variation of the Changjiang River Plume by the Satellite Observations
17:10-17:30			D4 Discussion

» 13TH SEP, TUESDAY AFTERNOON «

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» 13TH SEP, TUESDAY AFTERNOON «

ROOM DALIAN

D 2

» Case Studies of long term Change or Stability
in Coastal Ecosystems (*continued*)
Convener: John Keesing & Peter Thompson

Time	Speaker	Country/Region	Title
13:30-13:45	Xuelei Zhang	CHINA (MAINLAND)	Benthic Records indicating increasing Nutrient Availability and Primary Production in the Yellow Sea
13:45-14:00	Baoping Di	CHINA (MAINLAND)	Temporal Variation of Diatom and Silicoflagellate Assemblages in Coring Sediment over the last 130 years in Sishili Bay, China
14:00-14:15	Yajun Shi	CHINA (MAINLAND)	The Impact of different Pollution Sources on modern Dinoflagellate Cysts in the Sishili Bay, Yellow Sea, China
14:15-14:30	Feifei Liu	CHINA (MAINLAND)	Using the MERIS-derived Data to analyze the Chlorophyll-a Variation in the Bohai Sea
14:30-14:45	Peter Thompson	AUSTRALIA	Long Term Trends in Rainfall and their Impacts on Phytoplankton Ecology in a Southwest Australian Estuary
14:45-15:00	Dongyan Liu	CHINA (MAINLAND)	Long Term Change in Diatom Community as an Indicator of Environmental Change in a heavily impacted Coastal Bay – Jiaozhou Bay in China
15:00-15:15	Yingjun Chen	CHINA (MAINLAND)	High-resolution Record of Black Carbon and polycyclic aromatic Hydrocarbons in Coastal Zone of Yantai, China
15:20-15:40			Tea Break
15:40-15:55	Jin Li	CHINA (MAINLAND)	Estimating the Deposition Rate of the Tidal Flat from the morphological Data of the <i>Spartina alterniflora</i> Plants
15:55-16:10			D2 Discussion

ROOM DALIAN

D 1

» Plant biodiversity in coastal zone area
and intensive utilization «

Convener: Song Qin, Sung-Min Boo & P. Ang

16:10-16:25	Jianming Ren	CHINA (MAINLAND)	The Antibacteria Activities and prebiotic Effects of O-sulfated and Sulfanilamide Derivatives of Inulin
16:25-16:50	Sung Min Boo Sung	Korea	Marine Red Algal Diversity and Their Use in Korea
16:50-17:05	Yufeng Yang	CHINA (MAINLAND)	Gracilaria Cultivation Development and Bioremediation Roles of Seaweed in Chinese Coastal Waters
17:05-17:20	Qiuying Han	CHINA (MAINLAND)	Effect of Burial and Erosion Disturbances on <i>Zoster Anoltii</i>
17:20-17:35	Akwasi Asamoah	GHANA	Achieving Co-operation in Transboundary Groundwater Management: Challenges and Opportunities to Water and Food Security amid Climate Change
17:35-17:50	Hongbo Shao	CHINA (MAINLAND)	Plant biology in maintaining sustainable development of coastal zone: Disciplinary roles and relationship
17:50-18:05	Put. O. Ang Jr.	CHINA (HONGKONG)	Biodiversity and Biogeographical Analysis of the Genus <i>Sargassum</i> in the South China Sea Region
18:05-18:20			D1 Discussion

» The Application of Isotope to track
Pollution Source from Land to Ocean «

D 5

ROOM
QINGDAO

Convener: Pierre Richard & Jing Zhang

Time	Speaker	Country/Region	Title
13:30-13:55	Pierre Jean Richard (Keynote Speaker)	FRANCE	Use of Nitrogen isotopic Signatures of Nutrients and Macroalgae as Indicators of anthropogenic Inputs in Coastal Areas
13:55-14:20	Shuh-J. Kao (Keynote Speaker)	CHINESE-TAIPEI	Climate-driven isotopic Speciation of Sedimentary C/N in Seas receiving Sediments from turbid Rivers
14:20-14:35	Yujue Wang	CHINA (MAINLAND)	Study on the historical Variations of Terrestrial Organic Matter Sources with Carbon and Nitrogen stable Isotope and C/N Ratios as Indicators in Column Sediments of Sishili Bay, Yantai
14:35-14:50	Kay-Christian Emeis	GERMANY	Eutrophication in Marine Environments as seen from an N-Isotope Perspective
14:50-15:05	Hequan Gu	CHINA (MAINLAND)	Using Radium Isotopes to determine horizontal Mixing of Coastal Water in the Eastern Coast of Hainan Island, China
15:05-15:20	Abeer Abbas El-Saharty	EGYPT	Radionuclide Concentrations in Shallow Water Sediments off the Nile Delta, Egypt
15:20-15:40			Tea Break
15:40-15:55	Hongwei Xiao	CHINA (MAINLAND)	The Use of $\delta^{15}\text{NNH}_4$ in Precipitation for Identifying Nitrogen Sources and Fractionation Mechanisms
15:55-16:10	Ying Cui	CHINA (MAINLAND)	Stable Isotopes and fatty Acid Composition of Coiliamystus: Implications for Composition and Variation of Diet
16:10-16:25	Shigeru Kato	JAPAN	Studies on Carbon Accumulation and Food Cycle System in the rehabilitated Mangrove Forest of the Southern Thailand
16:25-16:40	Nguyen Tai Tue	JAPAN	Sources and Exchange of particulate Organic Matter in an Estuarine Mangrove Ecosystem of Xuan Thuy National Park, Vietnam as traced by stable Isotopes
16:40-17:10			D5 Discussion

POSTER SESSION

Evening 18:30 - 20:30

During the evening poster session we ask authors to be available for questions.

Refreshments will be served.

We encourage you to spend time with the poster and the excellent science displayed.

» 13TH SEP, TUESDAY AFTERNOON «

» TUESDAY EVENING «

欢迎来烟台

» 14TH SEP, WEDNESDAY MORNING «

ROOM
SHANGHAI

C3

» Coastal Hazards, Vulnerability, and Adaptation «

Convener: Bruce Glavovic & Ramachandran Ramesh

Time	Speaker	Country/Region	Title
8:30-8:55	Bruce Glavovic	NEW ZEALAND	Coastal Disaster Narratives: Learning from Katrina, the BP Oil Spill and Climate Change
8:55-9:10	Liu Ling	CHINA (MAINLAND)	Environmental Assessment on Erosion/Siltation in Jiaozhou Bay (China) over a 75-year Period, regarding P-A Relationships
9:10-9:25	Alexandre Magnan	FRANCE	A holistic and integrated Framework for Assessing Adaptive Capacity to Climate Change
9:25-9:40	Alexandre Magnan	FRANCE	Is Vulnerability “to Climate Change” measurable?
9:40-9:55	Xuegong Xu	CHINA (MAINLAND)	Ecological Risk Assessment of Typhoon and Storm-Surge Disasters in the Coastal Land of China
9:55-10:10	Fan Li	Netherlands	Probabilistic Modelling of Extreme Wave Climate along the Dutch Coast
10:10-10:25	Ahsan Uddin Ahmed	Bangladesh	Effect of Climate Change on the Coastal Land: A Case Study of a Storm Surge Hazard in a selected Embankment in Bangladesh
10:20-10:40			Tea Break
10:40-10:55	Liangju Yu	CHINA (MAINLAND)	Vulnerability Assessment of Coastal coupled Social-ecological System based on Meso-scale of Land Use
10:55-11:10	Yonggui Yu	CHINA (MAINLAND)	Rising Sea-Level and Sinking: A Twin Threat to Deltas
11:10-11:25	Ralf Weisse	GERMANY	Coastal Hazards: An Approach to assess long-term Changes in Wind, Wave, and Storm Surge Climate
11:25-11:40	Sajjad Zohir	BANGLADESH	Identifying Pro-Poor Economic Activities in Coastal Southwest Bangladesh
11:40-11:55	Bhu Premathilake	SRI LANKA	Reducing Vulnerability of Coastal Communities to Coastal Hazards through Building Community Resilience
11:55-12:10	Juma Rahman	THAILAND	Health System Adaptation to changing Health Profiles of Women and Children resulting from increasing Coastal Pollution - A Case Study on the Coastal Area of Bangladesh
12:10-12:25	Ruijie Zhang	CHINA (MAINLAND)	Levels and Distribution of Antibiotics in Laizhou Bay, North China: Impacts of River Discharge
12:30-13:30			Lunch

Convenor: Zhongyuan Chen & Yoshiki Saito

Time	Speaker	Country/Region	Title
8:30-8:55	James P.M. Syvitski (Keynote Speaker) LOICZ Heritage Lecture	USA	Deltas under Climate Change - the Challenges of Adaptation
8:55-9:20	Houjie Wang (Keynote Speaker)	CHINA (MAINLAND)	Human Disturbances on the Catchment-Estuary System of the Yellow River
9:20-9:35	Jianhua Gao	CHINA (MAINLAND)	Rapid Changes of Sediment Dynamic Processes and Geomorphology in Yalu River Estuary under Anthropogenic Impacts
9:35-9:50	Meilin Wu	CHINA (MAINLAND)	Human Activity and Monsoon Dynamics Influence on spatial and temporal Hydrochemistry in Tropical Coastal Waters (Sanya Bay, South China Sea)
9:50-10:05	Liang Wang	CHINA (MAINLAND)	Organic Carbon Transportation in the Huanghe (Yellow River) Mainstream, considering the Influences from Human activities
10:05-10:20	Wenzhi Cao	CHINA (MAINLAND)	Sources of Riverine Nitrogen to the Jiulong River and Estuary
10:20-10:40			Tea Break
10:40-10:55	Jing Chen	CHINA (MAINLAND)	Organic Carbon Isotope Record in the recent Sediments of Yangtze Prodelta and its Implications
10:55-11:10	Liangyong Zhou	CHINA (MAINLAND)	Muddy Sediments and Coastal Changes in an enclosed Bay in Qingdao, China
11:10-11:40	Yan Wang	CHINA (MAINLAND)	Atmospheric Deposition of Polychlorinated Naphthalenes in Dongjiang River Catchment of Guangdong Province, South China
11:40-11:55	Guangzhe Jin	CHINA (MAINLAND)	Effect of Submarine Groundwater Discharge on Nutrient Characteristics in the Sediment: A Comparative Research in Kojima Bay and Hiuchi-Nada, Seto Inland Sea, Japan
11:55-12:10	Zhongyuan Chen	CHINA (MAINLAND)	China's Three-Gorges Dam: Estuarine Unbalance?
12:10-12:25	Xiyong Hou	CHINA (MAINLAND)	Simulation of Non-Point Source Pollution in the Past Thirty Years in Jiaodong Peninsula, China
12:30-13:30			Lunch

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» 14TH SEP, WEDNESDAY MORNING «

ROOM
HONG KONG

B⁶

» Coastal Biogeochemical Cycles and Climate Change «

Convener: Chen-Tung Arthur Chen & Christiane Lancelot

Time	Speaker	Country/Region	Title
8:30-8:55	Chen-Tung- Arthur Chen (Keynote Speaker)	CHINESE-TAIPEI	Cross-boundary Exchanges of Carbon and Nitrogen in the Marginal Seas
8:55-9:10	Li Zou	CHINA (MAINLAND)	Production and Preservation of Organic Carbon in the Intertidal Area of Yellow River Delta
9:10-9:25	Elizabeth Henderson Shadwick	AUSTRALIA	Carbon Uptake in Polar Continental Shelf Regions
9:25-9:40	Xinyu Guo	JAPAN	Downstream Nutrient Transport by the Kuroshio in the East China Sea and its temporal Variations
9:40-9:55	Thomas S. Bianchi	USA	The Role of Terrestrially-Derived Organic Carbon in the Coastal Ocean: A Changing Paradigm
9:55-10:10	Xiangcheng Yuan	CHINA (MAINLAND)	CO ₂ Fluxes and Microbial Roles in the Coastal Waters near the Pearl River Estuary
10:10-10:25	Hon-Kit Lui	CHINESE-TAIPEI	Limiting Nutrient in Estuarine Ecosystems and beyond: Changing Nutrient Inventory
10:20-10:40	Tea Break		
10:40-10:55	Lisa Helper	USA	An Integrated Approach for Predicting Nutrient Transports from the Land to the Ocean
10:55-11:10	Lijun Hou	CHINA (MAINLAND)	Nitrogen Dynamics in Intertidal Marshes of the Yangtze Estuary
11:10-11:25	Cui-Ci Sun	CHINA (MAINLAND)	Spatial and temporal Distribution of transparent exopolymer Particles (TEP) in the Pearl River Estuary, China
11:25-11:40	Jianing Wang	CHINA (MAINLAND)	Spatial and inter-annual variation on HCO ₃ ⁻ and pCO ₂ in the Changjiang River system
11:40-11:55	Andreas A. Hutahaean	INDONESIA	Daily Variability of Biogeochemical Processes in Upper Water Column of Sagami Bay, Japan
11:55-12:10	Gang Xu	CHINA (MAINLAND)	Effects of Air-drying and freezing on Phosphorus Fractions in Soils with different organic Matter Contents
12:10-12:25	Discussion B6		
12:25-13:30	Lunch		

Convener: Joyashree Roy & Shang Chen

Time	Speaker	Country/Region	Title
8:30-8:55	James Kahn (Keynote Speaker)	USA	Think Globally but Model Locally: The Use of Panel Data in Estimating Behavioral Models of the Relationships Between Human Behavior and Environmental Change
8:55-9:20	Joyashree Roy (Keynote Speaker)	INDIA	How sensitive Policies and Implementation are to Ecosystem Services in Indian Sundarbans
9:20-9:35	Shafi Noor Islam	GERMANY	Ecosystem Services and Food Security under Threat due to Climate Change Impacts on Coastal Region of Ganges Delta
9:35-9:50	Shang Chen	CHINA (MAINLAND)	Marine Ecological Capital Assessment: Concepts and Frameworks
9:50-10:05	Jingmei Li	CHINA (MAINLAND)	Study on the Assessment of Environment Cost from Sea Reclamation: Jiaozhou Bay as a Case
10:05-10:20	Yan Xu	CHINA (MAINLAND)	The Tideland Classification of Jiangsu Province based on the Ecosystem Service Function, China
10:20-10:40			Tea Break
10:40-10:55	Yamin Wang	CHINA (MAINLAND)	Sea Grass Bed Restoration and Coastal Marine Ranching in Northern of China: A Study on Basis of Shandong Rongcheng Sea Grass Bed Survey
10:55-11:10	Anning Suo	CHINA (MAINLAND)	Response of Ecosystem Service Value to Land Use Change in Coastal Zone of Bohai Sea in last 30 years
11:10-11:25	Jie Yu	CHINA (MAINLAND)	Research Model of Optimal Nutrient Reductions Scheme in Watershed
11:25-11:40	Tiziana Luisetti	UNITED KINGDOM	The State-of-the-Art, and new Developments, for a robust economic Appraisal of Ecosystem Services: The Case of the European Saltmarshes
11:40-11:55	Lenin Babu Kamepalli	INDIA	Linkages between Agricultural Practices and Closing Basins
11:55-12:10	Murray Rudd	UNITED KINGDOM	Citizens' Willingness to pay for improved Ecosystem Services arising from Wastewater Cleanup in Newfoundland, Canada
12:10-13:30			Lunch

» 14TH SEP, WEDNESDAY MORNING «

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» 14TH SEP, WEDNESDAY MORNING «

ROOM
QINGDAO

B 5

» Eutrophication, Hypoxia and Algal Blooms «

Convener: Alice Newton & Sandra Shumway

Time	Speaker	Country/Region	Title
8:30-8:55	Joao G. Ferreira (Keynote Speaker)	PORTUGAL	Beyond Biomass: Ecosystem Interactions of Eutrophication, with an Emphasis on Shellfish Aquaculture and IMTA
8:55-9:20	Sandra Shumway (Keynote Speaker)	USA	Bivalve Shellfish Aquaculture and Eutrophication
9:20-9:35	Patricia M. Glibert	USA	Nutrient Pollution and Harmful Algal Blooms: A Global Analysis
9:35-9:50	R. C. Panigrahy	INDIA	Eutrophication Assessment of a Coastal Lagoon (Chilika Lagoon, India) after the Restoration Process
9:50-10:05	Jie Xu	CHINA (HONGKONG)	A Comparison of Eutrophication Impacts in Two Eutrophic Harbors in Hong Kong with Different Hydrodynamics
10:05-10:20	Brian Edward Lapointe	USA	Eutrophication and harmful Algal Blooms in Southwest Florida's Coastal Waters: Relations to Riverine Discharges and N:P Ratios
10:20-10:40			Tea Break
10:40-10:55	Wang Meng	CHINA (MAINLAND)	Relationship between Seasonal Distribution of Dissolved Organic Nitrogen and Population Dynamics of Representative HAB Species in Daya Bay
10:55-11:10	Xiaodong Wang	CHINA (MAINLAND)	The Role of Nitrogen on the Growth and Colony Development of <i>Phaeocystis globosa</i> (Prymnesiophyceae)
11:10-11:25	Christiane Lancelot	BELGIUM	Evaluating the Effect of Nutrient Reduction Policies on Eutrophication and atmospheric CO ₂ Absorption in the Southern North Sea with the SR-MIRO-CO ₂ Model
11:25-11:40	John Keesing	AUSTRALIA	The World's largest Green-tides: Recurrent Macroalgal Blooms caused by Expansion of Coastal Aquaculture in the Yellow Sea off China
11:40-12:00			B5 Discussion
12:30-13:30			Lunch



» Coastal Hazards, Vulnerability,
and Adaptation «
(continued)

Convenor: Bruce Glavovic

& Ramachandran Ramesh

Time	Speaker	Country/Region	Title
13:30-13:45	Marcello Sano	AUSTRALIA	Vulnerability of Coastal Communities and Progress in Climate Change Adaptation: The Case of South East Queensland, Australia
13:45-14:00	Chuanyuan Wang	CHINA (MAINLAND)	Source Identification of Oil Spills based on the Distribution of pyrrolic Nitrogen Compounds
14:00-14:15	Saudamini Das	INDIA	Planting exotic Species for Coastal Protection: Evaluating the Storm Protection Services of native vs. exotic Species
14:15-14:30	Qian Zheng	CHINA (MAINLAND)	Occurrence and Distribution of Antibiotics in the Beibu Gulf, China: Impacts of River Discharge and Aquaculture Activities
14:30-14:45	Faith Uwemedimo Ekong	NIGERIA	Cocastal Hazards and Development Setbacks in Nigeria: Perspectives in Niger Delta Region, Nigeria
14:45-15:00	Yong Liu	CHINA (MAINLAND)	Mechanisms of Mangrove Tolerance to polycyclic aromatic Hydrocarbons: Radial Oxygen Loss and Antioxidant Enzymes
15:00-15:15	Priyadarsan Dharma Rajan	INDIA	Deliberative Democratic Methods for the Conservation of heavily used Vembanad Backwaters of Kerala, (India)
15:15-15:40			Tea Break
15:40-15:55	Ivonne M. Radjawane	INDONESIA	Coastal Vulnerability Assessment of Semarang City Based on Sea Level Rise and Land Subsidence Scenarios
15:55-16:10	Runti Choudhury	INDIA	Arsenic Accumulation in the Deltas of the Tibetan Rivers - A Source to Sink Study
16:10-16:25	M. Shah Nawaz Chowdhury	BANGLADESH	Local Perspectives on a global Phenomenon: Can the Fishers of the Naaf River be insured against Climate Change?
16:25-16:40	Lam Vu Thanh Noi	VIETNAM	Assessment of Vulnerabilities to Climate change for Water and Wastewater Infrastructure Management in Vietnam: A Case Study of Ho Chi Minh City
16:40-16:55	Md. Nymul	BANGLADESH	An Attempt to find out the Effect of Tsunami accompanying with Analyze the Marine Micro-floras and Faunas (Diatom and Foraminiferid) in the Water and Bottom Sediments: A Geo-environmental Study of South Eastern part of Bay of Bengal
16:55-17:10	Subrota Kumar Saha	BANGLADESH	Assessment of Vulnerability and Adaptive Response in the Context of Climate Variability in South-west Bangladesh
17:10-17:25	Santosh Kumar Sarkar	INDIA	Impact of a tropical cyclonic Storm 'Aila' on Water Quality Characteristics and Mesozooplankton Community Structure of Sundarban Mangrove Wetland, India
17:25-17:40	Saleem Janjua	PAKISTAN	Climate Change, Adaptive Governance, and local Coastal Areas in Pakistan
17:40-17:55	Nana Abayie Boakye-Boaten	GHANA	Modelling the Vulnerabilities of the Songor Lagoon and its Catchment Area (Ghana) to Sea-Level Rise
17:55-18:15			C3 Discussion

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» 14TH SEP, WEDNESDAY AFTERNOON «

ROOM
YANTAI

B 2
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» Catchment-Estuary: Nature and Human Interaction
(Hotspot) « (continued)

Convener: Zhongyuan Chen & Yoshiki Saito

Time	Speaker	Country/Region	Title
13:30-13:45	Yoshiki Saito	JAPAN	Natural and Anthropogenic Influences at the Land–Ocean Interface of Asian Megadeltas
13:45-14:00	Zuosheng Yang	CHINA (MAINLAND)	Decline of the Huanghe (Yellow River) Delta to Destruction phase
14:00-14:15	Katsuto Uehara	JAPAN	Impact of River-Dyke Constructions on Sediment Dispersal off the Mekong River Estuary, Southern Vietnam
14:15-14:30	M. Shah Nawaz Chowdhury	BANGLADESH	Small-scale Fishermen along the Naaf River, Bangladesh in Crisis: A Framework for Management
14:30-14:45	Yingjun Chen	CHINA (MAINLAND)	Distribution of BC and PAHs in the surface sediments of coastal zone in Bohai Bay, China
14:45-15:15			B2 Discussion

ROOM
YANTAI

A 7
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» Coastal and Marine Sectors:
Managing Change «

Convener: Valerie Cummins & Anne Marie O'Hagan

15:40-16:05	Frank Maes (Keynote Speaker)	BELGIUM	Local ecological Fisheries Knowledge in Support of Decision-making and Marine Spatial Planning
16:05-16:20	Nengye Liu	BELGIUM	Prevention of Vessel-Source Marine Pollution: Challenges and Prospects for Chinese Practice under International Law
16:20-16:35	Akhmad Solihin	INDONESIA	PanglimaLaot: A Local Institutional Effort in Coastal and Marine Resources Preservation
16:35-16:50	Md. Abdur Rouf	BANGLADESH	Mitigating Coastal Environmental Problems: The Tidal River-basin Management (TRM)
16:50-17:05	Tsung-Yi Lin	CHINESE-TAIPEI	Assessment Index of Dune Degradation for the Sustainable Management: An Example from the Northeast Coast of Taiwan
17:05-17:20	Viacheslav Manukalo	UKRAINE	Water-Related Problems of Large Cities in the Black Sea Costal Zone of Ukraine and Ways of their Decision
17:20-17:35	Ajit Kr. Bera	INDIA	Coastal Islands Ecosystem Management and Sustainable Development of the Lower Gangetic Delta, India
17:35-17:50	Okuku Archibong Ediang	NIGERIA	Ocean Surge: Dynamics, Impacts, past and future Changes in West Africa Coastal Areas: A Case of Nigeria
17:50-18:00			A7 Discussion

ROOM
HONG KONG

» Coastal Biogeochemical Cycles
and Climate Change «



(continued)

*Convener: Chen-Tung Arthur Chen
& Christiane Lancelot*

Time	Speaker	Country/Region	Title
13:30-13:45	Xiuli Yan	CHINA (MAINLAND)	Nutrient Dynamics in the Macro-Tide Jiulong River Estuary, China: Distribution and Export Fluxes to the Sea
13:45-14:00	Liang Xue	CHINA (MAINLAND)	Air-Sea CO ₂ Fluxes in the Southern Yellow Sea: An Examination of Continental Shelf Pump Hypothesis
14:00-14:25	Ming Xue	CHINA (MAINLAND)	Distribution of partial Pressure of CO ₂ in Jiaozhou Bay, an Area highly affected by Urbanization
14:25-14:45	B6 Discussion		

» Climate Extremes and
Carbon Biogeochemistry
in Large-River Delta-Front Estuaries «



ROOM
HONG KONG

*Convener: Minhan Dai,
Thomas S. Bianchi & Jianping Gan*

15:40-15:55	Minhan Dai (Keynote Speaker)	CHINA (MAINLAND)	Influx and Export of dissolved organic Carbon in the marginal Seas - Implications for Global Ocean Carbon Cycling
15:15-15:30	Zhiyuan Liu	CHINA (MAINLAND)	The Changing Behavior of Inorganic Carbon in Yellow River Estuary between Spring and Fall
15:30-15:45	Thomas S. Bianchi	USA	Changing Biogeochemistry in Changjiang and Mississippi/Atchafalalya Delta-Front Estuaries
15:45-16:00	Kun Yan	CHINA (MAINLAND)	Response of Photosynthesis and Photosystem in Sorghum to short-term high Temperature
16:00-16:15	Qian Liu	CHINA (MAINLAND)	How significant is Submarine Groundwater Discharge and its associated dissolved inorganic Carbon in a River dominant Shelf System - the Northern South China Sea?
16:15-16:30	Yan Bai	CHINA (MAINLAND)	Annual Variation of the aquatic pCO ₂ of the East China Sea using Satellite Remote Sensing during Summer Time
16:30-16:45	Jianping Gan	CHINA (HONGKONG)	Nutrient Transport by Coupled Shelf-Bay Circulation in Mirs Bay (Hong Kong)
16:45-17:15	D6 Discussion		

» 14TH SEP, WEDNESDAY AFTERNOON «

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» WEDNESDAY EVENING « » 14TH SEP, WEDNESDAY AFTERNOON «

ROOM
DALIAN

A6

» Ecosystem Goods and Services
and Environmental Economics «

(continued)

Convener: Joyashree Roy & Shang Chen

Time	Speaker	Country/Region	Title
13:30-13:45	Zhanhui Qi	CHINA (MAINLAND)	Feasibility of Co-Culture of Abalone and Sea Cucumber in the Offshore Area of Sanggou Bay, North China
13:45-14:00	Jinghua Zhou	CHINA (MAINLAND)	Research of Shandong Peninsula Blue Economic Zone Based on the Awareness of Conservation Culture
14:00-14:15	Swagat Kishore Mishra	INDIA	Economic Potential and Eco-System Benefits of Emissions Trading for Reducing Air Pollution in the Coastal Belt of Maharashtra
14:15-15:00	A6 Discussion		
15:20-15:40	Tea Break		

IGBP Synthesis in Coastal Megacities

Megacities-Workshop Part II - for description read page 42

chaired by Mark Pelling

(on invitation only)

Convenor: Luis Chicharo

Time	Speaker	Country/Region	Title
13:30-13:55	Keita Furukawa (Keynote Speaker)	JAPAN	Lessons Learned in Attempting to Restore the Tokyo Bay Ecosystem
13:55-14:20	Luis Chicharo (Keynote Speaker)	PORUGAL	Ecohydrology: A Tool for sustaining Ecosystem Functions and Services between River Casin and Coast under Global Changes: The Guadiana (SE Portugal) Case Study
14:20-14:35	Xiao Hua Wang	AUSTRALIA	Dynamics of Chinese Muddy Coasts and Estuaries
14:35-14:50	Kakoli Sen Sarma	INDIA	Varying Hydrodynamic State in Sundarban Estuary – the ultimate Force for physical and biological Modification
14:50-15:05	Kengo Kurata	JAPAN	Changes of benthic Community caused by anthropogenic Changes in the Honjo area of Lake Nakumi, Western Japan
15:05-15:20	Koji Seto	JAPAN	Anthropogenic environmental Changes due to partial Dike Removal in the Honjo Area of Nakumi Lagoon, Southwest Japan
15:25-15:40			Tea Break
15:40-15:55	Dejuan Jiang	CHINA (MAINLAND)	Impacts of Freshwater Input on Vegetation Cover in Yellow River Delta Wetland
15:55-16:10	Md. Hadayet Ullah	BANGLADESH	Habitat Degradation in Karnaphuli river Estuary: Application of Ecohydrology as a Tool to enhance the estuarine Ecosystem Carrying Capacity
16:10-16:25	Mohammad Z. R. Chowdhury	BANGLADESH	Dispersion Pattern of the Ganges-Brahmaputra River Discharge in the Bay of Bengal as Defined by Satellite Remote Sensing
16:25-16:40	Luis Chicharo	PORUGAL	Assessing ecological Conditions and benthic Composition in the estuarine transitional Zone and Coastal Waters of the Guadiana River (SW Spain)
16:40-17:00			B4 Discussion

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» 15TH SEP, THURSDAY MORNING «

ROOM SHANGHAI CONCLUDING PLENARY SESSION

(Chair: Alice Newton & Ping Shi)

08:30-09:30	Rapporteurs of LOICZ Synthesis Sessions
09:30-10:30	Rapporteurs of Track A-D Sessions
10:50-12:05	Rapporteurs of Hotspots
12:05-12:20	Rapporteurs of Megacities-Workshop (IGBP Synthesis)
12:20-12:30	Concluding Remarks

» THURSDAY AND FRIDAY
AFTERNOON «

FIELD TRIPS *for detailed information please read page 11*



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POSTER EXHIBITION THIRD FLOOR

POSTER CONTRIBUTIONS

Posters will be displayed throughout the conference with a special session scheduled on Tuesday 13 September, 2011, Evening 18:30 - 20:30

Session	Authors	Country/Region	Title
A1	Kana Kuroda, N. Nakatani & K. Otsuka	JAPAN	Evaluation of Material Circulation System between Land and Sea Using Exergy Flows
A1	Anke Schmidt	GERMANY	Transdisciplinary Evaluation of Different Coastal Adaptation Strategies: Integrating Regional Perceptions of Scientists, Practitioners and the Public
A2	Natalya Nikolaeva, Volobuyeva, S.A. Ogorodov, N.G. Belova, A.M. Kamalov, M.N. Grigoriev, S.Wetterich & P.P. Overduin	RUSSIA	Wave Action as a Forcing Factor of Coastal Erosion in the Western and Eastern Russian Arctic
A2	Qianguo Xing, Shouzhen Liang & Ping Shi	CHINA (MAINLAND)	Trends in Satellite-derived Chlorophyll Concentrations at High-Latitude Coastal Zone: a Case at the Hudson Bay
A3	Ho-Shing Yu & K. H. Hsiung	CHINESE-TAPEI	Types and Processes of Coastal Zones around the Island of Taiwan
A3	Jun Tao, Xu Yingjun Gu Wei, Lin Yebin & Bu Danyang	CHINA (MAINLAND)	Desalinization Effect of Sea Ice Mulching on coasted Saline Soils in Bohai Bay of China: An Artificial Platform Study
A3	Xiaoqing Wu, X. Q. Wu, D. Zhou & Z. L. Wang	CHINA (MAINLAND)	Simulating the Impacts of Protection and Utilization Policies of Coastal Resources on Urban Growth and its ecological Effects in Yantai, China
A3	Xiaobing Chen & Yu Junbao	CHINA (MAINLAND)	Sustainable Utilization of the Tidal Flat Resources Based on the Integration Agriculture in China
A5	X. Q. Wu & D. Zhou	CHINA (MAINLAND)	New progress in marine spatial planning and coastal management in China
A6	Marcus Lange, Kira Gee, Benjamin Burkhard & Malte Busch	GERMANY	New Approaches towards an Overall Ecosystem Assessment of Impacts associated with Offshore Wind Farming
A6	Huanhuan Rao & Benrong Peng	CHINA (MAINLAND)	Compensate the Marine Ecosystem Damage of Sea Area Use
A6	Yipeng Wang	CHINA (MAINLAND)	Purification, Cloning, Structure, Function and antimicrobial Mechanism Analysis of Cathelicidin-BF from <i>Bungarus Fasciatus</i>
A6	Xu Yan	CHINA (MAINLAND)	The Tideland Classification of Jiangsu Province Based on the
A6	Hongmei Liu, ZH. H. Qi, Y.Z. Mao, J.H. Zhang & J. G. Fang	CHINA (MACAU)	Valuation of Sanggou Bay Ecosystem Services under Different Mariculture Modes
A6	Guo-ying Du	CHINA (MAINLAND)	Valuation of Ecosystem Services in Shandong Coastal Waters, Western Yellow Sea
A6	Min Wang, Sh. Chen, T. Xia, M. Wang, D-C. Ren, Zh-Y Zhao & L. Wang	CHINA (MAINLAND)	Coastal Ecological Capital Assessment: A Case Study from Shandong Province of China
A6	Haofei Zhang, Ran Xu, Shufeng Ye & Panpan SuBangping Deng	CHINA (MAINLAND)	Evaluation and Change Analysis of Ecological Capital in the Yangtze River Delta Coastal Zones
A7	Hang Thi Minh Tran & L. M. Chou	SINGAPORE	Marine Protected Areas in Vietnam: Can Integrated Coastal Management improve MPA Management Effectiveness?
A7	Satoquo Seino	JAPAN	Appearance and Evolution of "Citizens" as Actors in the Legal System governing Japan's Coasts
A7	Jinzhong Xiao	CHINA (MAINLAND)	A Study about the Coordination Mechanism of Marine Area Legislation

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POSTER EXHIBITION THIRD FLOOR

B1	Ying Li & J. Zhang	CHINA (MAINLAND)	The Southwest Monsoon intervenes the Nutrients Supply Pattern of Zhemin Spawning Ground at the East China Sea
B1	Li Zou	CHINA (MAINLAND)	The Distribution and Budget of Nutrients in the intertidal Area of the Yellow River Delta
B1	Masashi Yoshikawa, K.Miyaoka & S.Onodera	JAPAN	Nutrient Supply by contrasting two Types of Groundwater to Tidal Flat in Ise Bay, Central Japan
B1	Bo Lin Yi, L. Zou, H. X. Wan, Y. K. Zhang, X. Q. Zhang & H. W. Gao	CHINA (MAINLAND)	The Biogeochemistry of Nitrogen and Phosphorus in the Shuangtaizihe Estuary in Autumn, 2010
B1	Yulin Cui	CHINA (MAINLAND)	Stable Nuclear Transformation of <i>Platymonas (Tetraselmis) subcordiformis</i> (<i>Prasinophyceae, Chlorophyta</i>)
B1	Chaopu Ti & X. Y. Yan	CHINA (MAINLAND)	Characteristics of Nitrogen Budgets and riverine Nitrogen Load in two comparing Areas in Eastern China
B1	Dennis Swaney B. Hong & R. W. Howarth	USA	Nutrient Budgets and Nutrient Accounting in Coastal Waters and their Watersheds
B2	Liyang Yang, Weidong Guo & Huasheng Hong	CHINA (MAINLAND)	Behaviour of dissolved organic Matter in a subtropical River-Estuary-Coastal Interface, China: Insights from Fluorescence Spectroscopy and parallel Factor Analysis
B2	Naishuang Bi, Z. S. Yang, H. J. Wang, D. J. Fan & Y. Saito	CHINA (MAINLAND)	Seasonal Variation of suspended Sediment Transport through the Southern Bohai Strait
B2	Ritsuo Nomura, A. Tsujimoto & S. Kawano	JAPAN	Significance of River Sediments on brackish Organisms in Coastal Lagoon
B2	Xiyong Hou	CHINA (MAINLAND)	Simulation of Non-Point Source Pollution in the Past Thirty Years in Jiadong Peninsula, China
B3	Santosh Kumar Sarkar	INDIA	Distribution of heavy Metal Core Sediments in a tropical Mangrove Wetland and their Environmental Risk to Biota
B3	Hanxing Wan, L. Zou, S.X. Huo & H.W. Gao	CHINA (MAINLAND)	Evolution of heavy Metals and its Ecological Risk on the Sediment in Bohai Sea in the past 20 Years
B3	Changyou Wang & Yong Zhang	CHINA (MAINLAND)	Application of Growth Inhibition Rate as Ecological Effect Assessment Indicator in Ecology
B3	Mei Wen, L. Zou,B.L. Yi & L. JV	CHINA (MAINLAND)	The chemical Characteristics and related Factors in the Waters of the Shuangtaizi Estuary and its adjacent Areas
B3	Chao Xu, Li Sha, Xie Qiang, Yang Yuangzheng, Huo Dongming & Xu Xiaolu	CHINA (MAINLAND)	The Design and Implementation of Ocean Data Visualization Sharing and Application System
B3	Ying Su, Keqiang Lia, Xiulin Wang & Jinbo Muc	CHINA (MAINLAND)	Environmental Capacity of Petroleum Hydrocarbon Pollutants in Jiaozhou Bay, China, Modeling and Calculation
B3	Yuta Shimizu, S. Onodera & M. Saito	JAPAN	Long-term Variation in Nutrient Discharge from Watersheds to Central Seto Inland Sea, Japan
B3	Dingfeng Yu, Q. G. Xing & P. Shi	CHINA (MAINLAND)	Study on Modeling for Secchi Disk Depth in the Yellow Sea and the East China Sea based on <i>in situ</i> and Satellite Data
B3	Weiwei Feng, Ma Zheng & Chen Lingxin	CHINA (MAINLAND)	An optical Sensor for dissolved Oxygen based on Phase Detection

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B3	Xuelu Gao	CHINA (MAINLAND)	Heavy Metal Concentration and Fractionation in Sediments of intertidal Bohai Bay, China
B3	Jianmei Zhuang, H. M. Zhaob, L. Zhangc, D. Z. Shena & D. W. Panc	CHINA (MAINLAND)	Determination of Trace Copper by anodic Stripping Voltammetry at nano-TiO ₂ modified Gold Electrode
B3	Li Zhang, S. H. Zhouc, J. M. Zhuangd & D. W. Pana	CHINA (MAINLAND)	Electrochemical Sensor based on Novel tin-bismuth Alloy Electrode for Determination of Cadmium in Waters
B4	Rui Zhang	CHINA (MAINLAND)	History Trends of heavy Metals in Sediment Cores from tidal Flat in Haizhou Bay, China
B4	Tingting Lou	CHINA (MAINLAND)	Chemosensors based on gold nanomaterials for sensitive detection of heavy metal ions
B4	Meng Gao	CHINA (MAINLAND)	Bayesian analysis for Marine/Coastal ecosystem model—Theory and Methods
B4	Koji Seto	JAPAN	Anthropogenic Environmental Changes due to partial Dike Removal in the Honjo Area of Nakaumi Lagoon, Southwest Japan
B4	Dejuan Jiang	CHINA (MAINLAND)	Impacts of Freshwater Input on Vegetation Cover in Yellow River Delta Wetland
B5	Xiaowei Zheng, Bangzhou Zhang, Jinlong Zhang , Liping, Huang & Tianling Zheng	CHINA (MAINLAND)	Study on a novel Marine Algicidal Actinomycete against against the Toxic Algae Phaeocystis Globosa
B5	SHI Rong-jun, HUANG Hong-hui, QI Zhan-hui HU Wei-an, TIAN Zi-yang & Dai Ming	CHINA (MAINLAND)	Effects of marine algicidal bacterial isolated from a sub-tropical bay on Skeletanema coatumatum
B5	Xu N, J L Qin, S G Sun & S S Duan	CHINA (MAINLAND)	Uptake Kinetics and Regulation Mechanisms of Prorocentrum donghaiense for Urea
B5	J. Chen & G. Pan	CHINA (MAINLAND)	Harmful algal blooms mitigation using clay/soil/sand modified with xanthan and calcium hydroxide
B6	Xijie Yin, Huaiyang Zhou	CHINA (MAINLAND)	Sulfate Reduction in Sediments of Pearl River Estuary (PRE)
B6	Zhigao Sun, X. J. Mou, L. L. Wang, H. L. Song & H. H. Jiang	CHINA (MAINLAND)	Nitrogen Cycling of Plant-Soil System in Suaeda Salsa Wetland in the intertidal Zone of the Yellow River Estuary
B6	Chaofeng Lin, E.I. Larsen, P.R. Grace & J.J. Smith	AUSTRALIA	Impacts of Plantation Clear-felling and Replanting on Iron Mobilization and Greenhouse Gas Evolution in Soils of a subtropical Coastal Catchment
B6	Caiyun Zhang, Da Li & Huasheng Hong	CHINA (MAINLAND)	Spatial-temporal Rainfall Distribution based on TRMM Satellite Data over the Taiwan Strait and its adjacent Area
B6	Qingji Li, Xinyu Guo, Yoshitsugu Koizumi & Hidetaka Takeoka	JAPAN	Seasonal and interannual Variations of Nutrients in the Bungo Channel, Japan
B6	Yuwei Yang & Xuelu Gao	CHINA (MAINLAND)	Geochemical Characteristics of Nitrogen in core Sediments from Sishili Bay, China
B6	Yen-Chun Chen, C. T. A. Chen, Y. H. Fu & H. I. Huang	CHINESE-TAIPEI	Seasonal Variations in Fluxes of dissolved inorganic Carbon from Taiwanese Rivers
B6	N. Gypens, A.V. Borges & Christiane Lancelot	BELGIUM	Excess and imbalanced Nutrient Loads modify the Carbon Sink in the Southern North Sea: A Model Study over 50 Years

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B6	Yu-Han Fu, C.T.A. Chen & Y. C. Chen	CHINESE-TAIPEI	Seasonal Variability of CO ₂ Fluxes in subtropical Estuaries: Case study of Taiwan
B6	M. L. Leal-Acosta, E. Shumilin & N. Mirlean	MEXICO	Arsenic and mercury accumulation in brown seaweed <i>Sargassum sinicola</i> and sediments of the western coast of Bahía Concepción, Baja California Peninsula, México: assessments of the effects of geothermal, hydrothermal and groundwater discharges
C1	Guanqiong Ye & L.M. Chou	SINGAPORE	Evaluation of ICM Governance Capacity for Sustainability: A Case Study in Quanzhou, Fujian, China
C1	Xiaoqing Wu & D. Zhou	CHINA (MAINLAND)	New Progress in Marine Spatial Planning and Coastal Management in China
C2	Koki Onishi, S. Onodera, M. Saito, R. F. Lubis, H. Bakti, R. M. Delinom & Y. Shimizu	JAPAN	Seasonal Variation in BOD Discharge to the Sea from the Ciliwung River of Coastal Megacity, Jakarta
C3	Barbaro V Moya, A. A. Alfonso & G. Martin	CUBA	Climate Change in Zapata, Vulnerability, Impacts and Adaptation
C3	Md Khurshid Alam Bhuiyan, M. Zafar & M.I. Chowdhury	SPAIN	Radioisotopes Concentration in Water and Sediment along the Offshore Area of the Bay of Bengal, Bangladesh
C3	Dung Viet Luu, Nguyen Thi Hong Hue, Tran Dang Quy & Mai Trong Nhuau	VIETNAM	Vulnerability Assessment in Urban Coastal Zones of Vietnam, Case Study in Ha Long City
C3	Lianzhen Li, Hufeng Wu & Xiaoli Liu	CHINA (MAINLAND)	Pathways of Cadmium Fluxes in the Root of the Halophyte <i>Suaeda salsa</i> : A Cadmium-Selective Microelectrode Study
C4	Odada E.O., Abuodha P., Nyanja J. & Christine Omuombo	KENYA	Towards Sustainable Tourism along the Kenyan Coast
D1	J. E. Lee, S.-R. Lee, J. H. Oak, J. A. Lee & I. K. Chung	SOUTH KOREA	Molecular Monitoring of Plankton Biodiversity in the Nakdong River Estuary in Korea
D1	Hongli Cui, Hongli Cui, Yinchu Wang & Song Qin	CHINA (MAINLAND)	Molecular Evolution of Phytoene Desaturase Involved in the Formation of Carotenoids in Eukaryotic Algae
D1	Yin-Chu Wang & Song Qin	CHINA (MAINLAND)	Evolutionary Stride of Phytoene Synthase from Prokaryote to Eukaryote via Cyanobacteria
D1	Hongyu Zhang, Fuchao Lic, Hongli Cuia, Zeping Xiea, Yang Pua & Song Qi	CHINA (MAINLAND)	A new Anthracene Derivative with Cytotoxic Activity from Marine isolate <i>Streptomyces</i> sp.
D1	Fei Shi, Jinju Jiang & Song Qin	CHINA (MAINLAND)	Diversity and Phylogenetic Analysis of Bacteria associated with <i>Laminaria japonica</i> Gametophyte
D1	Yin Mao Fan & Lei Zhang	CHINA (MAINLAND)	Molecular Cloning and Expression Analysis of a Iron Superoxide Dismutase gene from <i>Laminaria japonica</i> (Laminariaceae, Phaeophyta)
D1	Li Li Li, B. Liu, Y. P. Wang & S. Qin	CHINA (MAINLAND)	Study on the Fermentation of Jerusalem Artichoke Wine
D1	Bo Guan	CHINA (MAINLAND)	Physiological Responses of Halophyte <i>Suaeda salsa</i> to Water Table and Salt Stresses in Coastal Wetland of Yellow River Delta
D1	Yuhong Liu, MAO Pei-Li, Wang Guang-Mei, Chen Wen-Lian, Han Guang-Xuan, Zhang Zhi-Dong & Yu Jin-Bao	CHINA (MAINLAND)	Study on Biomass Allocation in <i>Suaeda salsa</i> Population in different Habitats of Coastal Zone



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D1	L. H. Zhang, H. B. Shao & G. F. Ye	CHINA (MAINLAND)	Effects of infertile and arid environment on tannin production of Casuarina equisetifolia seedlings branchlets
D2	Wen-Tseng Lo, P. K. Hsu & H. Y. Hsieh	CHINESE-TAIPEI	Long term Changes of Copepods and Hydrology in a eutrophic tropical Lagoon in Taiwan
D2	Thamasak – Yeemin, C. Saenghaisuk, S. Pengsakun, W. Donsomjit, W. Klinthong, K. Saengmanee, M. Yuchareon & M. Sutthacheep	THAILAND	Long-term Change of an Acropora dominated Community at Tao Island, the Gulf of Thailand
D2	John B. Gallagher	AUSTRALIA	Stochastic Forcing on little Swanport Estuary: Late Anthropocene Paleoreconstructions, long-term Data Imputation and Hindcasting
D2	Ameneh Sajjadi, SeyedSaber Sajadi & Aboulghasem Roohi	IRAN	Global Warming, Solar Radiation and it's Effectiveness on Nudolaria Algae Bloom in the Caspian Sea
D2	Xuhong Shen, Dongyan Liu, Li Li, Yingjun Chen & Baoping Dia	CHINA (MAINLAND)	Distribution of Biomarkers in Sediment Core of the Northern Yellow Sea and Its Ecological Significance
D2	Y.J. Yu, B.X. Han, T.C. An	CHINA (MAINLAND)	Long-term ecosystem change in Jiaozhou Bay and its catchment: the driver-pressure-state-impact-response approach
D4	Weiwei Song, B. X. Han, F. W. Liu & Y. J. Yu	CHINA (MAINLAND)	Port Development and eco-sensitive Coastlines in Beibu Gulf Economic Zone: A GIS Analysis
D4	Yueyin Cai & Ma Hongwei	CHINA (MAINLAND)	Analysis of Status quo of the Sea Area Utilization and Countermeasures in Liaoning
D4	Shouzhen Liang, Q. G. Xing, P. Shi & D. Zhou	CHINA (MAINLAND)	Monitoring urban Phenology in Bohai Rim using MODIS Data
D4	Guo Jie & Xie Qiang	CHINA (MAINLAND)	Detection of Oil spill Pollution using SAR Image by ENVI and Next 4A
D4	Di Wu, Wang Zou, Chenghu Zhou & Xiaomei Yang	CHINA (MAINLAND)	A Coastline Changing Detection Method based on Buffer Zone and least Square Theory – an Example of Liao Dong Bay
D4	Ajira Tiangstrong	THAILAND	Beach Erosion caused by Rsunami on 26 December 2004 in Phang Nga Province using IKONOS Imagery
D5	Li Zou	CHINA (MAINLAND)	Temporal and spatial Variations of Chl a and its Implication on the Food Source to clam in the intertidal Area of the Yellow River Estuary
D6	Guizhi Wang, Qian Liu & Qing Li	CHINA (MAINLAND)	Signals of the Changjiang River Plume demonstrated by Radium Isotopes
D7	Shujian Xu, J. Chen, A. J. Wang, Y. H. Li & W. G. Wang	CHINA (MAINLAND)	OSL Dating and Grain Size of Loess deposits in the Southern Laizhou Bay of Shandong Peninsula and its environmental Significance
D7	Yonghang Xu & Xingxiu Yu	CHINA (MAINLAND)	History of Sea Level Change in the late mid-Holocene: Reflected by Sedimentology of Core from inner Shelf of the Northern South China Sea
D7	Qianguo Xing, Mingjing Lou & Ping Shi	CHINA (MAINLAND)	Human Activity and Climate Co-driven Fluctuations in Chlorophyll-a Concentration at the Enclosed Coastal Seas: The Daya Bay, China



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YOUNG LOICZ FORUM: POSTER CONTRIBUTIONS



Author	Country/Region	Title
Dekun Huang	CHINA (MAINLAND)	Particle dynamics of the Changjiang estuary by natural radionuclides
Yangfan Li	CHINA (MAINLAND)	The impact of urban sprawl on landscape and environmental change in Lianyungang, China
Shiela Villamor	JAPAN	Geographic information system for habitats in Nogas Island, Philippines
Mingjie Li	GERMANY	Synergistic monitoring of chlorophyll concentration in coastal waters based on MERIS and Ferrybox data
Khairunnisa Ahmad Kamil	MALAYSIA	Travel without passport: Be the plastic bags, to be the world traveller
César Marques da Silva	BRAZIL	Urbanization, mobility and environment at São Paulo State coastal zone, Brazil
Chia-Chi Wu,	GERMANY	Common pool resources management in linked social-ecological systems: a case of Penghu Archipelago, Taiwan
Marcello Sano	ITALY	Coastal urbanisation in a changing climate: the case of South East Queensland, Australia
Carlos Castellanos Perez Bolde	MEXICO	Coastal urbanization, remote sensing and GIS: Yucatan, Mexico: a case study
Yulius	INDONESIA	Islands identification in Lingga County Riau Archipelago Province Base on toponymy method
Pronab Kumar Halder	BANGLADESH	Impact on coastal land during storm surge in river mouth systems under climate change: a case study of Cyclone Aila in polder-5
Elizabeth Shadwick	CANADA	The CO2 system in Arctic coastal waters
Christine Omuombo	KENYA	Towards sustainable tourism along the Kenya coast
Siwaporn Tangwanichapong	THAILAND	Vulnerability to climate change in coastal cities: a case study of Thailand
Anke Schmidt	GERMANY	Developing strategies for viable coastal protection in urban areas
Xin Zhou	CHINA (MAINLAND)	Space optimization of wetlands under rapid urbanization in Tianjin Binhai New Area



**ABSTRACTS
ORAL PRESENTATIONS**



» ABSTRACTS OPENING «

Plenary Keynotes

Visioning: Towards a new initiative on Earth system research for global sustainability

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Abstract

In February 2009 ICSU started a consultative Visioning Process, in cooperation with the International Social Science Council (ISSC), aimed at developing options for a single, holistic international strategy for integrated, policy relevant Earth System research. Based on a global consultation with the scientific community, funders and other stakeholders, and following in-depth discussions at two international meetings – held in September 2009 and June 2010 – the Visioning Task Team produced a document outlining five Grand Challenges in Earth System Research for Global Sustainability. This document also emphasized the need for a single, new overarching structure, which would bring together researchers, funders, service providers and users, and allow for more integration of existing Global Environmental Change (GEC) programmes , the Earth System Science Partnership (ESSP) and other activities.

In parallel, in June 2009, some of the world's main funders of environmental change research established a new, high-level body called the Belmont Forum. Its aim is to align international resources to accelerate delivery of the science-derived knowledge and capabilities that society needs to address environmental change. Members have established the following 'Belmont Challenge': To deliver knowledge needed for action to mitigate and adapt to detrimental environmental change and extreme hazardous events.

In October 2010, the funders from the Belmont Forum, ICSU and ISSC met in Cape Town, South Africa, to discuss the visions and implementation options that have emerged from both the Belmont and Visioning processes. All agreed that there are significant opportunities for convergence between these two processes: both in terms of substantive priorities, and next steps towards their implementation. After the 3rd Visioning meeting in February 2011, and the fourth Belmont Forum meeting in April 2011, ICSU, ISSC and the Belmont Forum are now building an Alliance to propose a new 10-year Initiative on Earth System Research for Global Sustainability. The goals, characteristics, and recent developments of the Initiative are described on www.icsu-visioning.org.

Keywords: Earth System research; environmental change; Global Sustainability; Visioning

A Vision Towards Coastal Sustainability

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Abstract

LOICZ has participated actively in the visioning process that was led by ICSU. In parallel, LOICZ carried out its own "Visioning" to focus attention on the coastal zones that are "hotspots" of Global Change. These include:
River-mouth systems where fluxes of water, sediment, fertilizers and contaminants are focused;
Urbanized coasts and megacities where vulnerable populations are concentrated;
Arctic coasts where the effects of climate change are accelerating a fundamental state change;
and,
Low lying coasts that are at risk of flooding, storm surges, sea-level rise and subsidence, such as small, vulnerable islands where managed realignment and setback is not an option.
In the next five years, LOICZ will be attempting to answer the questions developed in the ICSU visioning process, in the context of these coastal hotspots. LOICZ will include five approaches: forecasting, observations; thresholds; responses and innovation to offer solutions to the challenges posed by global change in the coastal zone.



Ecosystem Issues Facing Sustainable Development of China's Ocean and Coasts

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Abstract

China's economy rose sharply from the 1980s, especially in its coastal provinces. Since the 1990s, China has included the development of marine resources as an important theme within the nation's development strategy. In 2008, the total added value of marine economy reached 5.7% of the national GDP. The five major industries are: marine transportation, marine tourism, fisheries, offshore oil and gas, and shipbuilding, altogether constituting 91% of the marine revenues. In the 30 years following its economic reform, China's coastal areas are seeing an increasing concentration of industrial and broader economic activity. Currently, a ribbon of high economic development has formed along China's coasts, bringing with it high population density and urbanization. Moreover, coastal areas in China are heading now into a new stage of industrialization. Looking at the long-term development, there will be large-scale relocation of petrochemical, steel, shipbuilding, and thermal and nuclear power industries into coastal areas. These major developments will require increasing access to marine areas and resources to fuel their progress. In this presentation, we will review the pressures on the marine and coastal ecosystems from various land and marine developments since the late 1970s. In particular, special emphasis will be placed on two issues, namely, eutrophication from land sources and sharp rise in demand of marine space along the coast. Implication of such pressures on the sustainable development of China's ocean and coasts will be discussed.

The Anthropocene: Are We There Yet

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Abstract

Work is underway to determine whether the Anthropocene should be considered a new geological Epoch where the human footprint on the earth surface equals or surpasses the level of other geological climate events, such as that seen in the transition between the Pleistocene and the Holocene. Records in question include near global biostratigraphic markers, such as from the worldwide spread of invasive or non-native species, monoculture ecologies, or from the conversion of much of the planet's dry land to agricultural or industrial use. Other records might be from global climate signals, chemical (e.g. ocean acidification) and radioactive (e.g. nuclear activity) signals, and species extinctions.

Human impacts on Earth surface processes are not however spatially or temporally homogeneous.

Human impact on sediment production began 3000 years ago but accelerated more widely 1000 years ago. By the sixteenth century, societies were already engineering their environment. Millponds were ubiquitous in the 18th and 19th century and affected the hydrological nature of many rivers. Early twentieth century mechanization has led to global signals of increased sediment flux in most large rivers. By the 1950s, this sediment disturbance signal reversed for many rivers owing to the proliferation of dams, and sediment load reduction below pristine conditions is the dominant signal today. A delta subsidence signal began in the 1950s and is now a dominant signal in terms of sea level for many coastal environments, overwhelming even the global warming imprint on sea level. Humans have engineered how most water and sediment are discharged into the coastal ocean. Hyperpycnal flow events have become more common for some rivers, and less common for other rivers. Bottom trawling is now widespread, suggesting that even continental shelves have received a significant but as yet quantified Anthropocene impact.



» ABSTRACTS A 1 «

Session: A1 Keynotes

Coastal and Marine Social-Ecological Systems, cross-level Feedbacks, regional and global Sustainability: Linking global to regional sustainability analysis in marine and coastal social-ecological systems

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Abstract

In the era of the Anthropocene, analyses of ever more closely integrated social-ecological systems need to encompass multiple spatial and institutional levels. Regional sustainability problems the world over are increasingly generated by global drivers while planetary sustainability problems are also driven by regional and local processes. Different regional coastal and marine social-ecological subsystems (CM-SES) are exposed to a number of specific problems such as overfishing (fishing down the food chain / price list), marine and coastal pollution and species loss as well as poverty among coastal and island populations and insufficiently understood marine and coastal governance and management. CM-SES also provide characteristic services to humanity such as livelihood support, species nursery, carbon sink and storm and erosion protection. This presentation argues that the cross-level integration of problem-focused interdisciplinary analyses has good potentials to generate knowledge which effectively supports more desirable future scenarios for human-nature relations. In the coastal and marine field, natural-social science analyses to date focus on large marine areas (LME) or on the long-term investigation of coastal regions (e.g. the Swedish SUCOZOMA, North Brazilian MADAM and North Sea German Coastal Futures programmes). These studies mostly address the sub-national regional and some the trans-national level. So far, planetary analyses of human-nature relations have remained mostly disciplinary, or in the realm of either the natural or the social sciences. Analyses of the two-way feedbacks between the spatial and institutional levels of human-nature relations are rare; Global Environmental Change research programmes have not so far consistently analysed the feedbacks between regional and global level changes. This presentation starts with the **session** which examines a) the links between coastal and marine regions and global sustainability problems and b) ways of rendering such links more visible. The presentation explores how explicitly cross-level multi-scale analyses of regional coastal and marine social-ecological systems analysis might become the basis for a regionally grounded interdisciplinary sustainability science which is an integral part of a global sustainability science directed towards maintaining a “safe operating space for humanity”.

Keywords: coastal and marine social-ecological systems, cross-level feedbacks, regional and global sustainability

Social-Economic-Natural Complex Ecosystem Approach and Its Application to Hainan Eco-province Planning

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Abstract

Landscape is a kind of Social-Economic-Natural Complex Ecosystem dominated by human behavior, sustained by natural life support system, and vitalized by ecological process. Its natural subsystem consists of the Chinese traditional five elements: metal (minerals), wood (living organism), water, fire (energy) and soil (nutrients and land). Its economic subsystem includes the components of production, consumption, reduction, transportation and regulation. While its social subsystem includes technology, institution and culture steered by man. The duty of landscape planning and management is to understand and coordinate the temporal, spatial, quantitative, structural, and functional contexts among and within these three subsystems. Based on the ancient China's human ecological philosophy, 10 cybernetical principles for urban ecological regulation have been summarized. Among these principles, the evolution, adaptation, feedback and integration were always emphasized in ancient China.

Hainan Island is the second largest island in China with 34,000 km² land and 7.5 million population. It locates at the south China's sea between Hong Kong and Viet Nam. Hainan is the most valuable potential region in biodiversity conservation in China. But as its economy is less developed and left behind most of the coastal provinces in China, the tropical forest and wildlife habitats are under a high pressure of declination. In order to promote its sustainable development, a concept of ecological province was pushed forward by the local government together with researchers from Chinese Academy of Sciences. An eco-sustainability planning for its eco-industry, eco-landscape and ecocivilization at four levels of regional, industrial, residential and human ecology was carried out since 1995. A combinatory model consists of learning model, planning model and management model has been developed.

The target of eco-province development is to build a kind of economically productive and ecologically efficient industries, a kind of systematically responsible and socially harmonious culture, and a kind of adaptive and sustainable landscape or Feng-shui with ecological totality, vitality and mobility. Wealth, health and faith are the three goals for its development, measured by eco-capital, eco-service and eco-awareness respectively. Different scale of case studies from eco-village, eco-community eco-industrial park, eco-city, ecopolis to watershed through ecological planning, engineering and management have been carried out. The eco-province plan has been implemented by the province government and supported by the National Ministry of Environment. After 10 years' development, the island's environmental quality ranks the top among 31 Chinese provinces, while its social and economic development has got significant progress. Their experiences have been disseminated to other provinces since 1999, and 14 provinces have followed Hainan to initiate Eco-province development campaign approved and supported by the Ministry of Environment.

Keywords: social-economic-natural complex ecosystem, eco-province, eco-industry, ecopolis, eco-culture, Hainan

Session: A1 Oral

Social-ecological issues on Arctic coasts and their multi-level driving forces

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Abstract

This presentation explores some of the socio-ecological issues on Arctic coasts and their multi-level driving forces. Global change processes present challenges to the stability of Arctic coastal communities and their local economies, and nature-based livelihoods. The focus is on drivers of transformation of the northern economy, socio-economic challenges and opportunities, with emphasis on the local and regional resource based economy of the North. Physical, biological and social systems interact in complex ways to affect Arctic coastal communities and their local and regional economies. Global change is projected to have substantial future impacts on renewable resources-fisheries, stock of marine mammals, terrestrial ecosystems, and agriculture. At the same time it may reduce the opportunity to engage in a number of traditional activities important to the identity and way of life of northern residents. Challenges related to global change can be expected to play a growing role in decisions regarding resource allocation, resource use, ownership and control, and with important consequences for Arctic economies and their economic sustainability. Strategies for socio-economic development and Arctic environmental protection need to take into consideration the economic, social and environmental linkages between the Arctic and other regions of the globe, and the emerging and ongoing processes of globalization.

Keywords: Arctic communities, socio-economic development, natural resources, global connections

Common Pool Resources Management in Linked Social-Ecological Systems: A Case of Penghu Archipelago, Taiwan

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Abstract

Complex systems in multi-level world have caused scale mismatch of many common pool resources (CPR) managements, resulting in mismanagement. In order to understand the complex systems and mismatch problems, this research uses social-ecological system (SES) as a framework for analyzing systems at spatial, temporal and functional scales, using Penghu archipelago, a county belonged to Taiwan, as an example. Penghu archipelago surrounded by water possesses rich marine natural resources so the residents had their livelihood rely heavily on fishery. However, rapid industrialization and decline fishery production in Taiwan have changed the economic structure and livelihood of people on islands. Fishery SES has been transformed to fishery-tourism SES in function. Therefore, this study provides a historical review of the fishery, tourism development from 1898 to 2009 and a policy analysis of marine natural resources management in Penghu for understand the social-ecological co-evolution trajectory and outcome in a regional scale. The traditional uses of the natural resources were mostly restricted within a place specific system. However, the great enhancement of the accessibility resulted from globalization has broken the territorial boundaries and made most of the state owned CPR in marine are de facto open access. The regulations in specific geography boundary of SES are, consequently, no longer suitable for marine resources management. Instead, this study proposes different spatial and functional scale SESs should be linked together to form cross-level and multiple-use institutions in order to better govern the local natural resources with a global view. Considering severely depleting marine natural resources happened in all over the world, sound local resources managements which have linkages with different scale SESs are required. This study shows that SES is an appropriate framework for examining the social-ecological dynamics in complex systems.

Keywords: common pool resources; social-ecological system; scale; management



» ABSTRACTS A1 «

Reef-related Tourism and Integrated Coastal Management

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Abstract

Reef-related tourism is considered to be one of the fastest growing industries in the world. If managed properly, tourism can generate numerous benefits to coastal communities and contribute to the gross domestic products of destination countries. However, most attention is given to short-term profit rather than long-term sustainability. The impacts of coastal development, high density of tourists, pollution, as well as climate-related issues are continuing to affect the economic and ecological values of coral reef ecosystem. There has been limited understanding of the interaction between tourism and coastal environment as well as its planning and management. This project addresses these issues using a small island of Koh Tao, Thailand and the Great Barrier Reef (GBR), Australia as case studies. Both selected study sites have the biggest number of dive certificates globally and share the common critical concern in impacts of and threats to marine tourism. The study identifies major challenges facing Koh Tao in maintaining quality and diversity of corals and sustaining its tourism industry. Existing reef-based tourism management practices, its impacts to coastal communities, locals' preferences toward future tourism, as well as institutions and policies addressing these issues were investigated. Integrated Coastal Management (ICM) is internationally accepted for managing pressures on coastal zones and also acknowledged as a sound path towards the sustainable development of coastal tourism. Therefore, management recommendations under the framework of ICM are proposed. Furthermore, lessons learned from the GBR are used to identifying transferable and/or applicable practices to Koh Tao. Integrated planning and management can reduce the consequent conflicts of recreation demand and ensure sustainable tourism. Further expectation is to convert them into a format applicable for decision-making processes and presented as a model for dive tourism elsewhere.

Keywords: coral reef; ecological value; integrated coastal management; reef-related tourism

New approaches to marine conservation and coastal planning in the Tropics

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Abstract

The establishment of coastal and marine protected areas became a usual practice for resource conservation in many developing countries. The number of protected areas will increase since the Convention of Biological Convention in its COP10 meeting in Nagoya has called Governments to increase their number to at least 6 percent of the world coastal area, five times more than the present existing area. At the same time, some countries such as Chile, Brazil, Spain Philippines and others are also establishing sustainable use protected area in coastal areas, reversing the existing tendency of creating only no take areas, where all human uses are forbidden. In Brazil the number of coastal protected areas, particularly those of sustainable use has increased substantially in the last years, most probably because of existing social demands and because a fringe of the littoral and all coastal waters are State domain and do not involve expropriation costs when put under conservation areas. In addition to the conservation of living resources, the concentration of protected areas of non use and use in a given part of the littoral may lead to more balanced coastal management and development. This concentration of coastal protected areas occurs for instance in the northern part of the Maranhão State, along most of the southeastern states such as São Paulo, Rio de Janeiro and Paraná, the most populated areas of Brazil. Since coastal management has not been put into practice, among other factors because of the lack of legal and institutional means, the fact of protected areas have this framework can be a start point for a process of coastal management in Brazil. There are opportunities but also constraints in this process. This paper will deal with some of these issues, focusing mainly on the role of coastal protected areas of sustainable use and their role in the establishment of mosaic structures, combining take and no take areas.

Systems: 'easy' in theory but what about practice? Issues of scale and interdisciplinarity in a systems application within the Odra/Oder river basin

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Abstract

Cross-scale interactions are critical to promoting sustainability within Integrated Coastal Zone Management (ICZM). Yet our knowledge of social and ecological system linkages across temporal and spatial scales and levels of organisation within coastal systems is often rather weak. This paper explores the theme of cross-scale interactions and presents a perspective about scale-based challenges emerging from the application of the 'Systems Approach Framework' (SAF) during a recent European project, SPICOSA (Science and Policy Integration for Coastal System Assessment). A systematic approach to managing coastal environments necessitates understanding the complexities and interconnectedness within and between social and natural systems; as well as the links within and between scientific teams driving research progress and other stakeholders within the coastal zone. However one clear take-home message emerged from the SPICOSA Project: it is considerably easier to think of a system as a system than actually to manage it in practice as one. The discussion in this paper explores challenges in such practical implementation of systems thinking, as these are related to managing complex coastal environments, including issues of geographical scale, social scale and the range of scope of issues i.e. trade-offs and negotiations versus focused management. It uses insights on cross-scale interactions from resilience literature to reflect on experiences within the southern Baltic (Oder/Odra), in which a SAF was applied to explore management solutions related to eutrophication and degradation of coastal ecosystems. The paper considers both opportunities and constraints on improving cross-scale implementation and it seeks to identify lessons as well as challenges for restructuring interactions towards more adaptive relations. The discussion will have a particular focus on issues related to the challenges of interdisciplinarity and on participatory processes of learning and change.

Keywords: cross-scale; integration; interdisciplinarity; stakeholders; socio-ecological systems; southern Baltic

Integrating knowledge sources in social-ecological projects: lessons learnt from a french case study

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Abstract

Tidal flats are complex social-ecological ecosystems that have undergone rapid and major changes over the past century (Millennium Ecosystem Assessment, 2005). Most changes are currently influenced by human activities occurring at local, regional and/or global levels. In parallel, knowledge sources have diversified as a result of the involvement of a wide range of stakeholders in ecosystem understanding, exploitation and conservation. Therefore, the sustainable management of such ecosystems currently requires a high level of integration of the sources of knowledge and parties concerned. A transdisciplinary approach based both on science integration (consideration of the human drivers that are the roots of ecosystem degradation) and science/management integration enables the integration of all sources of knowledge (academic, traditional, administrative and even popular) in the design and implementation of a territorial project. Because knowledge sharing implies the sharing of concepts, methods and tools, it can act as a valuable lever to reach sustainability. We will demonstrate the value of transdisciplinarity to reach sustainability in three steps. We will firstly explain why a transdisciplinary approach can support efficiently the identification of existing knowledge and its integration into the realization of territorial projects on the basis of theoretical considerations. Secondly, we will analyse three regional transdisciplinary projects conducted on the central Atlantic coast of France and show how to achieve knowledge integration. These projects that deal with coastal quality allow the analysis of knowledge integration in three different ways: (1) on the basis of science/management integration (academic/decision-makers knowledge integration), (2) on the basis of science integration (social-ecological understanding of ecosystems degradation), and (3) on the basis of administrative knowledge integration through the enforcement of a law. Knowledge integration processes and benefits for sustainability will be analysed and compared. Finally, we will discuss the benefits of such regional projects for global ecosystem management.

Keywords: social-ecological systems; knowledge integration; sustainable management; quality-based public policies; Atlantic coast of France

Transdisciplinary Evaluation of Different Coastal Adaptation Strategies: Integrating Regional Perceptions of Scientists, Practitioners and the Public

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Abstract

Coastal protection strategies increasingly have to take into account the effects of climate change. At present, engineering and natural science models that assess the impact of global climatic transformations on regional coastal zones and their protection structures remain rather detached from the knowledge and insights of practitioners. The paper argues, that innovative coastal protection requires not only interdisciplinary but transdisciplinary research that takes into consideration the whole array of actors involved in regional coastal protection strategies. The findings presented in this paper result from the five year research project A-KÜST – “Changes in the Coastal Climate: Evaluation of Alternative Strategies in Coastal Protection” – that was launched in 2009 in the context of the Climate Impact Research Programme (KLIEFF) of the German federal state of Lower Saxony. Qualitative interviews have been conducted with all decision-makers participating in coastal protection of the project region of the Ems-Dollard estuary (Southern North Sea) as well as natural and engineering scientists involved in the regional climate modeling process, focusing on perceptions and orientations towards coastal protection strategies and climate change. In addition, a quantitative public survey was conducted in order to collect public perceptions on climate change and coastal protection. The analysis reveals that, in contrast to an overwhelming consensus on fundamental issues and principles of coastal protection today, perceptions and orientations towards the significance of climate change and the evaluation of different strategies in the future vary considerably among scientists, practitioners and the public. For the group of scientists, not the scientific discipline they pertain to shapes their perception, but the institutions they work for. The differences in scientific, practitioner's and public perceptive cultures become especially apparent with relation to the evaluation of different future time horizons. Integrating local coastal knowledge completes the study and enables anchor points for the societal acceptance of future adaptation strategies. Against this backdrop, transdisciplinarity results to be an important step towards fruitful strategy development.

Keywords: Wadden Sea; coastal zone; integrated approach; global change; ecology; socio-economics
change

The Wadden Sea Region, a hotspot for the analysis of changing human-nature interactions

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Abstract

Bordering The Netherlands, Germany and Denmark, the Wadden Sea is one of the largest intertidal areas in the world. It is part of one of the most important flyways for migrating birds. In 2009 the Dutch and German parts have been designated as a UNESCO World Heritage Site. Major changes in the shape and ecology of the Wadden Sea over the past millennia resulted from a combination of geological processes and, progressively, anthropogenic influences. The latter include land reclamation, coastal protection, exploitation of natural resources and industrialisation. The valuation by society of the Wadden Sea has changed in parallel with these developments. The changing perceptions are mirrored in policy measures. In order to anticipate the impact of and the societal response to climate change (i.e. an increase in the rate of sea-level rise) and other challenges to this region, a combined analysis of the natural and social system is needed. In this presentation an integrated approach is suggested which links ecological, geoscientific and climate research to cultural history and socio-economics. Specific attention is given to linking processes on different time and spatial scales. Such an approach may contribute to the management of the Wadden Sea and comparable areas elsewhere.

Keywords: Wadden Sea; coastal zone; integrated approach; global change; ecology; socio-economics

North European Coasts and Islands – Cross-scale coastal management, culture- and place-specific social-ecological systems, global environmental change

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Abstract

Transdisciplinary knowledge integration and cross-scale interaction remain two challenges in coastal management, never met sufficiently in several decades of research and experience with integrated and sustainable coastal management. Both challenges are reflected critically in this presentation, starting from the more recent debate about scale epistemologies ("does scale exist?") and sustainable resource management under conditions of global environmental change. The aim is to make visible knowledge gaps and problems of coastal resource use and management in the perspective of adaptive governance. Results and examples from research about coastal resource management in several Swedish projects will be reviewed to identify such gaps - the SUCOZOMA-project about sustainable coastal zone management, the FRAP-project about conflicts between coastal fishery and species protection, the SECOA-project about solutions to contrasts in coastal metropolitan areas. Social-ecological systems analysis will be used to frame the review that connects the analyses of resource use conflicts, vulnerability, and resilience. Connecting theoretical and empirical knowledge components is expected to give new insights about protective use of marine and coastal resources, beyond definition of "take" and "no take"-zones. The strategy of adaptive governance can support this search of improved knowledge for sustainable resource management under conditions of climate change.

Global change and coastal threats: The Indonesian case

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Abstract

This presentation seeks to link global and local issues, using case studies from Indonesia as a focus for a discussion of national policy and governance approaches, and to illustrate how these relate to livelihoods and to coastal and marine resource management. Climate change is a major aspect of global (environmental) change. Both are linked to the economic, social and cultural dimension of change—issues that can be treated by interdisciplinary human ecology.

In Indonesia, globalization and climate change produce repercussions on local developments and livelihoods, specifically on coasts. The Indonesian government has set the stage for linking ocean developments and coastal threats to climate change in an apparently novel way. The contemporary “climate divide” may represent a new facet of the old conflict between the North and the South on environmental issues. To assess human-nature relations a more holistic approach is required, in theory as in practice, as proposed by human ecology. Such an approach involves natural and social sciences in close cooperation. Multi-level social-ecological research is advocated to address the connections and feedbacks between global change and local livelihoods in an interdisciplinary mode. Indonesia's coral islands are endangered by global change (sea level rise, floods and storm surges), socially aggravated by hazardous fishing methods (blast and cyanide fishing), collapsing coral ecosystems, and depleted fish stocks. Storm surges are threatening, among other regions, the Spermonde Archipelago (Sulawesi): They severely erode the shores of densely populated small islands and may eventually swallow them. Fish resources have been depleted in Spermonde: Fishing, the major bread winning activity, becomes more time consuming and more dangerous, partly due to the increased incidence and intensity of storms. The islanders acknowledge that present fishing practices, if unchanged, will result in reef degradation. There are hardly any future perspectives or visions: The conviction of a God-given destiny is ever present. The “climate divide” between the rich and the poor, globally and nationally, appears as a recent version of the age-old “environmental divide” between industrialized and developing countries. Climate change and poverty are connected. In island communities such as those in our study area, storms exacerbate economic polarization.

» ABSTRACTS A2 «

Session: A2 Keynote

Megatrends in Arctic Development

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Abstract

The current pace of global change has already had a decisive impact on the Arctic. To understand the current and likely future situation in the Arctic it is important to acknowledge the pre-conditions, challenges and tendencies at work here. Some of these developments should be characterised as megatrends because they overarching and impact on everything else. They are trends deemed so powerful that they have the potential to transform society across social categories and at all levels, from individuals and local-level players to global structures, and eventually to change our ways of living and thinking. A total of nine megatrends have been identified:

- Increased urbanisation - a global trend also including the Arctic
- Demographic challenges - the old stay while the young leave
- Continued dependency on transfers and the exploitation of natural resources will continue to dominate the Arctic economies
- Continued pollution and ongoing climate change will have a significant impact on the nature and environment of the Arctic.
- The Arctic needs to generate more Human Capital by investing more in its people
- Changes in the nature of interaction between the public and private spheres will impact development
- Renewable energy will contribute to a ‘greening’ of the economy.
- Increased accessibility provide opportunities as well as new risks
- The Arctic as a new player in the global game

The complexity and rapidity of the social, economic, legal and geopolitical changes that are taking place in the Arctic region requires substantial international efforts to share stewardship and concern for this ecologically fragile area which retains a vital importance for all residents of the North, the many Arctic and non-Arctic stakeholders and for the globe more generally. The Arctic, which is richly endowed with resources, fully engaged in new frontier research for scientific and intellectual capital/knowledge and highly diverse is becoming gradually integrated into global developments. This however presents both challenges and opportunities for the potential prosperity of some Arctic communities, creating conflicts over interests between developers and indigenous peoples and disagreements in relation to the most basic issues of power and control. These general geopolitical trends indicate that we are dealing with a work in progress and that significant effort will need to be made to ensure stability, peaceful cooperation and the exercise of good governance practices. The Arctic is not just a source of resources, a strategic resource base for geopolitical power or the avenue for new shipping routes, it is the homeland for many peoples and a region of increasing concern at several levels and where this is likely to be the case for many years to come.

Coastal permafrost processes within the Siberian Arctic Region

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Abstract

The coastal zone of the Arctic Seas is a place of dynamic interaction of the atmosphere, sea and permafrost. Coastal dynamics directly reflecting the complicated land-ocean interactions play an important role in the balance of sediments and organic carbon in the Arctic basin. Thermal abrasion is the most important destructive phenomenon affecting coastal retreat in this area. The Laptev and East-Siberian Seas are of particular interest, since large volumes of sediment and organic carbon are supplied to the sea from coastal erosion. Based on the estimates of coastal sediment input and average organic carbon concentrations in the coastal sections, the total organic carbon supplied to the Laptev and East Siberian Seas by coastal erosion can be quantified as ca. 4×10^6 t/yr. Other Arctic Seas are characterized by considerably lower coastal retreat rates, as well as lower sediment and organic inputs. The organic carbon, which originates from eroded coastal permafrost deposits, might be an important agent of increasing the greenhouse gas flux to the atmosphere. Long-term observations of coastal erosion on the key sites with ice-rich shores show that the coastal retreat rates within the study area have significantly increased (1.5 to 2 times) between 1999-2003 and 2010. These drastic changes in coastal dynamics are likely due to the notable rise of summer air temperature and the reduction in sea ice extent, as well to some increase in active-layer thickness on the coastal slopes. Increased coastal retreat rates can result in greater sediment input, including organic carbon, and pose threat to residential and industrial facilities located in the coastal zone of Siberia.

Keywords: Coastal retreat rate, coastal erosion, thermal abrasion, sediment and organic carbon flux, ice rich coast

Assessing socio-economic development in the Arctic: Arctic Human Development Report (AHDR-II): Regional Processes and Global Linkages.

River-ocean interactions at the mouth of the sediment-laden Mackenzie River, Beaufort Sea coast, Canada

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Stefansson Arctic Institute and University of Akureyri

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Abstract

This presentation provides an overview of the process, methodology, structure and content of the large scale circumpolar project entitled AHDR-II – Arctic Human Development Report II: Regional Processes and Global Linkages. The purpose of AHDR-II is to move the study of human development in the Arctic beyond the AHDR (2004) baseline, to provide the second broad scale and circumpolar assessment and synthesis report on the state of human development in the Arctic, and to contribute to our increased knowledge and understanding of the consequences and interplay of physical and social global change processes for human living conditions and adaptability in the Arctic. With the production of AHDR-II it will be possible to move beyond the baseline study of the state of human development in the North and to make comparisons and contrasts between critical time periods in an era with rapid change impacts in the North. The project will yield an assessment of the state of human and socio-economic development in the Arctic with focus on a range of social and socio-economic systems, opportunities and challenges facing the North, including overarching cross-cutting themes of global change impacts; climate change; regional processes and global linkages.

Abstract

The Mackenzie River supplies sediment to the second largest Arctic delta and is the largest fluvial contributor of sediment to the Arctic Ocean. The subaerial delta and its subaqueous extension in the nearshore buffer sediment and nutrient delivery from a large continental drainage basin, however, relatively little is known about delta and river-mouth processes in large permafrost deltas on the Arctic coast. Over the past several years a series of unique field surveys have been undertaken in winter, spring and summer to acquire data that are being used to improve conceptual models of nearshore processes and to develop and validate numerical models of waves, circulation and sediment transport. The timing and location of sediment transport is complex, driven by a combination of open water season storms and spring floods. Unlike temperate counterparts, river-ocean interactions during spring freshet are mediated by the presence of an ice cover. Increasing discharge leads to flooding of the ice surface, followed by vortex drainage through the ice and scour of the seabed below ('strudel' drainage and scour). During winter months, surveys have shown the duration of ice contact with the bed determines the thermal characteristics of the seabed. Analysis of cores shows that the silts comprising the shoals are up to 6 m thick with sedimentary structures typical of an active wave-influenced delta front environment. Oceanographic measurements acquired in 2-5 m water depths show that during moderate storm events, waves attenuate rapidly as water depths shoal. Entrainment of fine material and rapid flocculation due to the presence of brackish water may induce the transient formation of high density suspensions near the seabed, which contribute to this rapid attenuation. Rare, severe summer storm surges are known to cause massive vegetation die-off when brackish waters are driven onto the delta surface and pond just prior to freeze-up.

Keywords: Arctic; delta; permafrost; bottomfast ice; strudel scour; storm surge

State of the Arctic Coast 2010 – scientific review and outlook

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Abstract

The international State of the Arctic Coast report was published on-line in April 2011 and is available at www.arcticcoasts.org. The Arctic coastal interface is a sensitive zone of interaction between land and sea, a region that provides essential ecosystem services and supports indigenous human lifestyles; a zone of expanding infrastructure investment and growing security concerns; and an area in which climate warming is expected to trigger landscape instability, rapid responses to change, and increased hazard exposure. The 2007 international workshop on Arctic coastal zones at risk called for an assessment of the state of the Arctic coast. The goal of this report was to develop a comprehensive assessment of the current status of the circumpolar coast and its sensitivity to anticipated environmental and social change. The report aimed to identify key issues requiring future scientific focus in an international Earth system research agenda. Key findings include: (1) The evolution of Arctic coasts over coming decades will be strongly influenced by climate warming; (2) Arctic coastal habitats are the prime lifeline for Arctic communities and provide a wide range of ecosystem services; (3) Many Arctic coastal communities are experiencing vulnerabilities to changes in the coastal environment with impacts on travel, subsistence hunting, cultural resources, and housing and infrastructure in settlements. The following points are among 35 data gaps and research priorities identified in the report: (1) More robust projections of sea-level rise are a priority; (2) Anticipating increased coastal erosion in the Arctic, the lack of a systematic circumpolar coastal observing network is a critical gap; (3) Future efforts need to focus on adaptive management in the face of change, building of community adaptive capacity and resilience, and recognition that change to both physical and human systems in the Arctic has become constant; (4) Future research needs to focus on increasing support, opportunity, and capacity for local decision-making or effective resident input to decisions; (5) More effort is required to develop lines of communication between the science and policy communities concerned with Arctic coasts. These and other identified research priorities provide some guidance for the development of future LOICZ efforts in the Arctic.

Keywords: Arctic; circumpolar coast; communities; climate change; adaptation

Session: A3 Keynote

Environmental change in the Ariake Sea -reclamation, material transport and hypoxia

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Abstract

The Ariake Sea is a gulf type ROFI or estuary situated in Kyushu Island, western Japan. It has unique features in major embayments is Japan, e.g. high tidal range up to 6 m, extensive tidal-flat which accounts for 40 % of total tidal-flat areas in Japan, highly turbid water caused by suspended clay and unique biota including 23 endemic species. After late 1990s, several environmental problems became obvious here: increase in red tide, occurrence of serious hypoxia, decrease in bivalve harvest etc. The serious hypoxia was considered to be an important reason for the decrease in benthos. Now serious hypoxia occurs every summer in the bay head and the Isahaya Bay which is a tributary of the western Ariake Sea. The conspicuous feature of hypoxia there is that it was formed in the shallow area close to the offshore end of the mudflat. It would be caused by the effect of the estuarine circulation, the thin bottom layer between the seabed and strong pycnocline and the active re-suspension and accumulation of sediments. In 1990s, reclamation with double dikes system was conducted in the Isahaya Bay (area 1550 ha). The dyke was constructed and the gates were shut down in 1997. Since the serious hypoxia was firstly discovered and red tide started to increase after the dyke construction, the reclamation was suspected as a cause. However, there is no evidence that the reclamation of the Isahaya Bay increased the hypoxia in the bay head of the Ariake Sea. Actually the hypoxia in the bay head would be increased by several processes including basin scale material transport and long term change in tidal amplitude. On the other hand the gates of the Isahaya dyke will be open in the next 3 years to examine the effect of the construction of the dyke.

Keywords: Ariake Sea; estuary; hypoxia; reclamation

Session: A3 Oral

Levels and distribution of Dechlorane Plus in sediments from three coastal bays, North China

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Abstract

Dechlorane Plus (DP), which was first synthesized in 1970s, has widely been used as a substitute for Dechlorane and brominated flame retardants. Both syn- and anti-isomer have widely been detected in air, water, sediment, biota and human serum, but little information is available for marine sediment which is one of the major sinks for persistent organic pollutants (POPs). This study focused on DP levels and distribution in marine sediments from three Chinese bays, i. e. Jiaozhou, Sishili and Taozi Bay in North China. The top 5cm of the sediments were collected at 48 sampling sites of the three bays. The DP concentrations ranged from 0.6 to 189 ng/kg dw (mean 24.1 ng/kg dw) in Jiaozhou Bay, 0.3 to 138 ng/kg dw (mean 64.8 ng/kg dw) in Sishili Bay and 0.6 to 67 ng/kg dw (mean 34.1 ng/kg dw) in Taozi Bay, respectively. The contamination level was comparable with that of rural river sediments from China (\sim 160 ng/kg dw) and of sediments from Lake Winnipeg (30 ± 3.2 ng/kg dw), and it was dramatically lower than that in the sediments close to manufacturing plants, for example, Huai'an canal, China, (1860 to 8000 ng/kg dw) and Lake Ontario, Canada, (2.23 to 586 ng/g dw). The fsyn value is defined as the syn-isomer/(syn+ anti-isomer) to identify possible sources of DP in the environment. The fsyn values of sediments from Jiaozhou Bay (mean 0.29) were close to technical mixture (0.35 to 0.40), probably indicating a local usage of DP as a flame retardant. In contrast, sediments in Sishili and Taozi Bay showed much lower fsyn values (mean 0.17). Sishili and Taozi Bay were more open than the semi-closed Jiaozhou Bay, and receive sediment input from the Bohai Sea. The sedimentation rates were 0.704 cm/a in Jiaozhou Bay and 1.24 cm/a in Taozi and Sishili Bay. The DP inventories from 2006 to 2010 were estimated to be 0.33 kg for Jiaozhou Bay, 0.49 kg for Sishili Bay and 0.37 kg for Taozi Bay, respectively.

Keywords: Dechlorane Plus, coastal sediment, China

» ABSTRACTS A3 «

Development of coastal zone management involving drift litter on ocean beaches and the local knowledge of local communities on small islands

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Abstract

The sharply escalating scale of drift litter on beaches is now a coastal environmental issue on coasts around the world. Victims and perpetrators are a cross-boundary mix coming from different towns and even nations. The status of this situation as a “trans-boundary environmental problem” exacerbates its intractability. Taking the shorelines of Fukue-shima Island in the Goto Islands in Nagasaki Prefecture as a focal point, research is ongoing with the cooperation of a national NGO, a locally-based CBO, the local government and scientists. The case study below outlines the “local knowledge” and its effectiveness. The topography, climate and nature of the ocean around the Goto Islands puts them in a position to be easily effected by the warm Tsushima Current and prevailing winter winds off the continent. The results of the survey showed that drift litter was abundant, in a normal year, on seacoasts extending from west to north during the season of prevailing winter winds, and in summer on the southern coasts. Litter originating outside Japan was particularly apparent; there seemed to be a lot of it coming from Korea in winter and from China in summer. Thus, about 100 PET bottles each were collected on the different beaches facing the various compass points. The analysis of data for the winter season of 2009 is shown in the figure. As attested to by residents with respect to bottles drifting in from other countries, those from China, Taiwan and Hong Kong collected on southern-facing beaches and on beaches facing from west to north were correspondingly from Korea. The entire process of this study has been pursued in a research framework that requires the cooperation of residents in order to collect local knowledge, carry out the survey and invent measures to deal with the problem.

Keywords: Marine drift litter, local knowledge, Goto Islands, trans-boundary pollution

Community Based Aquaculture in Waterlogged Area: Autonomous Income Generating Option for Climate Vulnerability in Southeast Coast of Bangladesh

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Abstract

This paper is based on identifying potential adaptation method and exploring the wider implications for community based aquaculture management in waterlogged areas of Begumganj under Noakhali district, Bangladesh. It focused on minimizing climate vulnerabilities by adding an income option to the people of coastal area and initiating a process through which people adapted to them in the context of climate vulnerabilities. This adaptability was facilitated with community based aquaculture in 4.5 ha aquatic ecosystem with average water depth 1.5 m and water logging duration 6 months in Eklashpur village of Begumganj Upazila by involving locally available inputs, favorable natural precipitation, traditional aquaculture methods, flexible land use pattern. Through community based aquaculture approach, after 6 months farming a total of 2850 kg fishes harvested with selling price of Tk. 171,775 (US\$2454) having the Return-on-Investment (ROI) 45%. Opting income for local livelihoods from the waterlogged area, community members could use themselves in building certain aspects of adaptive capacity, resulted in fading vulnerabilities to the climate change. And possibilities for replication and expansion of community based aquaculture approaches in other unutilized areas may attract forward and backward industries as action outcome. Thus, alternative income option will be generated for the local people who remain jobless after different climate born vulnerabilities in the low income coastal areas of Bangladesh.

Keywords: Community; aquaculture; waterlogged; autonomous; climate vulnerability



Effects of Economic Transformations and Growth on Population and Land Use Dynamics of Coastal Areas of Selangor

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Abstract

Several studies have been conducted seeking to link demographic variables with land use dynamics but the findings have been inconclusive for a generalized population – land use dynamics theory due to different political, socio – economic and biophysical conditions within and across the study areas. Given this background, a study is conducted to examine the implications of demographic changes on coastal land use of Selangor, Malaysia with the aim of assessing the patterns and trends of population - land use dynamics in the state and relate this to coastal resources management. Socio – economic variables for this study were derived from data collected from the Malaysian Department of Statistics. The data were subjected to various statistical tests using SPSS version 18. Findings indicated that increased rate of urbanization in Selangor had been driven by availability of socio-economic infrastructures, excellent transport network system suitable topography and policies. Unfortunately, this has brought about environmental degradation of the coastal areas in Selangor. While efforts of the government at arresting the situation is commendable, a lot is still required in diversification of rural economies to achieve even development of the state for sustainable development of the country as canvassed in the ongoing Malaysian Vision 2020 development agenda.

Keywords: coastal land use dynamics; demographic variables; economic diversification; sustainable development; Vision 2020 development agenda.

Climate change, vulnerability, adaptation and economic development: challenges and conflicts in São Paulo Coast Zone, Brazil

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Abstract

The world is experiencing an energy crisis, mainly due to fossil energy dependence, specifically oil and its environmental impacts. In Brazil, investments made by Petrobras, government Oil Company, made possible the discovery of important oil and gas deposits at high ocean depth, in the called the pre-salt layer of São Paulo state coast zone, Brazil. These findings have strategic importance for the country economic development, and occur in a singular environment meaning area, covered by one of the most important biome in terms of size and biodiversity, the Mata Atlântica (Atlantic Forest), which passes to be threatened by the installations constructed and previewed for oil transport and refining. In this scenario, the 2 million coastal zone inhabitants are in constant contact with the São Paulo Metropolitan Area, which has more than 20 million inhabitants and are 50km away. Economic expansion due to oil exploitation should increase the demographic growth of some coastal municipalities, particularly in the urban areas. This situation became especially complex considering the hazards arising with climate change, which will involve, for example, increasing extreme weather events such as storms, storm surges and flooding. Furthermore, local relief characteristics, with many flat areas close to the sea, improve exposure to sea level rising risks and also the landslides risks. In this context, we question the continuity of the economic development historical pattern and its consequences, highlighting the increasing number of risks in the perspective of climate change.

The purpose of this study is to discuss the articulation of large investments that are underway with demographic dynamics, urban expansion and their implications for vulnerability and adaptation, considering the whole context determined by economic development processes and the set of hazards influenced by climate change. **Keywords:** climate change; coastal zone; vulnerability; adaptation; development; urbanization;



» ABSTRACTS A4 «

Session: A4 Keynote

Small Island Developing States: coastal systems, global change and sustainability

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Abstract

Early studies of the links between global change and small island vulnerability largely ignored more established concepts and assessment methodologies. However, recent work has built on broader concepts of vulnerability to such concerns as famine, hazards and poverty. Thus assessments of vulnerability have become more bottom-up, locally driven and participatory. This shift went hand in hand with two others: (i) recognition that, in the context of vulnerability, climate change impacts will in most cases first result from changes in the frequency and/or intensity of extreme weather and climate events; and (ii) increased use of risk-based approaches. All three shifts proved to be mutually reinforcing, but resulted in a multiplicity of community-based approaches, methodologies and tools. However, most share a common starting point of the current vulnerability of the community, ecosystem or economy, rather than future impacts, as had previously been the case, as well as recognising the strong linkages between climate adaptation and disaster risk reduction, all within sustainable development and humanitarian contexts. Even more recently, studies are combining scenario-driven impact assessments and place-based vulnerability studies. This more holistic and often risk-based thinking sees attention focusing less on vulnerabilities and more on assessing the need for building system resilience. Building resilience is integral to enhancing adaptive capacity, thus highlighting the relationship between resilience and vulnerability. Experience of addressing global change in the context of small island countries has highlighted the following:

Assessments of impacts, vulnerabilities and possible responses to global changes should also reflect wider sustainable development and humanitarian considerations;

There is an increasing gap between the available information and that which is required to make informed decisions related to managing vulnerabilities, risk and resilience; and Few success factors and lessons learned have been adequately documented and communicated; as a result, there are all too few examples of these being put into practice.

Strengthening the monitoring, evaluation and reporting of responses to global changes can help address the last issue. Documenting instances of bad practice (e.g., maladaptation) would also help address this gap.

Keywords: small islands; coastal; change; vulnerability; adaptation; sustainable development

Session: A4 Oral

Physical basis of coastal adaptation in Small Island Developing States

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Abstract

Physical vulnerability is just one aspect of the social-ecological system in island communities. Although community resilience requires a much broader and holistic approach to governance, the geological and oceanographic context is a fundamental consideration in managing adaptation to environmental change. The geology, morphology and ecology of small island coasts form the biophysical framework of island communities. Components of physical forcing, such as sea-level rise and variability, storm surges and wave climate, constitute a range of natural hazards. Combined with management practices and the nature of development, these define the exposure of the coastal system. Coastal stability is a function of wave energy, erodibility, and sediment supply, which may depend on reef health and the production of biogenic sand. Island types range from continental fragments and high volcanic islands to atolls and raised atolls. The nature of the hazards and appropriate adaptation measures vary between island types. Low-lying communities on high islands have the greatest exposure to tsunamis. These communities and those confined to the islet rims of atolls are exposed to flooding and wave runup, overtopping, or erosion in major tropical storms. Although raised atolls with surrounding cliffs (such as Niue in the South Pacific) appear well protected from coastal hazards, their steep submarine flanks and narrow reef rims enable deepwater storm waves to break directly on coastal cliffs, damaging buildings or other infrastructure up to 2.5 m above sea level. Atolls and the low-lying fringes of high islands are susceptible to future inundation under climate-induced acceleration of global mean sea-level rise (SLR). Robust projections of local sea-level rise for individual islands require knowledge of uplift or subsidence rates, including any tectonic effects and glacio-isostatic adjustment. There is general consensus that the SLR projections of the 2007 IPCC report (AR4) were conservative and that SLR this century is likely to be less than 2 m but exceed the AR4 estimates. A precautionary approach requires robust island-specific projections of the full range of realistic sea-level scenarios and future updating as new insights and consensus develop through the coming decade and beyond.

Keywords: tropical islands; coastal hazards; tsunami; storm surge; sea-level rise

**Means and extremes of climate and sea level as drivers of coastal change in small island states:
Need for a change in emphasis in research, planning and coastal management.**

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Abstract

Climate- and sea level-related extremes have had disastrous impacts on coastal areas of Small Island Developing States (SIDS). Tropical and extra-tropical cyclones; flooding from land, river and sea; drought; storm surges; rogue sea waves; extreme low and 'king' tides have resulted in big changes in natural systems and destruction of settlements and infrastructure. There has been a long history of such impacts and both traditional and modern island communities have been more concerned with the risks, and responses to extreme events, than to incremental changes in mean conditions. Thus, adaptation to extreme events in islands is nothing new. What is new is the potential for increases in both mean trends and extremes, combined with the more intensive use of coastal zones of SIDS. Examination of the IPCC's four scientific assessments since 1990 shows that there has been a greater emphasis on means rather than extremes. To date virtually all global sea level projections deal exclusively with mean sea level (MSL). Paradoxically, in few island settings is MSL particularly meaningful. Few ecological or geomorphological phenomena or processes have thresholds around MSL. Rather these change at the upper and lower limits of the tidal zone. It is here at the extremes where major natural transitions occur, and it is here that human uses change so abruptly, not at mean level. Clearly there is a requirement for more attention to be paid to analysis of extremes in observational data and projections. Thus far emphasis on extreme sea levels has focused on storm surges, and comparison of extremes and means. In both cases prominence has been given to extreme high water levels, but (1) storm surges are not the only weather-related sea level extreme; and (2) low sea levels also need to be given attention. Several gaps in the science literature and in impacts and adaptation studies are identified, and the urgent needs of SIDS discussed.

Keywords: SIDS; sea level; extremes; coastal change; adaptation; needs

Climate change adaptation policy tools for tourism in small islands - the case of Palau

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Abstract

Coastal areas around the world are the hot-spots of climate change impacts. Coastal locations in developing countries are also already burdened with numerous challenges related to resources, economy, and vulnerability to natural disasters. Understanding the diversity of coastal locations, adaptation responses to climate change require specifically tailored measures. Many developing coastal areas are also prime tourist destinations and provide a ground for aquaculture and biodiversity. Threats from climate change pose hindrances to economic growth in coastal regions and also implicit harm to human health and safety. This paper is intended to seek policy directions for climate change adaptation for facilitating tourism. This paper explores the various current and projected climate change threats that impact coastal regions. Published literature on climate change threats to coastal areas and adaptation policy formulation, implementation and evaluation are also discussed. The case of Palau's vulnerability as well as unique opportunities in the face of climate change is presented in detail. Palau, due to its natural environment, location, political stability, and capability has tremendous potential to develop compared to other low-lying islands. Especially the underdeveloped island of Babeldaob has many potentials of moderating harm and planned adaptation to climate change is deemed beneficial. By understanding dynamics of social actions and traditional ways of building resilience measures to enhance local level adaptation can be achieved. The review includes discussions on adaptation-mitigation duality, various approaches to tackle climate change, policy directions, evaluative framework, and challenges in adaptation. The review consists of policy paths that have been suggested elsewhere and try to fit the solution to the case coastal areas in a developing context. It is found that 1) climate change adaptation policies must address actions at multiple scales, levels and must involve multiple actors; 2) Mainstreaming of climate change adaptation in national policies enables an environment for positive actions; 3) climate proofing of existing and new policies should be implemented. Instead of conceiving climate change adaptation policy from scratch, response should be integrated into existing plans, programs and policies; and 4) Policies can also exploit overlaps in autonomous adaptation-those occurring without any policy intervention and planned adaptation to ensure limited resources are utilized to get maximum benefit.

Autonomous adaptation can be understood by exploring local context and traditional adaptation techniques which can be part of adaptation strategy. A list of adaptation tools focusing on above findings is also synthesized the tourism sector. The tools policy tools for adaptation involves developing a building code and standards; coastal setbacks; arming using natural structures; protecting natural shoreline vegetation; protecting tourism structures; disaster preparedness and evacuation plans; water conservation and recycling; and protecting watersheds from development interventions. This synthesis will be useful for policy making in the areas of climate change adaptation, tourism planning and disaster risk reduction in small islands.

Keywords: adaptation, small island developing states, Palau, tourism

» ABSTRACTS A4 «

Historical shoreline changes of reef islands around Tarawa Atoll, Kiribati.

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Abstract

Low-lying reef islands on atolls such as Tarawa, Republic of Kiribati, are fragile and appear threatened by impacts of anticipated sea-level rise. There is a widespread perception that these reef island shorelines exposed to increased wave action are likely to erode. On the other hand, because carbonate sediment is being produced on the surrounding reefs, an alternative view is that addition of sediments will lead to accretion. This study examines short-term changes in shoreline positions on the majority of reef islands around Tarawa over the past 30 years, comparing shoreline positions in 1968 and 1998 from aerial photography using Geographical Information System software. Rates and trends of shoreline change were determined using Digital Shoreline Analysis System. Over this period, Tarawa has experienced an average rise of +1.4mm/yr in sea level. Coastline investigated only covered the ocean and lagoon facing beaches, which represents more than 50% of the total reef island coastline length. Perpendicular to these shorelines, transects were cast at every 20m interval to determine the 30 year shoreline change. Analysis showed varying responses with most of the ocean facing beaches displaying net erosion. Others showed accretion, whilst only some displayed little change. Majority of the lagoon beaches showed net accretion, but detection of the base of the lagoonal beach on historical photos can be difficult. Windward ocean-facing beaches are more dynamic than leeward ones. In addition, El Niño conditions and humans also influence shoreline responses. Reef islands are resilient particularly where constrained by conglomerate. But concerns are raised for the future of these reef islands, as evidence highlights that widespread erosion occurs principally on the ocean shores. Results provide a foundation for appropriate adaptation measures to increase resilience such as prohibiting beach mining practices and offering alternative construction material.

Assessing the vulnerability of atoll states to coastal hazards: a South Tarawa case study (Kiribati, Pacific Ocean)

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Abstract

Over the past three decades, assessments of coastal areas vulnerability to natural hazards have been conducted in developed countries to provide easy-use indices to decision-makers (Garcia-Mora et al., 2001; Williams et al., 2001). Some recent works also try to include climate change and sea level rise related hazards in such methodologies (Diez et al., 2007; Abuodha and Woodroffe, 2010). Although Small Island Developing States are acknowledged to be very vulnerable to existing and upcoming coastal hazards (Woodroffe, 2008; Nunn, 2009), they have rarely been the subject of such approaches. Yet, in those countries, there is an urgent need for vulnerability diagnoses at a local scale to support decision-making and the design of realistic adaptive strategies. In line with the IPCC definition of vulnerability, we developed an assessment methodology based on a comprehensive and integrated approach. This methodology is innovative as (i) it considers a wide range of physical, environmental and anthropogenic features – the latter being underestimated in existing assessments – as well as their interrelations – that are generally not taken into account – and (ii) includes the factors influencing the coping/adaptive capacity, i.e. the state of natural resources, living conditions, economic diversification, perception and understanding of coastal hazards, protection works, etc.

At first, we will present this methodological framework through the description of its three sets of parameters (Environment, Exposure, Coping/Adaptive Capacity). Then, we will expose the results of fieldwork conducted in 2010-2011 in South Tarawa (Kiribati, Central Pacific). At last, we will discuss the interest and limits of such a methodology in comparison with other vulnerability assessments.

Keywords: Reef islands; shoreline; erosion; accretion; aerial photography; Tarawa.
Small Island Developing States

Vulnerability and barriers to adaptation in Small Island Developing States: the case study of Kiribati (Pacific Ocean)

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Abstract

Among Small Island Developing States, low-lying islands are acknowledged to be particularly vulnerable both to current coastal hazards and to climate change expected impacts. Two main reasons are generally highlighted: constraining physical characteristics (territorial fragmentation, smallness, low altitude, limited terrestrial resources, exposure to extreme events) and unsustainable development schemes that accelerated environmental degradation, notably in the most populated areas (Woodroffe, 2007; Nunn, 2009; White and Falkland, 2010; Hoegh Guldberg, 2010). As climatic and anthropogenic pressures on atolls' resource systems are constantly increasing, one of the main challenges that such countries have to face is to reduce vulnerability both to existing and upcoming coastal hazards. Based upon the unrecognized case study of South Tarawa urban district in Kiribati (Central Pacific), this paper will expose the vicious circle of vulnerability that questions the ability of coral island states to face both current and future coastal hazards. Indeed, over the past decades, the development process has led to a high demographic pressure on the central atoll of South Tarawa. This has generated strong environmental disturbances (ecosystem destruction, soil and groundwater pollution, coastal erosion) and challenged the traditional land tenure system. The combination of these two phenomena currently leads to a decrease in the room for manoeuvre of this country. The demonstration will rely on a diachronic analysis of aerial photographs showing the emergence of the "vulnerability system" and on field observations and interviews. The conclusion will go beyond the case study of Kiribati to question the barriers to adaptation in SIDS.

Keywords: SIDS; coastal hazards; vulnerability; sustainability; adaptive capacity

Managing adaptation to environmental change in small islands and analogous coastal communities

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Abstract

Integrated coastal management, proactive adaptation to climate change, and mitigation of non-climate coastal hazards are positive practices to enhance resilience in coastal communities, including small island developing states. Coastal vulnerability is a function of exposure, adaptive capacity, and the resources, institutional framework and governance to deploy that capacity to reduce impacts. The coping capacity and resilience of island communities can be greatly enhanced by best practices in land-use planning, emergency preparedness, institutional and governance coordination, infrastructure design and construction, and public education, among other strategies, and by mainstreaming integration of climate change and coastal hazard issues into the full spectrum of community policy concerns. Effective three-way communication between scientists, residents, and decision-makers is an important mechanism to ensure mobilization of local experience and the integration of scientific knowledge into policy and adaptation practices. C-Change is a collaborative international project linking coastal communities in Canada and the Caribbean to share tools and experience in managing adaptation to environmental change and extreme events. Of the eight communities, two are located in tropical small island developing states (Bequia in the Grenadines; Grande Rivière in Trinidad), two in small coastal developing states, three are mid-latitude Canadian coastal communities, and one is an island community in the Canadian Arctic. The project uses a bottom-up approach to evaluate community awareness, exposure, and existing capacity to respond to extreme events under present-day conditions. This involves a place-based vulnerability assessment that considers multiple dimensions in the coastal system and the role, priorities, and vulnerabilities of various community groups. Community data captured in geographic information systems can be used in combination with scientific data on environmental change and coastal hazards to identify various aspects of sensitivity and vulnerability in the community. A decision model can be used to compare alternative evaluations of community adaptation strategies and interactions with other community priorities. Ultimately, most adaptation decisions and actions take place at the community or island-wide level, so that measures to enhance local capacity and resilience are likely to have the greatest impact.

Keywords: small islands; coastal communities; adaptation; resilience; C-Change

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Session A5 merged with C1

Session: A6 Keynote

Think Globally but Model Locally: The Use of Panel Data in Estimating Behavioral Models of the Relationships Between Human Behavior and Environmental Change.

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Abstract

The process of informing public policy through research and modeling that integrates economic, ecological and physical models of environmental change is not a new area of scholarship, having first appeared in the pioneering work of Daly, Isard and Cumberland over 40 years ago. These models focused on measuring flows across and within systems, which was an enormous contribution and provided a new basis for informing policy decisions. However, these models did not incorporate behavioral relationships that alter flows, nor did they model behavioral changes in reaction to these fluxes. The incorporation of micro-level behavior into analytical models is critically important for understanding the most pressing of environmental problems, including those in the coastal zone. Although there have been some very good case studies, this type of modeling has not generally been included in the analysis. Especially with regard to the coastal zone, funding agencies and big scientific projects have focused on understanding flows within the eco/environmental system, and have not devoted sufficient attention to social and economic behavior.

This keynote address focuses on the development and implementation of socio-economic behavioral models, and highlights a necessary condition for their implementation; the creation of panel data sets. In this data collection process, observations on individual behavior (at the household and/or community level) are collected over a geographically diverse area over a sustained period of time. This gives both cross-sectional and time series variation with which to analyze behavior and provides the opportunity to look at phenomena such as extreme El Niño/La Niña events, time trends, and spatial variation in reaction to environmental change. The address identifies a set of behavioral models, with an emphasis on their implementation with panel data. Furthermore, the address exams the linkage of socio-economic behavioral models to ecosystem models, and how this integrated approach can be used to inform policy decisions, as well as providing insight about the value of coastal environmental services.

Keywords: behavioral models; coastal zone; environmental change; environmental policy; panel data.
How sensitive policies and implementation are to ecosystem services in Indian Sundarbans

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Abstract

Strategies to reduce vulnerability of fragile but important delta for protecting main land and biodiversity must have an ecosystem approach. Sundarban forms an integral part of the delta region at the mouth of the Ganga, the Brahmaputra and the Meghna and is shared by India (40 percent) and Bangladesh (60 percent). It also provides vital ecological functions (provisioning, regulating, amenity and cultural, supporting services) for the coastal South Asian region. The Sundarbans covers approximately 10,000 km² of forest and water. Natural subsidence is a feature of this delta with an eastward tilt causing freshwater discharge through Bangladesh. Past experiences of intense cyclones, frequent storm surges, salt-water intrusion and coastal flooding add to the concern. The welfare implication of the impacts of local natural environment and global predicted climate variability is complicated given the low (below state average) adaptive capacity of the region. To understand the extent and intensity of these challenges we analyse the past and ongoing development choices and coping capacity. The most important development choice relevant to sea level rise in Sundarbans is the embankments built to protect the shoreline. This major engineering intervention, which started in 1770 resulting in a 3,500 km- long embankment construction, changed the demographic pattern of the area and disregarded the natural ecosystem. Embankments were built by hiring labourers from neighbouring districts and states, who later settled there and started agricultural activity. Besides this development – induced migration and human- induced change of land use pattern, the embankments led to major interference with the natural environment causing conversion of forestland and for human settlements and building embankments through reclamation. Thus, the current population pressure is rooted in the past and in previous economic developmental choices. In the recent past, development choices have been more market- driven. About 70 per cent of shrimps are produced on India's east coast. The anticipated rapid growth of the shrimp aquaculture industry has generated debate within the sustainability paradigm: regarding its contribution to economic growth, distribution of its benefits and costs, the environmental and ecological impacts, and the extent of public participation. Past and ongoing developmental efforts have depleted the natural productive base of the economy irreversibly. Tidal flats, agricultural land and mangrove forests have declined over time, while abandoned aquaculture ponds, degraded mangrove and salt marshes have increased. Over one decade, mangrove area in Sundarbans has declined from 420 hectares (1987) to 212 hectares (1997). No comprehensive valuation has been done to assess the monetary damage caused by physical changes in natural capital due to development choices and natural erosion. Mangrove trees have specially adapted aerial and salt- filtering roots and salt- excreting leaves that help them occupy the saline wetlands where other plant life cannot survive. The fallen leaves and branches from the mangroves provide nutrients for the marine environment and support immense varieties of sea life in intricate food webs. Acting as

an interface between land and sea, mangroves help protect coastlines from erosion, storm damage and wave action. They prevent shoreline erosion by acting as buffers and catch alluvial materials, thus stabilizing land elevation by sediment accretion that balances sediment loss. The single most important conservation issue in the Sundarbans can be investment in the mangrove forests. These are vital for unique coastal ecosystems. The ongoing natural erosion and accretion processes are likely to worsen in predicted climate change scenario. All current coastal zone notifications are more in command and control style rather than economic incentive based. The strategy to reduce vulnerability must have an economic incentive based ecosystem approach. Given all the uncertainties, and going by the precautionary principle, immediate action can be taken to make necessary institutional changes, analysis of existing policy recommendations, land use management and adoption of green accounting framework to help in making genuine investment decisions. The importance of mangroves should be promoted through total economic valuation of mangrove system. This paper provides policy option matrix guided by a criteria matrix consistent with ecosystem approach within sustainable development paradigm and implementation risk assessment.

Session: A6 Oral

Ecosystem Services and Food Security under Threat due to Climate Change Impacts on Coastal Region of Ganges Delta in Bangladesh: An Overview

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Abstract

Ecosystems services are the benefits of humans derive from ecological processes and the ecosystem functions, by recognizing the value of ecosystem services, it could be accepted that the largely non marketed ecological wealth underpins our market economic wealth. The coastal ecosystem services produce food, fiber, fuel and non-marketed ecosystem services. They are supporting more than 15% of the total population of the coastal region. The Sundarbans is one of the productive tidal mangrove wetland ecosystem is situated in the Ganges tidal active delta. The silt deposits of the delta cover an area of about 105,000 km². The coastal length is 710 km and the area considered as coastal region is about 47,000 km². The river courses in the delta are broad and active, carrying 6 million m³/s of water and 13 million tons of suspended sediment per day and 2.4 billion tons of per year reach to the Bay of Bengal. The Sundarbans ecosystem services are proving four types of potential ecosystem services such as supporting services, provisioning services, regulating services and cultural services; those are now under threat due to anthropogenic influences, climate change impacts on natural resources in the coastal region of the Ganges delta. This mangrove ecosystem services are public goods, it is affecting because of climate change impacts and influences on upstream fresh surface water supply to the downstream. The global warming and climate change impact is a new threat for the coastal resources and communities. The environment and the people of the coastal region will particularly be affected by climatic impacts and Sea Level Rise (SLR) changes. This perspective and the already existing pressure on limited resources aggravate any effort to advance the country's socio-economic development. The coastal zone of Bangladesh is the low lying zone in the world where 36.8 million people are living within 1 meter elevation from the high tide level and fighting against climate change impacts and poverty. Thousands of small islands on rivers and coastal deposits (chars) constitute the most vulnerable environment. The cultivation of crops arose independently in the coastal area, but it is under threat owing to anthropogenic and climate change impacts. This is because climate change can cause SLR and upstream fresh water extraction can changes that could damage farmland, agricultural crop production and human settlements which lead to ecosystem services, food insecurity and poverty in the coastal society. The study has investigated mangrove wetland ecosystem and degraded ecosystem services which is threat for coastal community livelihoods and food security. The

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high salinity intrusion and heavy intervention on the coast which are challenges for coastal mangrove ecosystem and sustainable livelihoods of the communities. Therefore, measures need to be taken to develop and maintain these coastal zones and its ecosystem services in order to fight against food insecurity and poverty in the society. It has also been predicted that due to salinity intrusion and tidal inundation about 20% of cultivable land and 17 million coastal people will have to be displaced by 2030. The global climate change and environmental problems are both local and global in nature and have to be tackled collectively by the community participation within the inter-governmental cooperation. With the trends of population increase (growth rate 2.2%), anthropogenic influences on freshwater, natural calamities and food security should be the emergence issues and it should be solved within the collective efforts and initiatives. Proposed innovative adaptive approaches such as development of water village, floating settlement, floating cropping systems and micro scale base desalination technology could be the alternative approach to solve this problem. GIS and Remote Sensing (RS) application could be the proper tool for the decision makers to make appropriate coastal resource management plan. The study has been carried out based on primary and secondary data sources. The objective of this research is to contribute to develop a comprehensive framework and policy guideline for environmental plan for coastal ecosystem services, food security and poverty alleviation that could meet the needs of the present millions of coastal inhabitants in the Ganges delta of Bangladesh.

Keywords: Ganges delta, Climate change impacts, Food security, Ecosystem services

Marine ecological capital assessment: concepts and frameworks

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Abstract

Concepts and assessment frameworks of marine ecological capital (MEC) are developed based on the natural capital and ecosystem service theories. MEC is these marine ecological resources which provide benefits for mankind. It consists of marine living organisms and their habitat and the whole marine ecosystem. The value of MEC includes not only the value of standing stock of marine ecological resources but also the value of marine ecosystem services. The first is defined as the monetary value of standing stock of marine ecological resources with market price at specific time. These three resources with market-price are recommended for valuation, i.e. marine living resources, seawater and surface sea bottom resources. The value of marine ecosystem services includes the value of these four services, i.e. the provisioning, regulating, cultural and supporting services.

Provisioning services are material products provided by marine ecosystem during the specific period of time, including food production, raw material production, oxygen production and genetic resources provision. Regulating services are the benefits obtained from the regulation of ecosystem processes during the specific period of time, including climate regulation, waste treatment, disturbance regulation and biological control. Cultural services are the nonphysical benefits obtained from ecosystems during the specific period of time, including: recreational activities, scientific service, cultural activities. Supporting services are those that are necessary for the production of all other ecosystem services, including primary production, nutrient cycling and species diversity maintenance. They are different from provisioning, regulating and cultural services in that their impacts on people are often indirect or occur over a very long time. The assessment frameworks are developed to calculate the value of each element of MEC and total value.

Keywords: marine ecological capital; assessment; value; ecosystem service

Study on the Assessment of Environment Cost from Sea Reclamation: Jiaozhou Bay as a case

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Abstract

In recent years, large scale sea reclamations have caused depletion of coastal resources along with environmental and ecological function degradation in China's coastal areas. In essence they are the result of inefficient allocation of resources which is due to the underestimation of coastal resources value and lack of monetization of the environmental and ecological function of coastal resources under current resource price policy and market economy. After building up the value determination and value composition theory for coastal resource, this paper builds up the model and methods for calculating sea reclamation environmental cost. Using contingent value method (CVM) and resource equivalent analysis (REA), the paper works out those environmental costs in Jiaozhou Bay reclamation is 16.2 billion and 13.44 billion respectively which make up 3.66% and 3.03% in Qingdao's GDP (2008). The result provides the information for government with value compensation policy making from sea reclamation.

Keywords: Coastal resource value; sea reclamation; environment cost; Jiaozhou Bay

The Tideland Classification of Jiangsu Province Based on the Ecosystem Service Function, China

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Abstract

Land classification is a prerequisite to successful resource management. Traditionally, in China, land classification emphasizes land use productivity or is developed for single component of ecosystem (e.g., soil, vegetation). However, perspective and social values of the public regarding land resource management have changed the emphasis from production to multi-value, especially, ecological land practices. So the traditional land classification is not suited to comprehensively reflect the multiscale ecosystem function (e.g., gas regulation, climate regulation, disturbance regulation, water regulation, water supply, erosion control, soil formation, nutrient cycling, and food production). Ecological land classification (ELC) approach provides a taxonomic separation of sites within a hierarchical framework based on ecosystem service theory which stratifies the landscape into ecologically meaningful units. This paper applies ELC approach to undertake a land classification of tideflat ecosystem of Jiangsu in China. The diagnostic environmental variables were climate/water supply, landform, coastal line type with land and ocean interaction and vegetation. In Jiangsu tideflat, four levels to uniform areas are identified, for example, ecoregion, ecodistrict, ecosite and ecosite. The highest level-ecoregion is composed of warm temperate zone tideflat and semi tropics zone tideland. Ecodistrict is comprised of Huanghe delta plain tideflat, Coastal plain tideflat and Yangtze delta plain tideflat. Ecosite consists of accretion-type tideflat, erosion-type tideflat and stability-type tideflat. The lowest level-ecosite is made up of naked tideflat, spartina tideflat, salt grass tideflat and grass muddy deposit tideflat. ELC of tideflat in Jiangsu is not a substitute to the Chinese nation-level land classification but a useful complement, and can be used testing and establishing the environmental monitoring networks. Meanwhile, based on the landtypes, coupling with vegetation age information, ecosystem modelling will commence.

Keywords: land classification; ecological land classification; tideflat ecosystem; ecosystem foundation; ecosystem service; Jiangsu

Seagrass bed restoration and coastal marine ranching in northern of China: a study on basis of Shandong Rongcheng seagrass bed survey

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Abstract

Sea grass bed is one of the most important marine ecological systems and it has the extremely critical ecological service function and economic price. Sea grass bed is mainly distributed in the intertidal zone to boom with soft bottom area, such as mudflat lagoon area and it can form the single and multiple wide pastures. Shandong Rongcheng has abundant sea grass beds. In this study, we investigated the seaweed communities and the survival environment in Rongcheng. What's more, we also evaluated the ecological function of sea grass in Rongcheng. Additionally, the paper summarized the situation of the sea grass bed in Shandong Rongcheng, the threats and the restoration methods. At last, we proposed the designs and suggestions to ranch coastal marine.

Keywords: seagrass, restoration, coastal marine ranching

Response of Ecosystem Service Value to Land use change in Coastal Zone of Bohai Sea over the last 30 years

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Abstract

The coastal zone of Bohai Sea located in the east of North China ($37^{\circ}07' \sim 41^{\circ}0'N$, $117^{\circ}35' \sim 121^{\circ}10'E$), The coastal zone around Bohai Sea extends from Laotieshan corner of Dalian City in Liaoning province in the north to Penghai corner of Yantai City in Shandong province in the South with “C” shape. There are three bays inside the Bohai Sea: Liaodong Bay, Bohai Bay, and Laizhou bay, where major landscape types include estuary reed landscape, agricultural landscape, psammophytic landscape, halophytic landscape, and coastal forest and grassland landscape etc. There're thirteen regions in coastal zone of Bohai sea, which are Dalian, Yingkou, Panjin, Jinzhou, and Huludao in Liaoning province; Qinhuangdao, Tangshan, Cangzhou in Hebei province; Tianjin; and Binzhou, Dongying, Weifang, and Yantai in Shandong province, as showed in Figure 1. Bohai rim, including Hebei province, Shandong province, Liaoning province, and Tianjin, plays an important role in China's economic development, contributing almost 23% of China's overall GDP with 1.8% land area and 6.1% population of the whole country. Bohai Sea in last 30years. Series satellite remote sensing images obtained in 1988, 1998 and 2007 were employed to surveyed land use change integrated field surveying, firstly. Then an unit table of ecosystem services function value of main land use type was created reference some relative studies(Table 1). The response of ecosystem service value to land use change in 13 coastal zone regions of Bohai Sea in last 30 years was assessed. The result showed: the ecosystem service value lost 60.74×10^8 RMB in coastal zone of Bohai sea caused by land use change in last 30years. Among the 13 coastal zone region, the ecosystem service value increased only in Yantai coastal zone region and Dalian coastal zone region, there are 0.36×10^8 RMB and 0.20×10^8 RMB, respectively. While the ecosystem service value reduced in 11 coastal zone regions, such as Yingkou coastal zone region, Panjin coastal zone region, Binzhou coastal zone region, et al. the total lost value is 60.30×10^8 RMB. Human activities cut down area of coastal beach and reed swamp to arable land and fishing pools by 55011.70 hm^2 and 58063.202 hm^2 , respectively, this promoted value of food supply function and value of materials supply function increased by 3.2×10^8 RMB and 1.87×10^8 RMB, and cut down value of 7 indirect functions with 65.1110^8 RMB, such as purification function, climatic regulation function, etc..

Keywords: ecosystem service value, coastal zone, land use, Bohai Sea

Research Model of Optimal Nutrient Reduction Scheme in Watershed

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Abstract

Nutrient enrichment that leads to eutrophication is one of the major environmental problems in China. Different nutrient reduction measures in different sub-watersheds have different costs and impacts on the nutrient loads to the water body. At the same time, nutrient reduction involves large amount of investment. Lacks of study in this field in China has made it difficult for policy-makers to determine cost-effective nutrient reduction policies. To improve the efficiency and effectiveness of nutrient reduction policies, it is necessary to study the cost-efficient nutrient reduction scheme in watershed. With Beixi watershed of Jiulong river in Fujian Province as the studied watershed and total nitrogen and total phosphorus as object nutrient for reducing, this paper analyzes the sources of nutrient and identifies the respondent reducing measures at first. Secondly, the study establishes the cost functions and the nutrient loads response models of different measures in different sub-watersheds. Afterward, the paper develops the research model of optimal nutrient reductions scheme using GAMS software. The minimum cost solutions to pre-specified environmental targets, which means combination of different measures located in different sub-watersheds, can be got employing the developed models and the data in the studied watershed.

Keywords: nutrient reduction; optimal scheme; cost function; nutrient load response model; watershed

The state-of-the-art, and new developments, for a robust economic appraisal of ecosystem services: the case of the European saltmarshes.

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Abstract

There is now considerable evidence to indicate that coastal margins are under the threat of climate change (e.g. sea level rise, storm surge) worldwide. Climate induced risks and anthropogenic pressures on coasts, especially over the last century, have induced an increasing loss of some services that coastal ecosystems provide. In Europe, guidelines such as the Water Framework Directive are an attempt to compensate (on a 'like-for-like' basis) for the loss or the change of habitats and ecosystem services (e.g. recreating intertidal habitats). In Britain, national and local policy and governance are being adapted to face the challenge of changing coastal needs and management. However, the definition of ecosystem value is still capable of multiple interpretation and meaning whether the natural science, economic or social science perspective is adopted. Working towards a common understanding of the notion of ecosystem value, in this paper we review the state-of-the-art concerning decision support systems that encompass the valuation of environmental projects or policies. We will outline a conceptual framework which includes a DPSIR scoping procedure together with the simultaneous use of a sequential analytical system, which combines the ecosystem approach and the ecosystem services concept. We then show how those have been applied to the investigation of the policy of managed realignment in the East of England, the most at risk coastal zone in the UK. The applications revealed that positive economic values are held by the public for saltmarsh services. Economic valuation methodologies are, however, still in a relatively early stage of application to complex environmental issues. Environmental issues require the participation of individuals not only as consumers but also as citizens, and as such they may have different motivations/preferences and hence values.

Keywords: Coastal zone management; decision support systems; ecosystem approach; ecosystem services; ecosystem value; managed realignment.

Linkages between Agricultural Practices and Closing Basins

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Abstract

Primarily, the down-swellling currents have resulted poor development of fisheries in the eastern coast of India in comparison with that Western Coast. In addition, occurrence of extreme weather events such as cyclones result in damage to fishing infrastructure. Of late, to add to this sector is threat of closing of basins. Several reasons such as diversion to new irrigation projects, interbasin transfer to meet a) urban settlement and b) industrial demands. One such instance is the Tungabhadra basin, major contributor to the River Krishna in Southern India. We would like to discuss the sectorial changes taking place in Tungabhadra River with ultimate consequences of River Krishna Basin outflows and coastal fisheries.



Citizens' willingness to pay for improved ecosystem services arising from wastewater cleanup in Newfoundland, Canada.

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Abstract

Our study used a choice experiment to determine citizens' preferences and willingness-to-pay (WTP) for cleanup of raw wastewater being pumped into a local fjord on the west coast of the island of Newfoundland, Canada. Latent class analysis was used to assess sample ($n=672$) heterogeneity. Mean WTP calculated with a standard conditional logit model across the sample was C\$0.58 household $^{-1}$ yr $^{-1}$ ha $^{-1}$ increase in eelgrass (*Zostera marina*) abundance (C\$88 yr $^{-1}$ for an increase from 6.2 to 7.7 km 2 eelgrass beds). Mean household WTP was higher for the reduction of visual wastes and foul smells (C\$531 household $^{-1}$ yr $^{-1}$ for improvements from rarely seen visible waste and occasional odour to no visible waste or odour) and improvements in recreational fishing opportunities (C\$190 household $^{-1}$ yr $^{-1}$ where water was safe for contact sports and fishing versus contact sports only). With latent class analysis, respondents in the sample exhibited heterogeneous preferences and very different patterns of WTP. Improvement of all choice experiment attributes from the status quo to a 'much better' situation implied an aggregated compensating variation of C\$28.9 million yr $^{-1}$ for the city, providing an almost 9.1 benefit to cost ratio given estimated amortized wastewater treatment costs of C\$3.3 million yr $^{-1}$.

Keywords: willingness to pay, wastewater cleanup, eelgrass valuation, choice experiment, water quality

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Abstract

Intensive aquaculture of abalone and sea cucumber has been developing rapidly in the coastal waters of China. The waters suitable for aquaculture are very limited in nearshore. There is a trend towards the development of aquaculture offshore (5 nautical miles far from the sea shore). However, whether abalone and sea cucumber can survive and grow in offshore where the water current is relative high is unclear. A year long field experiment (from April 15, 2008 to May 10, 2009) was conducted in the offshore water of Sanggou Bay, northern China. Abalone *Haliotis discus hannai* Iwo and sea cucumber *Stichopus japonicus* were co-cultured in abalone cages with density ratios of both 3:1 and 6:1 from suspended longlines and fed with fresh kelp. Survival rates of abalone and sea cucumber were 100%, irrespective of density treatment. Both abalone and sea cucumber grew well. There were no significant differences in the growth rate for both abalone and sea cucumber among the two density treatments. The special growth rate of body weight (SGRbw) of abalone was highest in June, with an average SGRbw of 0.536 % d $^{-1}$. Maximum growth of sea cucumber, occurred during December, with an average SGRbw of 1.84 % d $^{-1}$. The results suggested that both abalone and sea cucumber can survive and grow well in the offshore. The integrated culture system of the two species was feasible in the offshore area of Sanggou Bay. Additional production profit could be achieved by integrating sea cucumber cultivation with abalone aquaculture without additional input.

Keywords: Abalone; *Haliotis discus hannai* Iwo; Sea cucumber; *Stichopus japonicus*; Co-culture; Integrated multi-trophic aquaculture (IMTA); Offshore; Sanggou Bay

Feasibility of co-culture of abalone and sea cucumber in the offshore area of Sanggou Bay, North China

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» ABSTRACTS A6 «

Research of Shandong Peninsula Blue Economic Zone Based on the Awareness of Conservation Culture

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Abstract

A blue economic zone is a geographical area relying on marine resources; it's formed on the basis of geographical division of labor with marine industry as its mainstay. It is also a multifunctional economic zone incorporating various elements including natural ecology, social economy, science and technology as well as culture. The construction of the Shandong Peninsula blue economic zone is based on the marine resources, marine industry, marine eco-environment and urbanization of the region; it's an effective way to realize the fundamental transformation of the social economic development pattern and the economic growth pattern of the province. Based on the real economic and social situation of Shandong Peninsula, this article firstly studies the internal relationship of marine resources, marine industry and marine economy in this area from the perspective of conservation culture, then analyses the development situation and existing problems of the blue economic zone. It not only provides theory basis for better protecting the marine ecosystem, developing marine resources scientifically and cultivating competitive marine industries, but also has certain practical significance for promoting the coordinated development of the marine industry, improving the comprehensive economic competitiveness and sustainable development capability of Shandong Peninsula blue economic zone as far as the whole province.

Keywords: Awareness of Conservation Culture; Blue Economic Zone; Shandong Peninsula; Marine Industry

Economic potential and Eco-system benefits of emissions trading for reducing air pollution in the coastal belt of Maharashtra

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Abstract

India is emerging as a key player in Carbon Finance and Nationally Appropriate Mitigation Actions (NAMAS). Ratified to the Kyoto Protocol (Article 12, referred as Clean Development Mechanism) it has recently started its own cap and trade mechanism pertaining to air pollution based on Point of regulation, Greenhouse gas (GHG) emission sources and choice of allocation method. This domestic Emission Trading Scheme (ETS) was first implemented in two states Tamil Nadu and Gujarat as pilot projects resorting to marking the cap, monitoring, allocation of permits and compliance. The study derives economic potential and eco-system benefits of ETS in the coastal belt of Maharashtra particularly Mumbai. The research methodology includes analysing ETS as a viable option for Maharashtra through the Perform Achieve and Trade (PAT) market based mechanism. The State Pollution Control Board (SPCB) of Maharashtra and the Ministry of Environment and Forestry (MoEF) of India provide baseline evaluation, GHG inventory, coastal regulatory framework and ambient air quality standards for deciding the reduction targets and the distribution of permits for free or by auctioning. Applying an inductive approach the research investigates the relationship between emissions intensity (emission per unit of Gross Domestic Product) and economic growth of coastal belt of Maharashtra.

Keywords: Emissions Trading; Maharashtra; State Pollution Control Board; Nationally Appropriate Mitigation Actions; Emission Intensity; Carbon Finance.

Session: A7 Keynote**Local ecological fisheries knowledge in support of decision-making and marine spatial planning**

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Abstract

The paper will report the first research results of “LECOFISH” (<http://www.lecofish.be>). Starting from the assumption that we lack sufficient small scale fisheries data for marine spatial planning and sustainable fisheries management, LECOFISH gathers fisheries data through local ecological knowledge (LEK) of fishermen, commercial and recreational, during a period covering the last 50 years. The Belgian coastal zone, including the territorial sea and exclusive economic zone (3,600 km²) is the case study area. LEK is not only about personal experience or knowledge, but is also influenced by external factors (legislation, technological development, political, economic interests) and by additional anthropogenic activities at sea (dredging, shipping etc.). These factors are taken into account. LECOFISH made use of interviews and oral mapping of fishermen. The overall objective of LECOFISH is: 1. to gather data through LEK to improve our knowledge of local ecosystems and fisheries in the Belgian coastal zone and to further analyze spatial and temporal distribution of fishery activities and fish abundance; 2. to compare LEK data with available Scientific Ecological Knowledge (SEK) data in order to assess the scientific value of LEK as a tool to fill in fishery data gaps (validation process); 3. to discuss LEK and SEK results with stakeholders (fishermen, officials from the fisheries administration, fishery scientists); 4. to explain changes in fishery activities and fish species shifts during the past 50 years; 5. to develop spatial maps with information of fishing (where, what and why) during this period. After having explained the methodology used, the results of the above mentioned objectives will be reported in a paper presentation with focus on four commercial fish species (cod, sole, plaice and shrimps) as an example for further decision-making. Finally, spatial fisheries and fish distribution maps in their historical perspective will be used in support of marine spatial planning.

Keywords: Coastal fisheries, local ecological knowledge, marine spatial planning

Session: A7 Oral**Prevention of Vessel-Source Marine Pollution: Challenges and Prospects for Chinese Practice under International Law**

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Abstract

This presentation reviews Chinese legal practice alongside with relevant international conventions on preventing vessel-source marine pollution. It assesses achievement and existing problems of China's practice. First, the international legal regime on the prevention of vessel-source pollution is described, especially the United Nations Law of Sea Convention (UNCLOS) and International Convention for the Prevention of Pollution from Ships (MARPOL). China's position towards relevant international conventions is also mentioned in this part. Second, the domestic legal framework is analyzed. It focuses on the Marine Environment Protection Law 1999, together with the recently adopted Regulation on the Prevention and Control of Vessel-Source Pollution (2010). This part addresses China's implementation of international law. Moreover, it also pays attention to institutions. Third, existing problems are discussed. E.g. some outdated standards compared to international law; the current legal framework is not sufficient to deal with green house gas emission from shipping, anti-fouling, invasive species from ballast water and etc.; lack of coordination in the disintegrated mechanism for implementation. Finally, some suggestions are provided for a better practice on the prevention of vessel-source pollution in the future.

Keywords: Marine Pollution; China; Law of the Sea

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Panglima Laot: A Local Institutional Effort in Coastal and Marine Resources Preservation

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Abstract

As an archipelagic state, Indonesia has the local wisdom in coastal and marine resources management, one of whom was the Panglima Laot in the Sabang City, Nanggroe Aceh Darussalam Province. Its institutional has been existed since the 16th century, when Sultan Iskandar Muda has pull strings at Samudera Pasai Royal Palace. In its development, Panglima Laot rule has changed along a decentralized government system and the tsunami disaster which destroyed part of its province. Based on that background, this research purposes to analyze of primary law management that build upon the local wisdom, resource management issues, and institutional rules has been established by Panglima Laot. This research is a descriptive analytic research which using normative juridical approach was completed by comparative approach. Around of analysis result, local wisdom was produced, that legal recognition after the enactment of Law Number 31/2004 on Fisheries and Law Number 27/2007 on the Management of Coastal Zones and Small Islands. While resource management issues faced in a horizontal conflict, between local fishermen with fishermen settlers who came from North Sumatra Region that use the trawl fishing gear. Panglima Laot institutional in Sabang City is divided into 10 Ihok, which each other has different rules. Even so generally, it has authority to set on the input restriction which consists of: (1) fishing gear, (2) fishing ground, and (3) season restrictions. The suggestion from this research is needed by effort for integration between local institutional with national institutions in fisheries resources management.

Keywords: local wisdom; Panglima Laot; horizontal conflict; input restrictions

Mitigating Coastal Environmental Problems: The Tidal River-basin Management (TRM)

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Abstract

The combined effects of climate change induced sea-level rise and mismatched human interventions have led the coastal zone of Bangladesh to a critical condition challenging the management of land and water resources for sustainable environment and livelihoods. In order to protect the land and water resources from tidal flooding, siltation, erosion and salinity intrusions, most structural interventions in Bangladesh involve construction of embankments on river banks and encirclement of low lying areas (called Polder) to keep tides confined to rivers. However, these approaches proved to be unsustainable in managing coastal resources; and in many cases lead to economic as well as environmental problems. In the backdrop of successive failure of polder projects in managing land and water resources in the coastal areas, the Tidal River-basin Management (TRM) approach, which was practiced in the pre-polder period, has again come to the front line through pressure from the affected people, the media and the civil society. The results of research suggest that TRM protects the tidal coasts in an environmentally-friendly way, even though many policy makers and some professionals are not yet convinced by the TRM system. As a result there exists disagreement between the stakeholders, mostly the farmers and the policy makers over the issue of water resources management strategy. Moreover, due to lack of independent and authentic study on this issue, there emerged a serious debate baring implementation of water resources management projects at local and regional levels in coastal zone of Bangladesh. It is expected that the present study would be able to explore appropriate coastal water resources management approaches and contribute to integrated coastal zone management (ICZM). This study however, would look into the impact of TRM situation and without TRM situation (mostly polders) on livelihoods especially agriculture, fisheries and on the environment in the coastal zone through comparative analysis. The evaluation process would employ production function methods, and social cost-benefit analysis. Finally the study would focus on management aspect of TRM from equity point of view.

Assessment index of dune degradation for the sustainable management: an example from the northeast coast of Taiwan

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Abstract

Coastal dune is a dynamic and biodiversified, yet vulnerable, environment. These dunes act as a buffer to extreme waves and winds, as well as, a freshwater aquifer to provide habitats to plants and animals. In addition, the dune landscapes also have high aesthetic values that can attract tourists. However, many coastal dune systems in the world are suffering degradation either from the natural environmental pressures or from the interference of human activities. In our case study from the northeastern coast of Taiwan, some different types of dune degradation are identified. Many beaches are narrowed; erosion dune scars are formed; and the recession of dune scarp continues. Dunes have been removed artificially for the construction of new roads or industrial parks. Low dune slacks are reclaimed as fish or duck breeding ponds. The continuous and increased intensity of human use has resulted in extensive and irreparable damages on the dunes ecologically and morphologically. Thus, there is an urgent need to develop an assessment index of dune degradation for the sustainable management. The discussion for developing the assessment indices for practical management that can evaluate the environmental quality is centered on three basic services provided by the coastal dune: coastal defense, ecology and aesthetic landscape. The intention is to provide environment managers a tool that can collect the information of dune conditions quickly and to be helpful for decision making.

Keywords: Coastal dune; environmental degradation; degradation assessment index; dune degradation index; Taiwan

Water-Related Problems of Large Cities in the Black Sea Coastal Zone of Ukraine and Ways of their Decision

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Abstract

Among social and environmental problems of Ukraine the water-related problems of large cities (Odessa, Mykolaiv, Kherson, Simferopol) located in the Black Sea coastal zone (the southern part of the country) is one of the most important. The population of this coastal zone is estimated at 5.5 million (about 11.5% of total population of Ukraine). With respect to the potential water resources (cub. m/year per capita) these cities are poorest ones in Ukraine: Odessa – 0.13; Mykolaiv – 0.24; Kherson – 0.11; Simferopol – 0.14. The large volume of pollutants (oil products, sulphates, chlorides, organic matter, pesticides, heavy metals and so on) arrive into the surface and sea waters together with a sewage waters. A municipal economy, ferrous and non-ferrous metallurgy, heavy engineering and agriculture are the most serious factors of river pollution. That is why water quantity and water quality became as limiting factor of usage of water resources and sustainable development of cities. The ecological state of waters in the Black Sea and the estuaries of the rivers Danube, Dnypro, Dniester and Southern Bug is a particular concern of scientists and general public. The wide-scale pollution of fresh and sea water ecosystems resulting from various economic activities has caused significant social and ecological losses. This region is among the most hazardous in Ukraine from the environmental health perspective. For example, increases in mortality rates in some cities appear directly related to a deterioration of the hygienic and sanitary state of these territories and the deteriorating quality of water resources. The biological productivity of the Black Sea has decreased significantly. Among the most dramatic situations is the reported accumulation of nitrates and pesticides in hydrobionts and fish. It is necessary to define and implement a variety of short- and medium-term policies in order to improve the water quality and achieve sustainable social and economical development in cities. Approaches towards the development of water-related policy in this Black Sea coastal area include a number of legislative, institutional, scientific and technical measures which are considered in this paper.

Keywords: Large cities, water problems, ways of decision

» ABSTRACTS A7 «

Coastal islands ecosystem management and sustainable development of the lower gangetic delta,
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Abstract

The main purpose of this paper is to analysis the present coastal islands ecosystem and the environmental resources which will contribute to assess the environmental resource potentiality and help the future planning for sustainable development of the coastal islands region in the Lower Gangetic Delta, India. The region is covered 2340 square kilometer area. Ecosystem Management is about recognizing the value of such amenities as recreation, wildlife, and aesthetics. An ecosystem management ensures that here recognized the value of biological diversity in formulating strategies for use of natural resources. Indeed, ecosystem management is about putting people on the land and doing so in a way it doesn't degrade the every resources upon which we depend. Sustainable resource use is possible and necessary to ensure the future of life on the region.

The identified problems are – (i) Population growth rate varies from 2.50 to 2.85 percent per year and density of population varies from 367 to 650 persons per sq. km. (as per 2011 census), (ii) 67.00 percent people is living below poverty line (BPL) in the area, (iii) Climatic vulnerability (i.e. Tropical Cyclone) on the area, (iv) Other problems are destruction of beach landscape, destruction of natural coastal habitat (biotic resources), wastewater discharges, dumping of solid waste and construction waste directly on the beach, beach erosion, conflicting land use and lack of awareness of the people etc. in the coastal islands region. The principle objectives of the study are – (i) identification of environmental features in relation to flora and fauna in study area; (ii) to investigate for the protection of environmental ecosystems; (iii) to find out the biotic resources and their use and misuses; (iv) finally, prepared a map on land use potentials for sustainable development and ecosystem management of the area.

The area consist of low-flat alluvial plains in which the process of land making is still going on, covered, where not under cultivation, with forests and swamps, intersected from north to south by wide tidal rivers or estuaries and from west to east, by narrow tidal creeks. All the estuaries, rivers and creeks carry saline water; there is no current down them except tidal outflow and inflow. The area are connected with each other by an intricate mesh of channels, so that the whole tract is a tangled network of estuaries, rivers and water courses which enclosed a large number of islands of various shapes and sizes. The whole Islands region of the Lower Gangetic Delta is divided into Seven Planning Regions i.e. (i) Littoral Zone; (ii) Coastal area; (iii) Forest land; (iv) Agricultural area; (v) Settlement area; (vi) Fellow land and (vii) Wetland. Separate ecosystem management strategies are recommended for each region for sustainable development of the area.

Keywords: Ecosystem, Management, Coastal Islands, Sustainable Development.

Ocean Surge: Dynamics, Impacts, Past And Future Changes In West Africa Coastal Areas: A Case Of Nigeria.

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Abstract

Despite the importance of the neighboring oceans to the economies climates and biodiversity of many African countries, decadal marine climate prediction to coastal ocean problems by African scientists is not well developed. This limited capacity is associated with relative lack of computational resources and facilities for training in marine and oceanography sciences on the continent, as well as little or no monitoring of coastal waters by local scientists.

From records, almost ninety percent of natural disasters are of Meteorological and Hydrological origin (WMO 2004), the importance of the contribution of National Meteorological and Hydrological Services (NHSS) to effective preparedness for natural disasters is obvious. Ocean surges represent a major type of natural hazard, frequently causing losses of lives and substantial economic damages. They confirmed that oceans surge generally refers to a rise or drop of sea surface caused primarily by winds and secondarily by the actions of atmospheric pressure on the sea surface. Significant ocean surge heights are generated when the wind pushes large water masses towards or away from the coast. The study looked into positive oceans surge which is associated with the appearance of major storm system (storm surges/ocean surges) while negative ocean surge also in some cases significantly reduced local water depths and may represent a potential hazard for shipping. The result shows that the Nigerians coastal water is warmest in April and coldest in August. From 1985 to date, there have been over 30 ocean surges along the Nigerian coastal areas and this ocean surges are frequently during the months of April - October. This coincides with the period of high springtides.

The future of coastal N pollution: a start towards evaluating the relative influences of climate, agriculture, and energy and trade policies

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Abstract

Over the past 30 years, nitrogen has grown globally as a pollution problem and now affects coastal marine ecosystems throughout many parts of the world. The main driver is agriculture, including both direct losses of nitrogen from fields and the increasing influence of industrial-scale animal agriculture. The combustion of fossil fuel also contributes significant nitrogen pollution in many areas through increased atmospheric deposition of nitrogen. Agriculture is intensifying globally, primarily in response to an increase demand for meat but also from increased production of biofuels. And climate change is already having an effect both on the delivery of nitrogen from the landscape to coastal waters and on the sensitivity of coastal marine ecosystems to the influence of nitrogen pollution. My talk will attempt a starts towards teasing apart the relative importance of these various influences on the future of coastal nitrogen pollution.

Keywords: nitrogen, nutrients, nutrient pollution, eutrophication, dead zone

Riverine N₂O concentrations, exports to estuary and emissions to atmosphere from the Changjiang River in response to increasing nitrogen loads

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Abstract

This study investigated the variations of dissolved N₂O and emissions over diurnal and seasonal temporal scales in 2009, as well as the time series of riverine N₂O export to estuary and emission to atmosphere in response to increasing anthropogenic nitrogen loads in the Changjiang River. For the diurnal study, N₂O concentrations ranged 0.26-0.34 and 0.44-0.52 $\mu\text{g N-N}_2\text{O L}^{-1}$, while N₂O emissions ranged 2.0-8.62 and 6.49-14.6 $\mu\text{g N-N}_2\text{O m}^{-2}\text{ h}^{-1}$ at August and October, 2009, respectively. Both dissolved N₂O and emissions exhibited clear diurnal patterns: higher during daytime while lower at night. For the seasonal study (June through December, 2009), N₂O concentrations and emissions ranged 0.34-0.72 $\mu\text{g N-N}_2\text{O L}^{-1}$ and 2.48-36.0 $\mu\text{g N-N}_2\text{O m}^{-2}\text{ h}^{-1}$, respectively, both of which were higher during summer while lower during autumn to winter. Denitrification with a mean nitrate reduce rate of 2.61% was significantly related with N₂O production. Based on the application of the Global News model in the Changjiang River, estimated N₂O emissions to atmosphere increased from 33.4 to 143 ton N-N₂O yr⁻¹ with an annual growth rate of 7.01%, while N₂O exports to estuary increased from 91.0 to 566 ton N-N₂O yr⁻¹ with an annual growth rate of 6.22% during the periods of 1970-2002. Our study indicates that both the river N₂O concentrations and emissions would increase as its response to increasing anthropogenic nitrogen loads.



» ABSTRACTS B1 «

Storms runoff of nitrogen in the North Jialong River in Southeast China

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Abstract

Nitrogen (N) exports from the North Jialong River watershed (9570 km²) located in Southeast China were investigated during the two largest back-to-back storms in June 2010, as well as baseflow condition in February 2011. Storm runoff water was sampled at intervals of one to a few hours and analyzed for various forms of N. The results disclosed a strong linkage between N concentrations and loading and hydrological controls. Dissolved inorganic N (DIN) varied from 1.89 to 2.61 mg N L⁻¹ during storm A (mean rainfall density 58 mm d⁻¹), and was diluted to 1.52 to 2.06 mg N L⁻¹ during storm B (rainfall density 34 mm d⁻¹), which occurred five days after storm A. Nitrate presented a dilution pattern during the storm periods and the concentration-discharge relationships exhibited a clockwise trajectory, which implies that nitrate supply is dominated by within-channel mobilization. On the contrary, ammonium decreased slightly at first but was elevated sharply in the rising limb of the hydrograph with the highest concentration observed in the falling limb. An anticlockwise trajectory was found for ammonium in storm A indicating its land based source and a delay in delivery from the upstream polluted area to the river. Subsequent storm always deplete land based ammonium N sources. Baseflow multi-site measurements showed that ammonium dominated in the upstream waters but was mostly nitrified when transported downriver. Storm runoff exported more ammonium (up to 30%) compared with less than 15% in baseflow, which might be closely connected with algal blooms (red tide) in the adjacent Xiamen Bay. Our results highlight the different biogeochemical behaviour and export pattern between N components and between hydrological scenarios. This finding can be used as a reference for future water quality monitoring programs, ecosystem research and modelling, and pollution mitigation strategy.

Keywords: Nutrient; Storm runoff; Diffuse pollution; Jialong River

A Nitrogen Budget for China at the Province Level

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Abstract

Substantial socio-economic development in China has greatly altered the regional pattern of nitrogen (N) cycle, leading to severe environmental pollution. To assess the impact of human activities, the Net Anthropogenic Nitrogen Input (NANI) was calculated for China at the province level. The NANI of a region accounts for the fluxes of atmospheric N deposition, fertilizer N application, agricultural N fixation, and net food and feed imports across its boundaries, and is thus a measure of the effect of human activities on the regional N cycle. In 2003, NANI of China was about 4010 kg / km², of which synthetic fertilizer input is 2265 kg / km² (56.5%), wet and dry deposition is 1289 kg / km² (32.1%), N fixation is 330 kg / km² (8.2%), and imported food/feed is 125 kg / km² (3.1%). The concepts of heterotrophy (N fluxes associated with human and livestock consumption) and autotrophy (N fluxes associated with cropland and livestock production) were used to assess province-level anthropogenic perturbation and its drivers. It was revealed that metropolitan areas such as Shanghai, Beijing, and Tianjin show substantial heterotrophy and drive the heterogeneity of NANI distribution at the province scale. Our preliminary research highlights the importance of coupled socio-ecological linkages in studying N pollution. We are further studying the temporal changes of NANI distribution.

Keywords: Net anthropogenic nitrogen input (NANI), China, Heterotrophy, Autotrophy



Spatial variation in nutrient and submarine groundwater discharge in a largest tidal flat of Seto Inland Sea, western Japan

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Abstract

Many previous research had reported the significant nutrient supply by the submarine groundwater discharge. To clarify spatial variation of nutrient discharge in one of a largest tidal flat of Seto Inland Sea, we observed subsurface flow and dissolved nitrogen, phosphorus, and silica, using piezometer and tracer method. The study area is located on Sajio city, Ehime prefecture, western Japan. The tidal flat has the width and length of 1km. We installed three piezometers for observing water potentials, and we collected pore water samples at the about 50 plots. In addition, ^{222}Rn concentrations of seawater were monitored in front of the tidal flat. The ^{222}Rn and salinity of pore water indicated that discharges of shallow groundwater at the landside and deep groundwater at the shoreside of the tidal flat, respectively. The discharge volume was larger in shallow groundwater than in deep groundwater. The nutrient included the nitrogen as well as phosphorus and silica. Based on these observations, the large contribution of nutrient was confirmed from groundwater to this coastal area. The temporal variation of ^{222}Rn indicated that shallow and deep groundwater affected to offshore before and after the low tide, respectively. The time lag between shallow and deep groundwater discharge was about 4 to 6 hours.

Keywords: nutrient; groundwater discharge; tidal flat; ^{222}Rn ; deep groundwater; tidal variation

Tools for calculating NANI (Net Anthropogenic Nitrogen Input) in the watersheds of US and Europe

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Abstract

NANI (Net Anthropogenic Nitrogen Input) is calculated as the sum of oxidized N deposition, fertilizer N application, agricultural N fixation, and N in net food and feed imports. It has been calculated in many watersheds of the US, Europe, and other parts of the world at various scales to estimate the human-induced nitrogen inputs to the region of interest, and has been shown to have a strong relationship with riverine nitrogen export. Recently, a set of tools referred to as NANI Calculator Toolbox has been developed, which allows the user to calculate NANI and its components anywhere in the US from a map of watersheds as input. New functionalities are being added to the toolbox to extend its applicability to regions outside the US and to nutrients other than N. Two examples of such additions are discussed: (1) allowing spatial variation in NANI parameters, which is particularly useful where the coastal watersheds from several countries draining to international waters are subject to varying agronomic practices and dietary preferences, and (2) applying the toolbox for NAPI (Net Anthropogenic Phosphorus Input) calculation. Specific illustrations of their use in assessing the regional variation of NANI and NAPI in the Baltic Sea catchments are presented.

Keywords: nitrogen; phosphorus; anthropogenic; watersheds; toolbox; riverine export

» ABSTRACTS B1 «

Accuracy and precision in annual loads from rivers to the coastal zone

Sources and fate of organic matter in Pichavaram Mangrove of East coast of India

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Abstract

Loads of chemical compounds are used for various purposes: for instance source identification. They are applied to assess the effectiveness of international reduction measures are they are often mandatory in many international agreements (e.g., OSPAR). Many countries in the world made agreements with each other to reduce the loads of chemical compounds to the aquatic environment. For instance, OSPAR countries agreed to reduce the loads with 50% between 1985 and 1995. In principle is it quite easy to calculate a load per unit time: the amount of water times the concentration for the time span studied. Often fixed numbers per year are presented. However, little is known about the accuracy and precision of these numbers. In future, these uncertainties regarding the loads will become more and more important. For most of the chemical compounds (e.g., nutrients and metals), a reduction between 50–70% have been achieved in the western world in the last decades. To make an additional reduction step it is necessary to know the accurate and precise values for the loads before tailor made measures can be proposed. The aim of this paper is to show and assess the accuracy and precision of loads of chemical compounds between two countries and from the river to the sea. As an example, monitoring data of various chemical compounds of the river Rhine are used. The results are translated in an optimal monitoring frequency. Preliminary results show that the accuracy and precision of the calculated annual loads is strongly dependent on the sampling frequency, but also on the variability of the load, which varies between rivers and between compounds. This implies that the sampling frequency required to achieve certain accuracy varies between parameters and between compounds.

Keywords: load, water quality, monitoring, accuracy and precision

Sources and fate of organic matter in Pichavaram Mangrove of East coast of India

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Abstract

Carbon, nitrogen, phosphorus and other nutrients are likely to limit growth in mangroves. Every month, at key locations, measurements were made of surface water. During the monsoon and at high tide, riverine inputs were significantly higher than phosphate concentration across the mangrove ecosystem. During non-monsoonal periods, oceanic influence was greater, leading to lower nutrient concentrations. A moderate correlation was found between phosphate and salinity, inferring that P is limiting for primary productivity which is due to the scavenging control of salinity over phosphate distribution. The Si/N ratio is close to the Redfield ratio is possibly attributed to relative contribution of diatoms productivity among the phytoplankton. Higher accumulation of ammonia would also contribute to increase consumption ratio of Si/N amounts which may be leads to higher planktonic production.. The sources and fate of organic matter (OM) in the dated sediment cores were also investigated. The variation represents variable inputs of marine and terrestrial OM in these area, OM degradation, replacement of native vegetation due to increasing salinity, and early diagenetic changes. Some of these changes could be attributed to anthropogenic activities that have been happening in the Pichavaram complex over the last few decades. Early diagenetic changes are modeled in the cores based on C/N stoichiometry.

Keywords: Pichavaram, mangroves, organic matter, nutrientsources, fate



Identification of coastal water quality by statistical analysis methods in Qingduizi Bay, Northern Yellow Sea India: A LOICZ Approach

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Abstract

The rapid development of aquaculture in recent years has been aroused increasing concerns on its environmental impacts in Qingduizi Bay, northern Yellow Sea. Cluster analysis (CA), principal component analysis (PCA) and the fuzzy logic approach were employed to evaluate the trophic status of water quality for 12 monitoring stations in Qingduizi Bay from 2008 August to 2009 July. CA grouped the four seasons into four groups (winter, spring, summer and autumn). PCA identified the temporal and spatial characteristics of trophic status in Qingduizi Bay. The fuzzy logic approach revealed more information about the temporal and spatial patterns of the trophic status of water quality. Secchi depth, TIN, Chlorophyll a and TP may be major factors for deteriorating water quality.

Keywords: Cluster analysis; principal component analysis; fuzzy logic approach; trophic status; water quality; Qingduizi Bay

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Abstract

Biogeochemical processes and budgets of carbon, nitrogen, phosphorus and silicate were constructed from seasonal observations using LOICZ biogeochemical budget model (steady state box model) with and without the effect of mud. The non-conservative fluxes of dissolved inorganic nitrogen ($\Delta DIN = -436 \times 10^3 \text{ mol d}^{-1}$ and $\Delta DIN = 66 \times 10^3 \text{ mol d}^{-1}$) and dissolved inorganic phosphorus ($\Delta DIP = 18 \times 10^3 \text{ mol d}^{-1}$ and $\Delta DIP = 9 \times 10^3 \text{ mol d}^{-1}$) for wet and dry seasons respectively, have been estimated for the estuary. Considering the effect of mud in both the seasons, net flux of DIC and DOC indicates a net removal from the estuary. High nutrient concentrations in the upstream region (large freshwater inflow), correlated negatively with salinity. The water residence time of the estuary varied seasonally from 18.6 days during the wet to 48 days during the dry season. When mud was considered as one of the primary variables, the Net Ecosystem Metabolism (NEM) was negative in both wet and dry seasons, indicating heterotrophy in this estuary. During both wet and dry seasons, the rate of nitrogen fixation and denitrification are almost similar- tending towards denitrification.

Keywords: Nutrient Budget; Muddy systems; Residence Time; Net Ecosystem Metabolism, Hooghly estuary



» ABSTRACTS B2 «

Session: B2 Keynote

Deltas under climate change- the challenges of adaptation

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Abstract

Over 0.5B people live on world deltas, including the fastest growing mega-cities. 20th-century developments place deltaic environments and their populations under threat — coastal flooding, wetland loss, shoreline retreat, and loss of infrastructure. Coasts are the riskiest places because of: 1) a concentration of natural perils, 2) a concentration of people and values, 3) imperfect and limited coastal protection, and 4) losses have reached new dimensions as aided by the growth of megacities in vulnerable coastal environments. To reduce the human contributions to these more natural risks, a team approach will be necessary. In addition to biophysical scientists and engineers, this team will need to include economists (cost-benefit of living on deltas, financial incentives for moving out), psychologists (perceptions of risk), anthropologists (culture and community tied to deltaic life), demographers (population dynamics on deltas), historians (history of delta development), political scientists (policy options, constraints on decision making, power issues), and geographers (sense of place, spatial patterns).

Multiple factors affect the temporary flooding and eventual drowning of deltas through impacts on the vertical position of a delta's surface relative to local mean sea level, DRSL. DRSL is governed by five factors (A , E , C_n , CA , M). A delta's Aggradation Rate (A) is determined from the volume of sediment delivered to and retained on the subaerial delta surface as new sedimentary layers. Under natural conditions A varies from 1 to 50 mm/y when area-averaged. Dam interception of upstream river-borne sediment presently leaves modern rivers with relatively clean water, reduced flood magnitude, and discharge through fewer distributary channels that are often armoured with artificial levees. The result is much reduced Aggradation Rates. Flooding from ocean surges can sometimes contribute sediment to the coastal portions of deltas. Unfortunately a partial solution to the general reduction in a delta's Aggradation Rate is to flood the delta surface to capture more of the river's suspended load, but the cost is high and limiting the risk to vulnerable infrastructure and people is difficult.

The Eustatic Sea Level Rate, is influenced by fluctuations in the storage of terrestrial water (e.g. glaciers, ice sheets, groundwater, lakes, and reservoirs), and fluctuations in ocean water expansion due to temperature. Today E may contribute up to 3 mm/y under the influence of global warming, with even higher rates on coasts under the influence of western boundary currents and in tropical regions. Natural Compaction (C_n), and Accelerated Compaction (CA) both reduce the volume of deltaic deposits respectively through (i) dewatering, grain-packing realignment, and organic matter oxidation

(typically ≤ 3 mm/y); and (ii) subsurface mining (oil, gas or groundwater), human-influenced soil drainage and accelerated oxidation. CA can exceed C_n by an order of magnitude. M is the typically downward vertical movement of the land surface as influenced by the redistribution of earth masses, including sea level rise and the historical growth of deltaic deposits. M is spatially variable with rates reaching upwards to 2 to 5 mm/y. As a result, a majority of the modern deltas are now sinking at rates many times faster than global sea level is rising.

A recent survey categorized deltas into five risk classes: 1) Low Risk: e.g. Fly, Orinoco, Mahakam – where aggradation rates are high, anthropogenic compaction is low and DRSL (relative sea level rise) is low; 2) Moderate Risk: e.g. Danube, Han – where delta aggradation is reduced and $DRSL < 1.2$ mm/y; 3) High Risk: e.g. Godavari, Indus, Parana, Vistula – where delta aggradation cannot keep pace with a rising sea level and $DRSL > 1.3$ to 3 mm/y; 4) In Peril: e.g. Ganges, Irrawaddy, Magdalena, Mekong, Mississippi, Niger, Tigris – where low aggradation rates along with compaction accelerated by humans and eustatic sea level rise give rise to DRSL of 4 to 32 mm/y; 5) Great Peril: e.g. Chao Phraya, Colorado, Krishna, Nile, Pearl, Po, Rhone, Tone, Yangtze, Yellow – with no aggradation and/or extreme accelerated compaction with $DRSL$ 7 to 150 mm/y. The consequence of human manipulations of water, sediment and nutrient discharge and accelerated sinking delta surfaces include: land loss, reduced biodiversity, increased predator fish & crustaceans, saltwater intrusion with soils turning saline, increased water temperatures, coastal erosion, loss of coastal infrastructure, and loss of mangroves.

Keywords: delta sinking, flooding, vulnerability, environmental manipulation



Human Disturbances on the Catchment-Estuary System of the Yellow River

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Abstract

Rapid increase in the Yellow River sediment yield from the Loess Plateau at 3000 yr BP was caused by the human interventions. As a result, the sediment load delivered to the sea increased to approximately ten folds of the pristine level, and large deltas were formed as rapid deposition of sediment happened in the shallow epicontinent seas. Given the extremely high SSC at the river mouth during the past thousands of years, hyperpycnal flows have been a dominant pattern for the terrestrial sediment dispersal in the coastal ocean and are responsible for the rapid deposition of sediment and accretion of delta coast. Nearly 90% of the river-laden sediment is delivered to the sea during the flood season when the hyperpycnal flows are prominent. However, soil-conservation practices and construction of large reservoirs within the river basin during the past several decades have reduced the sediment flux to the sea by ~90% and increased the grain size of suspended sediment delivered to the sea. Those changes are unfavourable for the formation of hyperpycnal flows at the river mouth. Observations from cruises after the operations of the Xiaolangdi Reservoir, suggest that buoyant hypopycnal plumes, rather than hyperpycnal plumes, have occurred at the river mouth since the dramatic changes in concentration and grain size of suspended sediment discharged to the sea. Climate change and human activities in the river basin have altered the natural catchment-estuary system. The Yellow River has become an artificially regulated river, and the delta, similar to the Nile Delta, will be starved. As a result, the delta erosion by monsoon activities will probably be a dominant source for sediment exporting to the distal mud deposition on the continental shelf. The perturbations from significant human activities will propagate throughout the catchment-estuary system, putting the mage-delta at risk.

Keywords: the Yellow River; catchment-estuary system; human disturbance; sediment flux; delta erosion

Session: B2 Oral

Rapid changes of sediment dynamic processes and geomorphology in Yalu River Estuary under anthropogenic impacts

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Abstract

The Yalu River, located along the border of China and North Korea, is a typical meso-scale river. However, this estuarine system has been undergoing rapid adjustments under influences of human activities. In order to study the response of Yalu River Estuary to human activities, the changes of sediment dynamics in the past 10 years are explored by hydrodynamic calculation, as well as heavy mineral and grain size analysis; and the characteristics of estuarine geomorphology evolution are discussed through comparison to historical data. Previous studies and hydrodynamic calculation of 1996 indicated that the bedload from catchments transports seawards whereas bedload movement of the Yalu River Estuary has largely been changed over the past ten years, under influences of reductions of water and sediment discharges, as well as sand dredging. The results derived from hydrodynamic calculation of 2009 and heavy mineral and grain size analysis indicated that the sediment from areas with water depth less than 5 m was transported from sea to land; the sediment from areas with water depths of 5 m to 20 m was transported seaward; the sediment from areas with water depth larger than 20 m was conveyed from sea to land. Comparison of historical maps showed that the entire estuarine system of Yalu River Estuary has also undergone tremendous changes since 1941, related with water and sediment discharge reduction caused by reservoir construction. Whereas, as a macrotidal and mountain river, the Yalu River estuarine system evolution induced by human activities is characterized by: 1) Rapid change; 2) The evolutions of estuarine system at different periods dominated by distinct sediment dynamics processes; and 3) Difference within the estuarine system evolution.

Key words: sediment dynamics; geomorphology; human activities; Yalu River Estuary

Organic carbon transportation in the Huanghe (Yellow River) mainstream, considering the influences from human activities

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Abstract

Transportation of particulate and dissolved organic carbon (POC and DOC) was examined in the Huanghe (the Yellow River) mainstream in fall 2003-2006 and summer 2007-2009 as well as the influence of “sand and water regulation” project generally conducted during June-July every year in the downstream on them via the daily continuous sampling in the Lijin gauge station during June-July 2008, some historical data is also utilized to complete the research. The results show that the concentrations of POC and DOC in the Huanghe mainstream have significant spatial variability from the upstream to the downstream (0.60-72.28 mg/L and 1.57-5.87 mg/L, respectively), whereas no significant seasonal variability (summer and fall). Since POC was mainly derived from the loess, POC and POC% (POC/TSS*100%) were associated with TSS and its grain size, respectively. POC is the dominant form of organic carbon (OC) transportation when TSS level is higher than 364 mg/L, otherwise dominated by DOC. However, in the stations where reservoirs were built, DOC is the main form of organic carbon and the component of biogenic organic carbon increased compared with other stations in the mainstream. During the “sand and water regulation” period, OC at the Lijin gauge station is dominated by POC. Although the DOC level apparently was not strongly diluted by the large discharge due to the release of OC from the sand, DOC flux during this period was extremely enhanced.

Keywords: Huanghe; organic carbon; Human activities

Human activity and monsoon dynamics influence on spatial and temporal hydrochemistry in tropical coastal waters (Sanya Bay, South China Sea)

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Abstract

Human activities and oceanic influences like mixing and/or upwelling define the hydrochemical and biological characteristics of coastal regions. In Sanya Bay, northern South China Sea, the balance between these two influences on spatial and temporal scales is poorly understood. The influence from human activities was discharge from Sanya River, while the most important marine influence was related to seasonal changes in hydrodynamics. Spatial differences ($p < 0.05$) were observed among TN and Chl a. Seasonal differences were observed for temperature, nutrients. Human activities are the dominant factor on hydrochemistry in inner bay. This region exhibited the maximum influence of discharge from Sanya River estimated by higher nutrient levels. Oceanic influences like upwelling and mixing caused by monsoons are the dominant factor on hydrochemistry in central and outer bay. Both human activities and oceanic influences play important role on coastal ecosystems in Sanya Bay. Therefore, this study has defined those characteristics so as to enact better management policies.

Keywords: Nutrients; Monsoons; human activities; Coastal ecosystem; Sanya Bay; South China Sea

Sources of riverine nitrogen to the Jiulong River and estuary

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Abstract

In the Jiulong River catchment, increased nitrogen (N) loading has been implicated in eutrophication and algal bloom occurrences in both fresh and coastal water. However, N sources in the catchment remained controversial. The various sources of riverine N in aquatic systems often have distinguishable $\delta^{15}\text{N}$ / $\delta^{14}\text{N}$ ratios, i.e. $\delta^{15}\text{N}$ signatures, thereby providing a trace to identify the N sources. Regular water quality sampling in the Jiulong River showed an increased trend in both dissolved inorganic nitrogen (DIN) and nitrate $\delta^{15}\text{N}$ values from the upper river to the estuary, indicating continuous DIN inputs to the river. Nitrate $\delta^{15}\text{N}$ values from 3‰ to 32‰ showed a variety of possible sources including commercial inorganic N fertilizers, mineralization of soil organic N, manure N, nitrification of NH_4^+ and sewage N. A positive relationship between nitrate N concentrations and $\delta^{15}\text{N}$ values indicated neither nitrification nor denitrification produced a quantity of nitrate N, and the increased $\delta^{15}\text{N}$ values along the river longitude axis showed the manure and sewage N, with high $\delta^{15}\text{N}$ values and proximity to the estuary, played an important role in N contributions to the estuary. The finding highlights the critical geographic areas and the N sources which more attentions should be directed for nutrient management and environmental protection.

Keywords: Riverine nitrogen; stable isotopic nitrogen; nitrogen sources

Organic carbon isotope record in the recent sediments of Yangtze prodelta and its implications

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Abstract

A short core (YZE) of 2.3m long was revealed from the Yangtze prodelta in late 2008. Based on chronology of ^{137}Cs and ^{210}Pb and other auxiliary approaches, grain size, total organic carbon (TOC), total nitrogen (TN) and organic carbon isotope ($\delta^{13}\text{Corg}$) were tested in the present study to discuss organic source in the recent sediments and its potential implication for sea surface temperature (SST), human activity in drainage basin and Taiwan Warm Current. The results of chronology showed that sediments of the whole core were deposited during the recent century. Three sections of grain size upward the core were identified to have a close relation to the evolution of Yangtze estuary channel, which helped to date the sediment further. The result of TOC/TN and $\delta^{13}\text{Corg}$ indicated four stages during the past century. Before 1980's, three stages of TOC/TN and $\delta^{13}\text{Corg}$ upward the core were coupled with those of SST of East China Sea. Before 1915 and during 1942-1980, low TOC/TN and high $\delta^{13}\text{Corg}$ implied higher contribution of marine organic which was benefited from higher SST. A reverse trend of TOC/TN and $\delta^{13}\text{Corg}$ took on during 1915 to 1942, indicating less contribution of marine organic due to low SST. However, this rule was broken after 1980's when more and more reservoirs constructed in the Yangtze catchment. High TOC/TN and low $\delta^{13}\text{Corg}$ in the sediments referred to less marine contribution, which were inconsistent with increased SST and abundant input of Nitrogen and Phosphorus from the catchment. This may be ascribed to large inputs of freshwater plankton from reservoirs where eutrophication intensified with trapping plenty of nutrients. Besides, this also might imply retreat of Taiwan Warm Current from the estuary due to less temperature gradient between tropic and subtropics since 1980's.

Keywords: marine organic; terrestrial organic; sea surface temperature; reservoir volume; Taiwan Warm Current

Muddy sediments and coastal changes in an enclosed bay in Qingdao, China

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Abstract

Cujialu Bay is a unique circular bay in Qingdao, China. Beach profiles, historical maps, and $^{210}\text{Pb}/^{137}\text{Cs}$ dating of sediment cores from the beaches and muddy tidal flats located along the western coast of the bay were used to study changes that have occurred to the bay and the relationship of those changes to construction of a harbor. The landward beach is composed of a narrow swath of coarse sand with a steep gradient. The muddy tidal flats are relatively wide with a gentle gradient and consist of muddy silts. These muddy tidal flats occur only in the middle of the western coast and are characterized by fine sediments with a depth of as much as one meter. $^{210}\text{Pb}/^{137}\text{Cs}$ data show that these muddy sediments have been present since the 1950s and have accumulated at an average rate of 15 mm/yr. In a core of 1.0 meter long, the sedimentation rate of the upper 0.7 m of muddy sediments has been greater than that of the lower 0.2 m. The implication is that muddy sediments have accumulated more rapidly during the last 35 years, or since 1975. That date corresponds to the construction of a dyke, which reduced the width of the bay's mouth by 30% and has very likely increased the siltation rate in the bay.

Keywords: $^{210}\text{Pb}/^{137}\text{Cs}$ dating; sedimentation rate; tidal flat; Cujialu bay; South Yellow Sea

Atmospheric Deposition of Polychlorinated Naphthalenes in Dongjiang River Catchment of Guangdong Province, South China

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Abstract

Atmospheric deposition of polychlorinated naphthalenes (PCNs) was investigated monthly at 10 sites in Dongjiang River catchment of Guangdong Province, South China, during January, February, July, and August of 2010 to assess the effect of PCNs to those areas. The average daily deposition flux of total PCNs was 828 pg/(m² d), and the TEQ was 0.14 pg/(m² d). The presumed average annual deposition value of total PCNs was 8.5 kg for Dongjiang River catchment within Guangdong province, and the corresponding TEQ was 1.3 g. Tri-CNs dominated the deposition fluxes in all samples and contributed to more than 50% of total PCNs. In addition, high contents of more chlorinated PCNs (penta-CNs to octa-CN), implying the source areas, were discovered in Guangzhou and Dongguan instead of Huizhou. Spatially, the average daily deposition fluxes of PCNs in Guangzhou and Dongguan were much higher than those in less developed city, Huizhou. Seasonally, the fluxes were generally higher in summer than in winter, while the corresponding TEQ fluxes were just the reverse. Combustions and other sources may both contribute to the PCN emissions in the Dongjiang River catchment, while the contribution of combustion sources to contemporary PCN is becoming important. Combustion related sources may be the main contributor of PCNs in Dongguan.

Keywords: Polychlorinated naphthalenes; Dongjiang River catchment; atmospheric deposition; source; deposition flux

Effect of submarine groundwater discharge on Nutrient characteristics in the sediment: a comparative research in Kojima Bay and Hiuchi-Nada, Seto Inland Sea, Japan

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Abstract

The Seto Inland Sea is the largest semi-enclosed coastal sea area in Japan. The eutrophication incidents occurred in this area with most serious scale from the 1960s to 1970s. In order to determine the sediment nutrient characteristics in this area, we compared the vertical variance of Nutrient in the sediment and sediment pore water from a costal bay area (Kojima Bay) and a semi-enclosed bay (Hiuchi-Nada) in Seto-Inland Sea, Japan. Core samples and surface sediment samples were analysed for the pore water nutrient and sediment phosphorus content. The dating data of the sediment core was also determined by ^{137}Cs and ^{210}Pb analysis. The results show that Kojima Lake (an artificial lake by enclosed inner part of the Kojima bay) has captured higher phosphorus in sediment (0.37-1.19 $\mu\text{g/g}$) than nearby Bay area (0.42-0.62 $\mu\text{g/g}$) and Hiuchi-Nada area (0.45-0.63 $\mu\text{g/g}$)in Seto Inland Sea. In Lake core samples, a peak of sediment Phosphorus content at the depth with an age of around 1970s, suggesting that phosphorus content elevated by phytoplankton bloom by eutrophication during that time. On the other hand it did not show the significant variations with depth in the sediments in Kojima bay and Hiuchi-Nada area. N:P molar ratio in the pore water shows significant difference trend between the two locations. Kojima bay area has high N:P ratios (average 322:1) and the values has been in increasing trend down core while Hiuchi-Nada area has a decreasing trend down core with relatively lower value (average 26:1). This may indicate nutrient of the pore water affected by different terrestrial resources between two locations rather than the different sediment accumulation process. The semi-enclosed bay sediment nutrient structure may have connection with submarine ground water discharge process reported by Saito et al. (2011) that provides a nutrient supply and water discharge affection.

Keywords: Yangtze estuary; basin damming; eco-balance
groundwater discharge

China's Three-Gorges Dam: estuarine unbalance?

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Abstract

Three-Gorges Dam emplaced at the upstream of the huge floodplain of the middle and lower Yangtze and its estuary serves as a gigantic mechanism in altering the transfer of materials (sediment and nutrients) downstream. Seasonal monsoon precipitation adds complication for this process in relation to migrated rainfall through the basin. Nearly 50% of annual rainfall that occurs at the mid-lower Yangtze basin is beyond the control of the dam, which provides additional drive forcing for the material transport into the estuary. The middle Yangtze is becoming a new sediment source area, where it supplies at least 50-100 million tons of sediment to the river mouth area. The unbalance of sediment dynamics of the river basin due to damming is obvious as represented by the river-channel erosion below the dam, which is further extending downstream before Wuhan meagacity. Reduced sediment flux into the river mouth would have raised serious coastal retreatment, but an question of sedimentation rate in relation to sediment supplement in coming decades. The freshwater into the river mouth, although stable at multi-annual scale, sees a critical challenge from the planned amount of discharge at the dam site and that of the threshold at the river mouth in order to balance saltwater intrusion, especially during winter season. Nutrient unbalance is also occurring in the river mouth area, as reflected by the trend of 'acidifying estuary' (Figure 1). Damming results in the unbalancing estuarine ecosystem, but reaching a new balance offers a buffer time for integrated coastal management.

Keywords: Yangtze estuary; basin damming; eco-balance

» ABSTRACTS B2 «

Simulation of Non-Point Source Pollution in the Past Thirty Years in Jiaodong Peninsula, China

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Abstract

Non-Point Source (NPS) pollution, as one of the most important factors that induce coastal water quality deterioration, are of increasing concern among water environment managers and planners worldwide. In this paper, taking Jiaodong Peninsula as the case study area, annual load of non-point source pollution from 1979 to 2008 was simulated based on multi-resource database and the N-SPECT (Non-point Source Pollution and Erosion Comparison Tool) model, and, the spatio-temporal dynamics of non-point source N and P was studied and the relationship between non-point source pollution and land use was analyzed. The results suggest that the temporal variation trend of NPS pollution loads of TN and TP from 1979 to 2008 exhibit sharp annual fluctuations and distinct decadal increasing trend. And the spatial patterns of NPS pollutant load are closely related to land use patterns, in detail, agricultural land, the residential area and industrial area are main source areas of nutrients. Among the three typical watersheds, Dagu River watershed is the uppermost contributor of NPS pollution in jiaodong peninsula, Five Dragon River watershed is the second, and Dagujia River watershed is the third. The information derived from this study can provide good supports for coastal land use planning and water environment managements.

Keywords: non-point source pollution, nitrogen & phosphorus, land use, coastal zone, Jiadong Peninsula

Natural and anthropogenic influences at the land-ocean interface of Asian megadeltas

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Abstract

Deltas are important interfaces at land-ocean boundaries. They are influenced by processes on land and offshore, and their natural evolution has been greatly affected by human activities. Deltas and their surrounding areas are important for the physical and economic wellbeing of humans. Asian coasts are characterized by large river deltas, called megadeltas, which are one of the most vulnerable environments in the world to the effects of global climate change. There are three key aspects of the present delta crisis: shrinking deltas, sinking deltas, and ecosystem collapse. Shrinking and sinking deltas are caused mainly by decreasing sediment supply from rivers to deltas and deltaic coasts, but also by relative sea-level rise, due either to eustatic changes or land subsidence. Asian megadeltas were initiated at ca. 8.0 ka after a rapid sea-level rise. Continuous seaward growth of mega-deltas has occurred since the middle Holocene in response to a huge sediment supply during a time of relatively stable sea level. Thirty to forty years ago, in response to human activities such as deforestation, the rate of supply of sediment to the coast by large rivers in Southeast and East Asia was $\sim 2.5 \times 10^9$ tons/yr, which represents more than 10% of global sediment discharge to the sea. New land areas were forming at a rate of more than 40 km^2 per annum, and the delta plains so formed now support human livelihoods in coastal zones. However, because of increases in other human activities (e.g., dam construction, sand mining, and irrigation) these rivers are today delivering less than 1×10^9 tons/yr of sediment to the coast, a level close to that of the middle Holocene. Formation of new land areas has come to a standstill and some deltas are currently shrinking. Because of these changes to the natural balance of delta systems, and the additional effect of resource-related activities in deltas (e.g., shrimp farms, groundwater uptake), the megadeltas of Asia that have been constructed since the middle Holocene are at serious risk of destruction.

Keywords: Asia; megadelta; Holocene; human impact; sediment;

Decline of the Huanghe (Yellow River) delta to destruction phase

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Abstract

The consequential distinct decline of the modern Huanghe delta to destruction phase due to rapid decrease of sediment flux to the sea since 1976 is studied based on the data of the Huanghe water and sediment discharge at Lijin gauge from 1950-2009, bathymetric records of 36 survey transects off the delta from 1976 to 2004 and the LANDSAT satellite images. The results show that the evolution of the delta with its land part and subaqueous part in the whole has passed 3 phases: a construction phase in 1976-1988, a transition phase in 1988-1996 and a destruction phase since 1996 to present.

The average land accretion rate was 18.6 km^2 in 1976-1996 and -2.7 km^2 in 1996-2005. The average sediment accumulation rate for the subaqueous delta was 0.44 bt/yr in 1976-1998 and -0.42 bt/yr in 1998-2004. The delta converted from a constructed phase to be a destructed one after 1997. The critical sediment load at Lijin gauge for keeping delta erosion-accumulation balance was estimated as 0.256 bt/yr . The 3 phases of the delta evolution correspond well to the different phases of the sediment decrease to the sea, which was caused mostly by the human activities in the Huanghe basin.

Keywords: decline, delta evolution, destruction phase, Huanghe delta, human activities, sediment load

Impact of river-dyke constructions on sediment dispersal off the Mekong River Estuary, Southern Vietnam

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Abstract

In the last decade, a large number of dykes and sluice gates have been constructed in the downstream part of the Mekong River to protect agricultural lands in the Mekong Delta from inundations and salinity intrusions. The development of such structures should have changed hydrodynamic conditions of the downstream Mekong River especially during high water levels, because the water exchange between river channels and surrounding lands would be limited when the gates are closed. In this study, a numerical model is employed to estimate the impact of the artificial structures on sediment dispersal within and off the Mekong River Estuary. Our main target is to evaluate whether this human activity is related to shoreline changes observed along the Mekong River deltaic coasts.

Keywords: Abstract; coastal erosion; human impact; Mekong Delta; Southeast Asian monsoon climate

» ABSTRACTS B2 «

Small-scale Fishermen along the Naaf River, Bangladesh in Crisis: A Framework for Management

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Abstract

The Naaf River estuary plays significant role in the socio-economic condition of local community and considered as a major source of income through small-scale fishing. This paper summarises the chronic problems of small-scale fishermen and their relative measures through management aspects. Rapid Participatory Rural Appraisal (PRA/RRA) was conducted using semi-structured questionnaire interviews of 120 small-scale fishermen from the three fishing communities solicited information on their activities, financial flows and their main problems confronting their enterprise. Besides 24 focus group discussions were arranged with different stakeholders to collect data on the organisation and management of small-scale fishing as well as to get their opinions on the problems, causes and their consequences. Field data indicated the dependence of the local community of fishermen villages on fisheries resources of the Naaf River. High dependency to fishery resources, annual catch reduction, catch price fluctuation, by catch discard, lack of processing and preservation facilities, credit facilities, training supports were identified as major problems which make the fishermen community disorganized resulting poor economic return. To ensure the sustainability by overcoming these increasingly marginalised problems, the fishery resources exploitation pattern call for right management approach. Finally, by considering the top down and bottom up views of different stakeholders, a co-management framework has formulated for long term sustainability and livelihood security of local community.

Keywords: fishers; fisheries management; livelihood; small-scale fishing

Distribution of BC and PAHs in the surface sediments of coastal zone in Bohai Bay, China

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Abstract

The concentrations and distributions of black carbon (BC) and 16 priority polycyclic aromatic hydrocarbons (PAHs) were investigated from 86 surface sediment samples in the intertidal zone, offshore and main rivers in west coast of Bohai Bay, China. The results showed that (1) the average concentrations of BC and PAHs in the intertidal zone were 0.52 ± 0.39 mg/g and 140.0 ± 84.1 ng/g, which were higher than that in other offshore areas in China; (2) distinct spatial pattern of BC and PAHs concentrations were observed in the intertidal zones, with the average concentrations of BC and PAHs in the north area four folds higher than that in the south (divided by Tianjin Port). This special distribution may closely related to the sediment granularity which shows "fine in north" (dominated by clayey-silt) while "coarse in south" (dominated by sandy), and illustrated the different sedimentary dynamics between two areas; (3) although BC and PAHs had similar spatial distributions, but no strong correlation was found between them; (4) the concentrations of BC and PAHs in the rivers were much higher than that in the intertidal zone and offshore, which may indicate that the rivers are the main input sources in this coastal zone.

Keywords: Black carbon (BC); Polycyclic aromatic hydrocarbons (PAHs); Spatial distribution; Coastal zone; Bohai Bay

Session: B3 Keynote**Coastal observatories: their role in coastal research**

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Abstract

Coastal observatories can be considered as complex measuring devices to cover spatial and temporal scales in a variable environment with strong gradients. These coastal environments under observation are important areas due to the strong interaction with human activities. This interaction is further increasing due to the world wide intensification of the use of coastal areas. This automatically leads to the societal wish to get up to date information on our coastal systems. However the size of these areas and their strong gradients make it almost impossible to establish measuring networks covering all temporal and spatial scales. Thus apart from measurements models are needed to extrapolate our observations to larger spatial and temporal scales. In our presentation we will introduce the German COSYNA (Coastal Observation System for Northern and Arctic Seas) large infrastructural investment, which is a combination of several approaches for high frequency and larger spatial scale observations. The available instruments are: remote sensing by satellite (MERIS on board ENVISAT) for large scale chlorophyll and suspended matter maps of the North Sea, mobile and stationary FerryBoxes partly on board of ships of opportunity to obtain high frequency observations along several transects in the North Sea of chlorophyll, dissolved oxygen concentration, turbidity, salinity and temperature, and dissolved inorganic nutrient concentrations (N, P, Si). Under development are methods for continuous measurements of pH, CO₂, and dominant algal species composition through bio-molecular methods. The combination of these measurements enables a synoptic description of the system and on the long term an analysis of trends as a consequence of global change. Apart from these physico-chemical measurements observations are ongoing on waves and currents with HF radar installations, on vertical structure of water masses with a Scanfish which should resolve the three dimensional distribution of water quality related parameters, whereas in a separate experimental mode sediment-water measurements are planned. These should deliver important data on specific exchange processes depending on sediment characteristics. A challenge is the construction of so-called underwater nodes which should enable the measurement of underwater and bottom related processes with easy to plug in new sensors, whereas the data are transmitted direct to an on shore station. This will be tested at the Island of Helgoland in the German Bight. As first products results of modelling studies with a water transport model will be presented. An overview of the different measuring methods will also be presented. Also the data management structure developed will be shown, which is of high relevance due to the different types of data as well as their large volume.

Session: B3 Oral**Monitoring of coastal changes in the Pomeranian Bay, southern Baltic Sea – a methodological approach.**

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Abstract

The Pomeranian Bay serves as an open field laboratory to understand natural and anthropogenic coastal processes in the tideless Baltic Sea. Although there are some sections of the coast with long-term strong accumulative tendency in the both sides of Swina gate, climatically controlled sea level rise causes permanent erosion of most of the coastlines and requires coastal protection activities. These activities need a comprehensive view to the Pomeranian Bay as a natural unit despite to the fact that the border between Germany in the West and Poland in the East separates the coast into two administrative parts. Therefore, a full and complete analysis of the coastal ecosystem needs a strong cooperation between Polish and German scientists. A bilateral scientific network has been established for the joint elaboration of numerical models to generate historical reconstructions and future scenarios of coastline change for the southern Baltic Sea coast whereby the Pomeranian Bay is regarded a key area (CoPaf project: www.copaf.pl). These models need to be validated using historical coastline maps and coastal monitoring data including digital elevation models. In our investigations, we analyse the relationships between the individual components of the Bay's coastal system and provide environmental monitoring on different time scales. Long-term coastal changes (decadal scale) and short-term volumetric coastal changes (annual scale) are recorded on a base of remote sensing methods (mainly air photographs and laser scanning data) and bathymetric measurements of submarine erosion (annual scale). The long-term morphodynamic model PRD-LTMM, which has been successfully applied to the morphologic evolution of Darss-Zingst Peninsula from centennial scale to millennium scale, will be also used to model the long-term sediment dynamic and coastal evolution of the Pomeranian Bay within the frame of the CoPaf project.

Keywords: Baltic Sea; coastline changes; historical maps; long-term; modelling; remote sensing;

Numerical prediction on the response of salinity regime to proposed engineered lagoons for Terra Ceia River and Frog Creek, Florida

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Abstract

Located in Florida, Terra Ceia River and Frog Creek are both mangrove covered, micro-tidal, partially mixed and shallow rivers. A large-scale ecosystem restoration project is being planned in the wetlands associated with Terra Ceia Bay. As components of wetland restoration, three intertidal lagoons are proposed offline of the northern loop of Frog Creek and Terra Ceia River. Salinity and tidal fluctuation are both important physical factors influencing the size and extent of mangrove swamps. Although mangroves can survive in freshwater, saltwater is a key element in reducing competition from other plants and allowing mangroves to flourish. Therefore, the tidal influenced circulation and salinity regime are vital to maintain the mangrove ecosystems. In this work, a three-dimensional hydrodynamic model was developed based on EFDC and the effect of the proposed lagoons on the salinity regime was evaluated. LIDAR data was employed to depict the bathymetry of mangrove covered areas. The model was calibrated by using water level and salinity observations at three gauges. By running experiments under different inflow conditions, the effect of three proposed lagoons on the salinity regime for the study area is discussed. The conclusions can provide effective suggestions to the project and protect the resources therein.

Keywords: Frog creek and Terra Ceia River; EFDC; Salinity; Lidar; Prediction; Mangrove

Study on the propagation of nuclear pollutants in Japan from ocean circulation

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Abstract

March 11, 2011, the Richter 9.0 earthquake (defined by Japan Meteorological Agency) occurred in the east of Japan, the epicentre was located at 38.1° N, 142.6° E. Earthquake that triggered the tsunami claimed up to 23 meters. The earthquake and tsunami combined affect, making the Fukushima nuclear power plant accident, leading to nuclear pollutants flowing into the sea. This paper study the propagate path of nuclear pollutants from ocean circulation. The research data include climate state circulation data, assimilation re-analysis products, surface drifting buoys trajectories, three-dimensional numerical model prediction products. The results show that nuclear pollutants has little effect on China in recently, but may have influential in long-term.

Keywords: nuclear pollutants; ocean circulation; impact analysis

Observational evaluation of Submarine Groundwater Discharge (SGD) in central part of the Seto Inland Sea, Japan

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Abstract

Recent studies have revealed that submarine groundwater discharge (SGD) is one of the important pathways for nutrients and the other dissolved materials from terrestrial area to the marine environment. Seto Inland Sea is the largest semi-enclosed coastal sea in Japan. Recently, some researchers tried to estimate SGD at the specific area of the Seto Inland Sea by field research and numerical model approach. Nevertheless, deep (confined) groundwater discharge was not evaluated in these studies. The objective of the study is to evaluate the SGD including both of shallow and deep groundwater based on the observation results in the coastal area of Seto Inland Sea. The study area is southwestern part of the Hiuchi-Nada located in central part of the Seto Inland Sea, and has a size of approximately 30 km × 13 km. We conducted the measurement of vertical profiles in salinity and water temperature at 13–15 sampling stations in July and November 2011. Radon-222 (^{222}Rn) concentration was measured at surface and bottom layers using electronic radon detector (RAD7, Durridge Co.). Radon-222 (^{222}Rn) is one of the useful tracers of SGD because groundwater has extremely high concentration in ^{222}Rn compared with river water and seawater. Vertical profiles of salinity and water temperature indicate the presence of stratification with a pycnocline at depth of about 5 m in July, whereas it was completely mixed in November. ^{222}Rn concentration in the surface layer was relatively high in the several sites near the coast line. Meanwhile, in the bottom layer, high ^{222}Rn concentration was detected in the offshore area at southern part of the study area in both July and November. Therefore, the result indicates that deep (confined) groundwater discharge from seafloor throughout the year.

Keywords: submarine groundwater discharge; spatial distribution; seasonal variation; Seto Inland Sea

Estimation of seawater recirculation and mixing with groundwater in an intertidal slope, using ^{222}Rn , ^{18}O and nutrient

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Abstract

To clarify dynamics in seawater recirculation and mixing with groundwater in an intertidal slope, we observed subsurface flow with tidal variation, using piezometer, ^{222}Rn , ^{18}O , and nutrient. We installed a pair of piezometers with various depths at some plots on an intertidal in Etajima Beach, Hiroshima Bay, and western Japan. Hydraulic heads were measured and intertidal groundwater, terrestrial groundwater seawater were collected at all piezometers at two or three hours interval in July, and September in 2009. Water samples were analyzed for Cl^- , NO_3^- -N, NO_2^- -N, NH_4^+ -N, ^{222}Rn , and ^{18}O respectively. We estimated the dissolved nitrogen fraction concentration of intertidal groundwater, based on the mixing process of inland groundwater with seawater. When the piezometric gradient was upward at around low tide, ^{222}Rn of seawater declined at the low tide whereas it increased at the before it. They suggested recirculated seawater discharge at the low tide, and flesh groundwater discharge before it. In addition, we confirmed production and disappearance of Inorganic-nitrogen in general. It was suggested that ammonification and denitrification process. Ammonification and denitrification occurred on low tide but nitrification of NH_4^+ -N and NO_3^- -N occurred as a result of seawater recharged by rising tide. We confirmed the production and disappearance process of dissolved nitrogen at a time and dynamics of dissolved nitrogen fraction transform by water mixing process with tidal variation in intertidal groundwater.

Keywords: intertidal groundwater, dissolved nitrogen, dynamics

Coupled modelling of surface runoff and storm overflow induced waterlogging in the City of Shanghai

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Abstract

During the process of rapid urbanization over the last few decades, the City of Shanghai experienced frequent problems of waterlogging. This paper describes the coupling of a 2D inertial-based flood inundation model (FloodMap) and a 1D storm sewer model (SWMM) and its application to the downtown area of the City of Shanghai. The flood inundation model and storm sewer model were coupled at the common boundaries, i.e. the manholes through which flow is passed between models. Drainage by pumping stations at the outlets of the storm sewer system has also been considered. The process of waterlogging in the City of Shanghai during a storm event occurred in November 1997 which caused widespread waterlogging in the study site was simulated. High resolution (2 m) topographic data were used in the simulation. Predictions of water depth and inundation extent were compared to observed data. The coupled model reproduced the spatial pattern of waterlogging for the event simulated reasonably well. The model is able to simulate the urban flood inundation arising from surface runoff, overflow of storm sewer and failure of pumping stations. Flood mitigation measures could be taken according to the simulation results. Scenario-based simulations were then carried out to investigate the impacts of: (i) storm events with changing return periods; and (ii) failure of pumping stations at different locations. Results suggest that, with the current drainage capacity, pluvial flooding will become more frequent and sever under changing precipitation regimes from climate change predictions. The combined effects of pluvial flood risks because of overcharged sewer drainage flow investigated herein, and those from other sources, such as coastal flooding due to relative sea-level rise and fluvial flooding arising from extreme tidal events are expected to be proportionately higher under future climate change predictions. Therefore, there is an urgent need to investigate the flood risks from various sources and their potential damages to the City of Shanghai.

Keywords: waterlogging; flood inundation; flood modelling; flood risks; FloodMap; SWMM.

Recent improvements in monitoring ocean colour in coastal waters by Earth Observation

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Abstract

The LOICZ project focuses on the coastal zone which comprises less than 20% of the earth's surface, but contains more than 45% of the human population and 75% of the earth's megacities (> 10 million inhabitants). Although the area is relatively small, the total length is extensive with estimates varying between 350,000 -1,600,000 Kms. Earth Observation from satellites is a cost effective method for monitoring such a heterogeneous and spatially diverse system to provide the scientific community, policymakers, managers and stakeholders with data to inform, educate and contribute to the sustainability of the world's coastal zone.

Remote sensing of ocean colour can produce information on concentrations of phytoplankton pigments, suspended sediments, colour of dissolved organic matter, light attenuation coefficients, chlorophyll fluorescence yield, pigment composition, bottom depth in shallow waters. These and other "products" derived from these data can support many applications for understanding the dynamics of the coastal zone. Some examples include impacts of land use and river runoff, eutrophication, global change and regional biogeochemical cycles, fisheries, aquaculture, harmful algal blooms, maritime surveillance, integrated coastal zone management. However, satellite colour sensors have limitations: most of the signal is from the atmosphere and is affected by clouds; data is restricted to surface waters; at higher latitudes, sun elevation levels are low and data collection is confined to only a few months per year. In the coastal zone, atmospheric conditions are complex and there are adjacency effects at the interface of the land with the sea. Also, coastal waters can be optically complex due to sediment disturbance, coloured dissolved organic matter, fluctuating hydrodynamic conditions, and algal blooms. Recent improvements to algorithms for coastal waters will be illustrated with images from the MERIS colour sensor of the European Space Agency for Argentina, China, India, Portugal and Sweden.

Keywords: algorithm calibration; bioptically complex waters; coastal zone; Earth Observation; MERIS sensor; ocean colour;

Effect of nutrient input on the Bohai Bay ecosystem: A comparative analysis

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Abstract

With the increasing input of nutrient substances such as N and P, Bohai Bay is becoming an eutrophication bay with harmful algae blooms, water quality and ecological diversity decreased.

To study the effect of different nutrient input on the ecosystem, a dynamic model which includes nutrient (P, NH₄ and NO₃), phytoplankton (*Phaeodactylum tricornutum* Bohlin and *Gymnodinium* sp), zooplankton and detritus was constructed. In addition, the effects of suspend mater and crude oil on the ecosystem were considered in this model. Results showed that the biomass of plankton increased with nutrient input increased. The blooming time of phytoplanktons changed under different nutrient scenarios.

Keywords: Eutrophication; nutrient input; Bohai Bay; Ecosystem model

Responses of thioredoxin 1 (Trx1) and thioredoxin-related protein 14 (Trp14) mRNAs to cadmium and copper stresses in *Venerupis philippinarum*

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Abstract

Thioredoxin (abbreviated as Trx) is an important ubiquitous disulfide reductase, which can protect organisms against various oxidative stresses. In the present study, thioredoxin 1 (named as VpTrx1) and thioredoxin-related protein (named as VpTrp14) were identified from *Venerupis philippinarum*, respectively. VpTrx1 possessed all conserved features critical for the fundamental structure and function of Trx1s, such as the conserved catalytic residues (C-G-P-C), but lacked the other cysteine residues, while VpTrp14 contained the conserved motif (C-P-D-C). Quantitative Real-time PCR assay showed that VpTrx1 and VpTrp14 transcripts were distributed in a wide of tissues with most abundantly expressed in hepatopancreas. The expression of VpTrp14 mRNA in hepatopancreas was significantly up-regulated after exposure to 10 and 40 µg/L Cd, while the VpTrx1 expression level was kept relatively constant. Both the expression levels of VpTrx1 and VpTrp14 in hepatopancreas were induced after exposure to Cu, and increased to the peak value at 96 h under the 40 µg/L Cu exposure. These results showed that VpTrp14 transcripts responded to metal stress more acutely than VpTrx1, and both Trxs responded to Cu stress more sensitively than Cd. Taking together, it was suggested that VpTrx1 and VpTrp14 perhaps played important roles in the antioxidant responses against metal stress in *V. philippinarum*.

Keywords: cadmium, copper, thioredoxin 1, thioredoxin-related protein 14, *Venerupis philippinarum*

Comparison and assessment of satellite derived chlorophyll concentration at the Yellow Sea and the East China Sea

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Abstract

The chlorophyll concentration is a vital ocean color remote sensing factor and it is of great significance to global carbon cycle, ocean primary productivity and water quality monitoring. The Yellow Sea and the East China Sea are typical coastal case-II waters with complicated optical properties. Two algorithms, one empirical algorithm which was developed for the Eastern Yellow Sea one the basis of the ratio of remote sensing reflectance and one correction algorithm for the waters at the East China Sea, were used to evaluate the satellite-derived chlorophyll concentration. The spatial difference between the chlorophyll concentration derived from the two algorithms and the standard chlorophyll concentration (NASA products) was compared and evaluated. The results show that the standard chlorophyll concentration products can be improved according to the regression algorithm. The above analysis can be a helpful reference for improving the chlorophyll concentration products for the Yellow Sea and East China Sea.

Keywords: local algorithms; satellite-derived chlorophyll concentration; the Yellow Sea; the East China Sea

Comparison and assessment of satellite derived chlorophyll concentration at the Yellow Sea and A Numerical Study of Marine Ecosystem Dynamics in the Jiaozhou Bay

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Abstract

In this paper, an appropriate eco-dynamics box model composed by the dominant species in the Jiaozhou Bay was constructed in order to explore the seasonal variations of the state variables in the ecosystem and the material and energy flow characteristics. Furthermore, a three-dimensional physical-biological coupled model (ROMS-NEMURO) was developed to qualitatively study the spatial and temporal variations of primary productivity in the Jiaozhou Bay. Significant results and useful conclusions have been achieved in the following aspects: In the box model, the annual cycles of phytoplankton and nutrient were simulated in reasonable agreement with the observations in the pattern, with a stronger spring bloom and a weaker summer bloom well presented. In the 3-D coupled model, how the limitation factors, including sea temperature and nutrient concentration, restrict the variations of diatom and dinoflagellate was discussed. The results indicated that diatom (belongs to Bacillariophyta) blooms when silicate supply was sufficient, while dinoflagellate (not belongs to Bacillariophyta) blooms when sea temperature was appropriate. Silicate and water temperature were two motive powers of phytoplankton growth, while silicate played a more important role than the water temperature in the system.

Keywords: ecological dynamics; Jiaozhou Bay; NEMURO; nutrients; ROMS

Numerical simulation of current circulation and ecosystem dynamics in the offshore area of the Yangtze River Estuary

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Abstract

In this paper, the 3-D Regional Ocean Modeling System (ROMS) is applied to simulate the tide and tidal current patterns in the offshore area of the Yangtze River Estuary with a 30-day run forced by 8 main component tides. In addition, the 0-D ecological model NPZD (Nitrate-Phytoplankton-Zooplankton-Deiritus) is applied to simulate the evolution of predominant ecological variables in the study area and double-peak distribution patterns of phytoplankton are obtained. Succeeding sensitivity analysis of important parameters finds that the ecosystem studied is sensitive to such parameters as NO_x (nitrogen concentration below mixed layer), UMAX (phytoplankton maximum growth rate), etc.. In the last, another ecological model NEMURO (North Pacific Ecosystem Model for Understanding Regional Oceanography) is coupled with ROMS to study the temporal and spatial distribution of 11 ecological variables in the studied offshore area. Temporal variations derived from this coupled model agree with the results obtained from NPZD model. The spatial distribution of nutrition is terrain-following and their concentrations are higher in the southern part with an exception of DON. When the temperature and solar radiation is suitable, phytoplankton blooms firstly in high nutrition areas and the prosperity of zooplankton is achieved afterwards.

Keywords: Current circulation; ecosystem dynamics; NEMURO; NPZD; ROMS; the Yangtze River Estuary

Distribution and air-sea exchange of current-use pesticides (CUPs) from East Asia to the Arctic

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Abstract

Surface seawater and boundary layer atmospheric samples were collected on the ice-breaker M/V Xuelong (Snow Dragon) from the East China Sea to the high Arctic (33°23'-84.5°N) in July to September 2010 and have been analyzed for six current-use pesticides (CUPs) trifluralin, endosulfan, chlorothalonil, chloryprifos, daethyl and dicofol. Particulatephase concentrations of CUPs in both air and seawater are very low. All CUPs were detected in all oceanic air samples and showed highest levels over 100 pg/m³ in the Sea of Japan. Gaseous CUPs basically decreased sharply from East Asia (36.6 and 45.1°N) to the north, following a relatively slow descent until it bottomed out at the Bering Sea (58.1-66.4°N), thereafter air CUPs slightly mounted up again in Chukchi Sea. The dissolved CUPs in Ocean water ranged widely from <MDL to 111 pg/L. Latitudinal trends of α -endosulfan, chloryprifos and dicofol in seawater were roughly consistent with their latitudinal trends in air. Trifluralin in seawater was relatively high in the Sea of Japan (35.2°N) and evenly distributed between 36.9 to 72.5°N, whereas below detection limit in the highest latitudes in Chukchi Sea. In contrast with other CUPs, concentrations of chlorothalonil and daethyl in Chukchi Sea were far more abundant than their concentrations in East Asia. The air-sea gas exchange flux of CUPs was generally dominated by net deposition.

Keywords: East Asia; Arctic; current-use pesticides; latitudinal trends; air-sea gas exchange

» ABSTRACTS B3 «

FerryBox – Nine Years of Experiences in Continuous Water Quality Observations in the North Sea

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Abstract

In 2002, the Helmholtz-Zentrum Geesthacht, Germany, started to use FerryBox automated monitoring systems on Ships of Opportunity to continuously record oceanographic, biological and chemical in-situ data. The FerryBox network is integrated in the German Coastal Observation System COSYNA to enable a synoptic description of the key state variables of coastal seas and their physical, chemical and ecological drivers and responses in the German Bight (North Sea). The present study summarizes the operational experience gathered since the beginning of this deployment and reflects on the potential and limits of FerryBox systems as a monitoring tool. One part relates to the instrumental performance, constancy of shipping services, and the availability and quality of the recorded in-situ data. The other considers integration of the FerryBox observations in scientific applications and routine monitoring campaigns. Examples are presented that highlight the added value of the recorded data for the study of both long-term and short-term variability in water mass stability, algal dynamics and productivity in the North Sea. Through the assessment of technical and scientific performance it is evident that FerryBox systems have become a valuable tool in marine research that help to fill gaps in coastal and open ocean operational observation networks.

Keywords: FerryBox; in-situ data; water quality; automated monitoring; ships of opportunity; North Sea

Organochlorine pesticides in seawater and atmosphere of the marginal sea of China

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Abstract

A recent open sea survey off coast of China in 2006 has substantially obtained update data about distribution and composition of organochlorine pesticides (OCPs). Hexachlorocyclohexanes (HCHs), DDT related compounds (DDTs), cis-chlordane (CC), trans-chlordane (TC), and α -endosulfan in both air (gaseous) and water (dissolved) samples were analyzed. Concentrations of γ -HCH, α , p' -DDT, TC and CC both in air and water were significantly higher in China open sea compared with those found in open ocean around the world recently, suggested there should have been new input of these chemicals from the neighborhood of Southeast Asia, especially China. In comparison to a study on the basis of archived air samples taken in same area in 1989-1990, α -HCH concentration decreased by a factor of approximately 2 orders in air, but it kept the same level in water during the same period. Although there was no decrease of p , p' -DDE, α , p' -DDT and p , p' -DDT in air, significantly increase by 60-220 times was found in water in the past two decades. It was indicated that air concentrations of OCPs adjusted to changing regional emission more sensitive. The time log of decease trends in the water may be due to a long half-life of OCPs in water. Besides, the recycled OCPs from contaminated soil runoff and relocation of previously deposited sediments in the watershed were the continued source to the open sea off coast of China. Air-water gas exchange calculations resulted in net depositional for γ -HCH and α , p' -DDT, it was suggested that there was still used in agriculture. Net flux of α -HCH, CC, TC, p , p' -DDE and p , p' -DDT was from water to air (net volatilization), it was suggested that the residues in soil and water were major sources for those compounds in air after they were phased out of usage.

Keywords: Organochlorine pesticides, Marginal seas; air-water exchange; DDTs; HCHs

Air-water exchange and air deposition of polycyclic aromatic hydrocarbons (PAHs) to the Pearl River Estuary, a subtropical Bay, south China

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Abstract

16 PAHs in the atmosphere and surface water were investigated across the Pearl River Estuary (PRE) in the cool-dry winter and hot-wet summer in 2007, where featured a typical Asian monsoon climate. PAH levels in the atmosphere were ~2 folds in winter than in summer, while the concentrations in the water samples show no significant differences for the two seasons. Relative higher particle-bound PAHs was observed in the western of the PRE water, corresponding to higher particulate organic carbon (POC) and lower salinity which suggested land freshwater input may be a important sources. Net gaseous exchange fluxes at the interface (FAW_Gas), wet deposition of gaseous PAHs (FDW_Gas), and dry and wet deposition of particle related PAHs (FDD_Part and FDW_Part) were calculated based on the meteorological data and chemical properties. It was estimated that ~1.92 MT of FAW_Gas, ~3.89 MT of FWD_Gas, ~0.15 MT of FDD_Part, and ~0.18 MT of total PAHs were input into this subtropical estuary in year 2007, respectively. The estimated fluxes of FAW_Gas, FWD_Gas and FWD_Part were relative higher in the summer than in the winter, however, FDD_Part values were relative higher in the wintertime.

Keywords: Air-water exchange; polycyclic aromatic hydrocarbons (PAHs); air deposition; Fluxes; Pearl River Estuary

Chemical Sensors and Biosensors for On-Site Detection of Environmental Pollutants in Seawater

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Abstract

The environmental pollution in seawater adversely affects not only the oceans and their wildlife, but also the health of many people and the surrounding environment. Seawater pollutants include inorganic, organic and biological species. The determination of these pollutants is of great importance from the ecotoxicological point of view. Many analytical techniques have been routinely used such as atomic spectroscopy for heavy metals, molecular spectroscopy for nutrients, high performance liquid chromatography for organic pollutants, and immuno-assays for viruses. However, these methods suffer from problems of complex instrumentation, high cost and long-time procedures, and therefore cannot be used as on-site detection of seawater pollutants. In recent years, much interest has arisen for the design of chemical sensors, since they are portable, easy to use and suitable for real-time monitoring. The aim of our research is to develop electrochemical sensors for rapid detection of heavy metals, pesticides and bacteria in seawater. Recent progress of our work will be shown in this presentation.

Keywords: Chemical sensors; biosensors; pollutants; seawater; on-site; detection

Metabolic profiling of cadmium-induced effects in one pioneer intertidal halophyte *Suaeda salsa* by NMR-based metabolomics

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Abstract

Cadmium has become the severe contaminant in both seawater and sediment in the intertidal zones of the Bohai Sea. The halophyte, *Suaeda salsa* is the pioneer plant in the intertidal zones of Bohai Sea and has been widely applied in environmental sciences. In this study, the dose- and time-dependent effects induced by environmentally relevant concentrations (2, 10 and 50 $\mu\text{g}\cdot\text{L}^{-1}$) of cadmium were characterized in *Suaeda salsa* using NMR-based metabolomics. The levels of amino acids, carbohydrates, intermediates of tricarboxylic acid cycle and osmolyte were altered in the *Suaeda salsa* samples after cadmium exposures. These metabolic biomarkers indicated the elevated protein degradation and disturbances in the osmotic regulation and energy metabolism caused by cadmium in *Suaeda salsa*. Overall, our results demonstrated the applicability of NMR-based metabolomics for the detection of metabolic biomarkers that could be used for the interpretation of toxicological effects induced by contaminants in the pioneer plant *Suaeda salsa* in the intertidal zones. In addition, the metabolic biomarkers could be potentially useful for the bio-monitoring of contaminants in the intertidal zones.

Keywords: Cadmium; *Suaeda salsa*; NMR; Metabolomics

Nanomaterial-based chemosensors for sensitive detection of heavy metal ions

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Abstract

Gold nanomaterials used for the development of ultrasensitive sensing strategies are becoming increasingly important in modern environmental sciences. In our laboratory, we have designed some related chemosensors based on gold nanomaterials. i) A non-aggregation, label-free colorimetric sensing strategy based mesoporous silica-coated gold nanorods (MS AuNRs) for the detection of Hg^{2+} and S^{2-} , relied on the redox-modulated surface chemistry. Similarly, silver overcoating of MS AuNRs ascorbic acid sensor has also been designed. ii) A ‘blue-to-red’ colorimetric sensing strategy has been proposed via redox regulated surface chemistry of AuNPs for the detection of Hg^{2+} and Ag^+ . iii) A colorimetric, label-free and nonaggregation-based silver coated AuNPs (Ag/AuNPs) probe has also been developed for the detection of Cu^{2+} , based on the fact that Cu^{2+} could accelerate the leaching rate of Ag/AuNPs by thiosulfate. In addition, these methods have been validated the practicality through the analyses of real samples, which possess great potential applications in food, environmental and biological fields. Moreover, we will present some effective sample pre-treatment technologies using the molecularly imprinted nanoparticles.

Keywords: Gold nanomaterials, chemosensors, heavy metal ions, sample pre-treatment, molecularly imprinted polymer.

Remote sensing observations relevant to natural hazard impacts marine biological environments Development of a Coastal Monitoring System for the management of Jeddah Coastline, Saudi Arabia

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Abstract

This paper summarizes and discusses on recently advances of remote sensing observations relevant to typhoon impacts on marine phytoplankton and ocean-acidification, and also discusses satellite remote sensing of natural hazards impacts on marine environments. Cyclones and typhoons have important effects on marine phytoplankton blooms; particularly have high contribution for the annual new production in oligotrophic ocean, such as the South China Sea. Ocean acidification, a consequence of the ocean absorbing about a third of the anthropogenic carbon dioxide (CO_2) emitted into the atmosphere, is poised to affect biogeochemical cycles and the seawater chemical system. Remotely sensed products including air-sea CO_2 fluxes, total alkalinity, suspended calcite (particulate inorganic carbon), particulate organic carbon, and calcification rates can be used to observe ocean acidification indirectly. Satellite images have been applied in studying of impacts of earthquake/tsunami in Japan in 2011.

Keywords: Natural hazard; coastal environment; remote sensing; marine ecosystem

Remote sensing observations relevant to natural hazard impacts marine biological environments Development of a Coastal Monitoring System for the management of Jeddah Coastline, Saudi Arabia

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Abstract

This paper summarises preliminary results of the development of a Coastal Monitoring System (CMS) for the coastal areas of Jeddah, Saudi Arabia. The CMS will be tailored primarily to nowcast and forecast water levels, current velocities and waves to support the coastal authorities in the planning and management of different tasks. The system integrates a user-friendly web interface with data from several operational monitoring devices and hydrodynamic models for simulation of flow, waves and particle tracking. In the first phase of the development of the CMS, a network of stationary monitoring devices will be established. Tidal gauges for monitoring water levels and winds were installed at coast guard stations Ohbahr, Gahaz and Saroom near Jeddah in April 2011. To provide a better spatial coverage of water levels and winds, two additional stations will be installed at the cities of Duba and Jizan in the northern and southern limits of the Red Sea respectively. In addition, a wave rider and a MetOcean buoy will be integrated into the operational monitoring network. Details of the devices, selection of the locations, data transfer and communication will be given. The process based model is based on the Delft-3D modelling system developed by Delft Hydraulics, the Netherlands. The model covers the entire Red Sea in variable grid size with higher resolutions along the Jeddah coastal areas. The models for simulation of flow and waves have been developed following the procedures of set-up, sensitivity studies, calibration and validation. Synoptic data from several sources has been gathered and processed for the development of the models. Also especially designed measuring campaigns have been conducted using measuring devices deployed from moving vessels. Details of the measuring campaigns, operational monitoring devices and development of the process based models leading to the CMS will be provided.

Keywords: Coastal monitoring system; operational devices, Red Sea; Jeddah; 3D hydrodynamic models

» ABSTRACTS B3 «

Investigation on climate change responses on Indonesian seawater properties by using ARGO data

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Abstract

As the previous study revealed a suspected signal of regime shift in climate from winter 1975 to summer 1986 by the CTD (conductivity/salinity – depth) data in the western Pacific Ocean, upper North of Papua, Indonesia, this research is to investigate further the responses on Indonesian seawater properties to the climate change. The data collections used were long enough, from 1967 to 2002 from all four seasons. The investigation of the responses to climate change in the seawater properties is crucial to further assess and predict the impact to the archipelago, especially the small islands of Indonesia in all aspects of environment and social-economic impacts. While the inner part of huge Indonesian water is lacking of such good quality data, from the outer ring of Indonesian waters which are exposed to the open Ocean of Indian and Pacific the data obtained by the ARGO floats. The maximum sea surface temperature ranges about $30 \sim 30.508^{\circ}\text{C}$ for eastern Indonesia and $31 \sim 31.3080^{\circ}\text{C}$ on Southern Java. For the eastern part of Indonesian water the data is from 2003 to 2011, and 2000-2011 for the Southern Java apparently not a long enough record to reveal significant responses yet this research is continually explore the signals by several data analysis techniques.

Keywords: ARGO; Climate change; pressure; salinity; shift; temperature.

Studies on the use of stable isotopic analysis for the reconstruction of past environmental conditions of Pulicat lagoon, South East India

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Abstract

Modelling the nutrient distributions in response to shifting salinities of dynamic ecosystems such as coastal lagoons, require supporting data from a variety of sources for accurate representation of their environmental statuses. While stable isotopic analyses can contribute to reliable datasets of nutrient distributions, their application in the study of coastal ecosystems of India has not yet been widely reported. In the present investigation, the salinity changes in a lagoon ecosystem, namely, Pulicat, Southeast India, has been studied using stable ratios of ^{13}C and ^{18}O . The suitability of the shells of *Perna viridis*, collected during the monsoon season of 2009-10 was explored for deriving salinities from the above isotopic analyses. It has been observed that while the isotopic ratios of ^{13}C of the conservative reservoir of dissolved inorganic carbon (DIC) in the lagoon can remain constant during the growth period of *P. viridis* ratios of ^{18}O fluctuate under changing conditions of primary production in the lagoon. This leads to unreliability of the data from the shells in representing salinity changes during the Southwest monsoon season. Hence, a new approach has been investigated by using ^{13}C ratios of shell carbonates as suitable secondary proxies for reconstructing the salinity changes of Pulicat lagoon.

Keywords: Pulicat; Stable isotopes; salinity; Perna viridis; dissolved inorganic carbon (DIC); primary production

The Application of Cloud Computing and Internet of thing to Ocean Environmental Monitoring Implementing a real time, online coastal water quality monitoring system

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Abstract

This Presentation will elaborate the concept of cloud computing and internet of things, including the technologies, architecture and the platform of hardware and software applied to the Ocean Environmental Monitoring. In addition to presenting the Yantai Haicheng Hi-Tech's state of art solutions, best practices and services provided to resolve the concurrent problems and challenges, it will give the Yantai Haicheng Hi-Tech's insights and strategies embracing cloud computing and internet of things to Ocean Environmental Monitoring in the future as well.

Abstract

Real time in-situ monitoring of water quality presents many challenges over laboratory or manual spot measurements. While the laboratory provides unparalleled accuracy and the ability to measure a diverse range of parameters, in-situ online monitoring is important to both understand the temporal changes in water quality, as well as providing an early warning system should alarm conditions be detected. Haicheng Hi tech and Greenspan have developed a system that accurately and reliably performs these measurements, as demonstrated by the pilot system installed in Yantai, for the National Marine Agency Yantai Branch. This presentation looks at the design concepts used in the monitoring system to ensure that the instruments operate within specification. Part of the challenge was to integrate instruments from various manufacturers with different interfaces and functional requirements, into a single harmonious online analyser. Of particular focus is the sampling system that protects the instruments from biological growth. The initial data from the installation and commissioning tests, and operation up until the conference presentation will be examined to show that measurements obtained are representative of the water quality in the area, within the accuracy requirements of the system, and do not excessively drift or foul over time. Data management tools will also be presented to look at how the continuous time series collected can be enhanced through quality flagging and data corrections using spot samples, corroboration between instruments and instrument recalibration data. Finally, the web based operator interface will be presented showing the access available to the collected and corrected data set.



» ABSTRACTS B3 «

Session: B4 Keynote

Lessons Learned in Attempting to Restore the Tokyo Bay Ecosystem

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Abstract

The shores of industrialised nations are often taken over with man-made structures to protect and enhance economic activities. Those changes have replaced large segments of natural habitats, have degraded water quality and have lost the original seascapes. Tokyo Bay is a typical bay suffered from those degradations. The Tokyo Bay Renaissance Project has been started in 2005. It was one of challenge to restore coastal habitat, and manage input load from land in such difficult circumstances. Adaptive principals are fully employed to handle the project, and it has been operated as an attempt of integrated coastal management. The project time scale is ten years with three internal appraisals. During the project, some new and unique bottom up projects to create urban type coastal habitat have started. Implementation of a monitoring campaign for water quality measurement has been also one of essential and important success of the project. Nevertheless, true integration of the coastal management is under way to be implemented.

Keywords: Integrated coastal management; habitat creation; water quality management; environmental restoration

Ecohydrology: a tool for sustaining ecosystem functions and services between river basin and coast under global changes: the Guadiana (SE Portugal) case study

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Abstract

Estuaries and coastal ecosystems are final recipients of all factors and processes affecting water quantity and quality at the entire river basin. Interaction between river and coast is naturally established through the hydrologic and biogeochemical cycles. Global changes are modifying water quantity allocation and activities affecting land uses as urbanization, agriculture or industrialization at the continent, and tourism, fisheries or aquaculture on the coast, are increasing pressures on water availability and quality that reaches estuaries and coastal ecosystems worldwide. Providing water in quantity and quality is fundamental for the balance and healthy functioning of estuaries and coastal ecosystems, to support their productivity, their functions (e.g. as nursery grounds) and the uses and services they provide. Dealing with anthropogenic impacts on coastal ecosystems under the variability imposed by climate change scenarios requires an integrated approach to enhance ecosystems carrying capacity and resilience, as a basis to support positive socioeconomic development. Ecohydrology approach involves engineering-based tools that integrate basin-wide human activities, changes in hydrologic cycle and climate change, in order to sustain, improve and restore ecological functions and services in coastal areas.

In this paper we demonstrate the effects to the Guadiana (south Portugal) estuarine and coastal ecosystems associated with the construction of the large Alqueva dam and we propose several ecohydrology based approaches to sustain the needed interactions between river and coast, crucial for the healthy functioning of these ecosystems and for the sustainable provision of their uses and services.

Keywords: Integrated coastal management; habitat creation; water quality management; environmental restoration

Session: B4 Oral**Dynamics of Chinese Muddy Coasts and Estuaries**

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Abstract

A special issue on 'Dynamics of Chinese Muddy Coasts and Estuaries' will be published in Estuarine, Coastal and Shelf Science in May 2011. The special issue is a collection of the papers presented in the workshop 'Dynamics of Chinese Muddy Coasts and Estuaries' held in September 2009 in Guilin, China. The workshop was sponsored by the State Key Laboratory of Ocean Remote Sensing and Dynamics, the Second Institute of Oceanography, SOA, China, as well as the LOICZ and EMECS (the Environmental Management of Enclosed Coastal Seas). There are totally ten papers contributed to this special issue as case studies of Changjiang, Huanghe and Zhijiang estuaries and Chinese muddy coasts in the Bohai, Yellow, East China and South China Seas. These papers represent the most recent advancement in Chinese estuarine and coastal sediment research in the fields including: 1) sediment processes in highly turbid estuaries (Wang, Y. et al.); 2) modeling for sedimentary processes (Qiao et al., Wang, X.H. et al.); 3) fluid mud behavior and processes in benthic boundary layer (Liu et al.); 4) fine sediment related biogeochemical processes in coastal ocean (Li et al., Zhang et al., and Zhu et al.); and 5) in-situ observations and instrument development (Bi et al., Dong et al. and Yang et al.). In this presentation, I will provide a synthesis talk on the importance of studying sediment dynamics of muddy coasts and estuaries and the advances in those studies in China.

Varying Hydrodynamic state in Sundarban estuary – the ultimate force for physical and biological modification

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Abstract

Sundarban estuary in Indian part are subjected to huge sedimentation. Breaching and slumping of embankment as a consequence of erosion are also posing threat to 4.2 million people (as per 2001) in this part. High tidal range and strong current along with the depth and shapes of the channels are the main guiding forces for such dynamicity. Distribution of sediment, nutrient, pollutant in this micro tidal estuary is also regulated by these factors. However, any systematic study to reveal the dynamicity of the estuaries has so far not been undertaken. Present study has documented the above data in detail to understand the dynamic state of the estuary. Wind, wave motions, and river runoff can also play important role locally. Sundarban estuarine system having network of six estuaries and 104 islands are adapted to natural and anthropogenic pressure since last 200 years. Strong tidal currents predominantly distribute sediments coming from the sea along these flood dominant channels, lined with mangroves. Tidal currents also influence salinity, turbidity of the region. The inner part of the estuary which is not connected directly with any upstream fresh water are having more salinity and less tidal current and high tidal range as compared to adjoining Hooghly river system having strong tidal current and less tidal range. Thus sediment and nutrient distribution patterns are completely different in this fresh water dominating channel. The change of the estuary from fresh water dominating channel to saline water rich domain has modified the physical and biological constituent of the ecosystem which is reflected by reduction of fresh water loving Sundari tree (Heretaria fomes), increase of saline blanks, increase of tidal flat area, decrease of depth of wider channel but increase of depth of interconnecting narrow channels etc. The hydrodynamic condition may thus be termed as 'cause' while the other parameters like chemical composition, floral and faunal diversity and sediment, nutrient distribution etc may be identified as the effects.

Keywords: Bathymetry; current; flood dominant; sundarban; tidal range

Changes of benthic community caused by anthropogenic changes in the Honjo area of Lake Nakaura, western Japan

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Abstract

Lake Nakaura located in Shimane and Tottori Prefectures is the second largest brackish lake in Japan. A part of the project aimed for reclamation and desalination of the lake has proceeded since 1960s, but in 2002 a decision was made that the Honjo area, which had been planned to be the largest reclaimed land, would remain a brackish water area. After the decision, removal of the dike and partial cut of the dike enclosing the Honjo area were scheduled in order to restore the water area. The long-term monitoring was started in 2006 to examine environmental and benthic community changes due to the restoration projects. Monthly samplings were conducted at selected 12 stations from May 2006 to August 2009. Six conspicuous species including five bivalves and one polychaete were analyzed for their number of individuals and wet weight. Biomass of three bivalves, *Ruditapes philippinarum*, *Raetellops pulchellus* and *Theora fragilis*, increased in the Honjo area in 2008-2009 compared to 2006-2007. *Macoma incongrua* showed a similar trend. *Musculista senhousia* did not show a large change from 2006 to 2009. Biomass of *Cistenides* sp. in 2009 seemed to be larger than that in the other years. Increases of *R. philippinarum*, *T. fragilis* and *M. incongrua* in the Honjo area are mainly attributed to the removal of the dike in the western drainage channel. Similarly, *R. pulchellus* and *Cistenides* sp. may have been responded to this modification. We suggest that the removal of the dike caused to change hydrography in Lake Nakaura and the Honjo area, and consequently dispersal of planktonic larvae and habitat conditions after settlement of these species may have altered. On the one hand, sharp increases in number of individuals of *R. pulchellus* and *Cistenides* sp. were observed on 2 July 2009, indicating that the two species increased immediately after the partial cut of the eastern dike.

Keywords: benthos; anthropogenic change; long-term monitoring; reclamation; Lake Nakaura; Honjo area

Anthropogenic environmental changes due to partial dike removal in the Honjo Area of Nakaura Lagoon, Southwest Japan

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Abstract

Nakaura Lagoon is a coastal brackish water lake in San'in District, Southwest Japan. In 1981 the Honjo Area, approximately the northern quarter of Nakaura Lagoon, was almost completely isolated by the Moriyama Dike constructed by the Nakaura Reclamation and Desalination Project. However, the reclamation project was cancelled in 2002. In May 2009, the 60 meters partial removal of Moriyama Dike was carried out and the water chemistry of the Honjo Area changed drastically. In this study, we document changes in the water environment resulting from the opening of the Honjo Area. The monitoring program is made up of 60 water quality measurement sites and 12 detailed sampling localities in a traverse line through the lake system and observations were made at monthly intervals from May 2006 to May 2011. Before the Moriyama Dike was removed, the salinity difference between surface and bottom water remained between 2 and 4 psu. For most of the year the water was stratified and bottom water in the Honjo Area showed oxygen depletion. The dissolved oxygen of bottom water decreased early in the year on the Moriyama Dike side of the Honjo Area. This oxygen-poor water was easily up-welled by winds because the vertical salinity difference was small. At times the observed dissolved oxygen value of surface water was less than 1 mg/l, indicating that the shallow ecosystem was significantly affected. After the opening of the Honjo Area, Sakai Channel bottom water with high salinity and high dissolved oxygen moved into the Honjo Area. The large density difference set up a strongly stratified structure in the Honjo Area. After stratification, the bottom water of the Honjo Area became oxygen depleted, becoming an anoxic environment except for a small area near the Moriyama Dike. The strong stratification, however, prevents bottom water from up-welling into shallow areas.

Keywords: anthropogenic change; reclamation; Nakaura Lagoon; Honjo area

Impacts of Freshwater Input on Vegetation Cover in Yellow River Delta Wetland

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Abstract

Vegetation coverage can deliver important information of wetland landscape and its ecological regimes. In Yellow River Delta wetland, vegetation cover is greatly sensitive to local climate conditions (precipitation and temperature) and freshwater input of Yellow river. Particularly, freshwater inflow has a significant restrictive effect on wetland vegetation. Therefore, the study on impacts of freshwater input on vegetation cover in Yellow River Delta Wetland has theoretical and practical significance. First, based on the data of MODIS images and under the support of GIS technique, the normalized difference vegetation index (NDVI) was calculated. Then, using NDVI as a key quantitative index, the spatial and temporal characteristics of vegetation cover were detected by the spatial autocorrelation analysis method. Finally, using the linear regression method, the relationship between freshwater inflow and NDVI was established and further, the effects of freshwater input on vegetation cover were evaluated. The results of this study would be helpful for the assessment of wetland ecological conditions and to develop appropriate adaptation and mitigation strategies for vegetation protection and restoration in the estuary wetland of Yellow River Delta.

Keywords: freshwater input; vegetation cover; NDVI; Yellow River Delta Wetland

Habitat degradation in Karnaphuli river estuary: Application of ecohydrology as a tool to enhance the estuarine ecosystem carrying capacity

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Abstract

Karnaphuli is the largest and most important river estuary in Chittagong in terms of both ecological and commercial point of view with a catchments area of 5,500 square miles which promote fishing, industrial, agriculture, and navigational infrastructure. The estuary supports the largest seaport of the country and the river and its tributaries are major source of drinking water supply for millions of people. But like many other estuarine systems, the river estuary is greatly threatened by anthropogenic activities causing obvious and hidden disturbances in the natural structure and functions of water biotic communities where water quality is considered to be the major problem for immediate attention. Pollution from sewage, industry, agriculture, over exploitation of natural resources and most importantly sedimentation made this estuarine ecosystem fragile. Untreated effluent with weak drainage system and unplanned strategy for resource management on the upstream have been making the river and estuaries vulnerable which in turns reduced primary productivity, fisheries production as well as biodiversity. Ecohydrology, a new transdisciplinary and integrative science has been developed in the recent years which has the potential to enhance the resilience and carrying capacity of the ecosystem and therefore makes the estuarine and coastal ecosystem more robust. Therefore, constructed wetland and sediment trap pond are proposed to use as ecohydrological management tools, following ecotechnological principle of ecohydrology, for effluent treatment to improve water quality by trapping sediments and absorbing pollutants into plant biomass. Biostimulation and bioaugmentation techniques using microbial organisms could be another good option to degrade a wide variety of pollutants and contaminants from the water body and soil of the estuarine environment. Moreover, minimum recommended environmental flow from the upstream should have to be maintained for the proper functioning of the ecosystem which might help to grow ability of the biota to sustain and adapt to human-induced stresses.

Keywords: Karnaphuli estuary, pollution, biodiversity, ecohydrology, environmental flow.

Dispersion Pattern of the Ganges-Brahmaputra River Discharge in the Bay of Bengal as Defined by Satellite Remote Sensing

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Abstract

River plumes are important pathways of terrestrial materials entering the sea. In northern Bay of Bengal, rivers are known to be the dominant source of littoral, shelf and basin sediment and coastal pollution; although a basic understanding of the dynamics of these river inputs does not exist. The Bay of Bengal exhibit unique oceanic feature due to large discharge especially, from the Ganges-Brahmaputra River system. The present study was designated to detect the dispersion pattern of Ganges-Brahmaputra River discharge based on satellite observations and archived field data. The signature of the plume of the Ganges-Brahmaputra Rivers was determined from the temporal and spatial distribution of salinity and turbidity index. Salinity data set used in the present study was obtained from World Ocean database 2005. To determine variation of turbidity distribution normalized water-leaving radiance at 555nm (nLw555) was used from SeaWiFS. Turbidity was always occupying its maximum value near the northern coast of the Bay of Bengal whereas salinity slowed its minimum. A gradual increase of salinity and decrease of turbidity towards south was found as a general phenomenon. The distribution of salinity and turbidity along the eastern and western coast, adjacent to the northern Bay of Bengal vary with river discharge and circulation pattern. The east coast of the Bay contains low saline water and higher turbidity all over the year. During the month of large river discharge and anticlockwise circulation in surface current, freshwater from the northern Bay also tends to move along the west coast indicating lower concentration of salinity and higher turbidity index. From the distribution of salinity and turbidity it was evident that the freshwater of Ganges-Brahmaputra Rivers moves along the east coast all over the year and during the month of anticlockwise circulation moves along the west coast.

Keywords: Dispersion pattern, River discharge, Bay of Bengal, Turbidity, Salinity.

Session: B5 Keynote**Beyond biomass: ecosystem interactions of eutrophication, with an emphasis on shellfish aquaculture and IMTA**

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Abstract
 A recent review of eutrophication assessment methods, within the context of the EU Marine Strategy Framework Directive, illustrated how the state of the art has evolved from the early approaches grounded in freshwater systems. In parallel, much is now quantitatively understood about the ways in which shellfish interact with eutrophication symptoms, including the role played by cultivated filter-feeders as a complement to land-based nutrient control, and their response to secondary symptoms such as harmful algal blooms. Asia is presently responsible for 90% of the world's aquaculture and, in countries such as China, the role of cultured shellfish in the top-down control of the symptoms of nutrient discharge to the coastal zone is pivotal in reducing coastal eutrophication. This review examines the most promising approaches to eutrophication assessment, including consideration of secondary symptoms such as hypoxia and species shifts, and ways of retarding pressure to state. It then uses mathematical models to quantify the interactions between eutrophication and organically extractive aquaculture, and the role of the latter in helping to limit hypoxia in bottom waters. We draw from examples ranging from Chinese bays to European systems, and briefly also discuss the significance of integrated multitrophic aquaculture (IMTA) in this context.

Keywords: Aquaculture; Eutrophication; HAB; Hypoxia; Model; Shellfish**Bivalve Shellfish Aquaculture and Eutrophication**

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Abstract

Increased nutrient supplies and associated pollutants from land-based human activities have pervasively degraded coastal ecosystems worldwide, destroying habitats, causing finfish and shellfish disease and death, and promoting harmful algal blooms. Recent controversy has focused on aquaculture as a potential major contributor to cultural eutrophication. Regrettably, fish and shellfish culture have been grouped as one in these discussions. Yet bivalve molluscs are highly efficient, filter-feeding primary consumers and as such they increase water clarity, and facilitate the removal of nitrogen and other nutrients which are incorporated in their tissues and removed from the system upon harvest. We examined 51 ecosystems with respect to system-level impacts resulting from bivalve shellfish aquaculture in the eutrophication of coastal waters and, conversely, the impacts of land-based nutrient pollution and associated pollutants on bivalve aquaculture. Only 4 ecosystems (~8%) had exceeded the carrying capacity of the ecosystem and sustained adverse impacts from large, intensive bivalve culture operations. Overall, relative to land-based pollution sources, our analysis indicates that bivalve aquaculture contributes little to eutrophication except in some poorly flushed areas. In contrast, pervasive, excessive nutrient pollution from urban and agricultural sources along coastal regions worldwide is seriously affecting shellfish populations and aquaculture. We suggest that at some scales, shellfish restoration projects and establishment of sustainable molluscan shellfish aquaculture operations can mitigate the effects of coastal development and coastal eutrophication. Further, we strongly recommend that resource managers and policy makers should increase protection of shellfish aquaculture operations from land-based nutrient pollution.

Keywords: aquaculture, shellfish, eutrophication, restoration

» ABSTRACTS B5 «

Eutrophication assessment of a coastal lagoon (Chilika lagoon, India) after the restoration process

Session: B5 Oral

Nutrient Pollution and Harmful Algal Blooms: A Global Analysis

Patricia M. Glibert

Abstract

The increasing frequency and distribution of many Harmful Algal Bloom (HAB) species are now recognized to be related, at least in part, to an increase in nutrient pollution. This report synthesizes the work of the SCOR/LOICZ Working Group 132 which is addressing, on a global scale, the relationships between nutrient loading and specific types of HABs. While nutrient loading is increasing globally, the amounts, forms and stoichiometric proportions of these nutrients vary widely throughout the world. In addition to the well-known land-based nutrient sources of fertilizer, sewage and emissions from fossil fuel burning, there has been an increase in both finfish and shellfish aquaculture in many parts of the world, and these industries have impacts on nutrient loads to coastal waters as well. The SCOR/LOICZ Working Group is applying the annual global river export data for nitrogen, phosphorus and silica from the IOC Global Nutrient Export from WaterSheds (Global NEWS) model, established for the year 2000, and is also making hindcasts to the year 1970 as well as future scenario predictions for the period 2000-2050 as based on the Millennium Ecosystem Assessment (MA). Simulations with the POLCOM-ERSEM Global coastal ocean model for NW European shelf and Baltic, Benguela upwelling, Humboldt Current, Indonesia and South China Seas, Yellow Sea and Sea of Japan, California current, Bay of Bengal, Mauritanian upwelling are being compared with Global NEWS. In addition, known occurrences of specific HAB species are being compared on a regional basis with both of these models. The occurrences of specific types of species are being compared by region, by nutrient load and ecosystem typology. This report will provide examples of some of these regions and relationships.

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Abstract

Chilika lagoon is a brackish water ecosystem in the east coast of India that has undergone the threats of eutrophication in the past decades. As a preventive measure the lake was restored in September 2000 by a hydrological intervention. A GIS-based method of eutrophication assessment was proposed with the purpose of studying the spatial distribution of eutrophication conditions in Chilika Lagoon. A trophic state index (TSI) consisting of six physical, chemical and biological indicators including total phosphorus (TP), total nitrogen (TN), chemical oxygen demand (COD), Secchi disk depth (SD), chlorophyll-a (Chl-a) and primary productivity (PP) was constructed to describe the eutrophication state of the lagoon environment. An overlay technique within the GIS framework was applied to analyze the information from the thematic maps in order to develop a final map illustrating the spatial distribution of eutrophication conditions in the lagoon. Results from the study indicate that the boundaries associated with different trophic levels (mesotrophic, uppermesotrophic, eutrophic and hypereutrophic) could be clearly defined in a final eutrophication map. This result comprises the principal advantage of the proposed methodology when compared with other attempts based on a multi-parametric classification and assessment of lagoon trophic trends. As such, the proposed methodology could be of special interest to policy makers involved in lagoon management and planning. In addition to this, TRIX has also been used to determine the trophic condition of the lagoon. Observations during 2000-2004 indicated that the trophic state of the lake is gradually deteriorating from mesotrophic to eutrophic instead of improvement of water quality, after two years of restoration. The northern sector of the lake was found to be completely eutrophic after four years of restoration. This suggests that the catchment basin management should be taken into consideration, which contributes to the major nutrient supply into the lake body.

Keywords: Eutrophication; Chilika; Restoration

A Comparison of Eutrophication Impacts in Two Eutrophic Harbors in Hong Kong with Different Hydrodynamics

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Abstract

Eutrophication impacts may vary spatially and temporally due to different physical processes. Using a 22-year time series data set (1986-2007), a comparison of eutrophication impacts between two eutrophic harbors, Victoria and Tolo Harbours, in Hong Kong with very different hydrodynamic conditions was conducted. In the highly-flushed Victoria Harbour (Victoria), the highest Chl a ($13 \mu\text{g L}^{-1}$) occurred due to stratification in summer as a result of the input of the eutrophic Pearl River discharge, but the high flushing rate restricted nutrient utilization and the further accumulation of algal biomass. In other seasons, vertical mixing induced light limitation and horizontal dilution led to low Chl a ($< 2 \mu\text{g L}^{-1}$) and no spring bloom. Few hypoxic events ($\text{DO} < 2 \text{ mg L}^{-1}$) occurred due to strong tidal mixing. Therefore, Victoria is resilient to nutrient enrichment. In contrast, in the weakly-flushed Tolo Harbour (Tolo), year long stratification, the long residence times and weak tidal currents favored algal growth, resulting in a spring dinatom bloom and high Chl a (up to $30 \mu\text{g L}^{-1}$) all year and frequent hypoxic events in summer. Hence, Tolo is susceptible to nutrient enrichment and it responded to nutrient reduction since sewage treatment resulted in a 32-38% decrease in algal biomass in Tolo, but not in Victoria. A significant (11-22%) reduction in bottom DO in the both harbors after sewage treatment was due to a decrease in the organic loading from sewage treatment or the diversion.

Keywords: Eutrophication; algal bloom; hypoxia; sewage; Victoria Harbour; Tolo Harbour

Eutrophication and harmful algal blooms in southwest Florida's coastal waters: relations to riverine discharges and N:P ratios

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Abstract

Historically, the shallow subtropical coastal waters in South Florida have supported biologically diverse and productive coral reefs and seagrass meadows, which have provided important ecological services including tourism and fisheries. During the past three decades, however, these coastal waters have experienced an increase in the frequency and extent of harmful algal blooms (HABs), including both phytoplankton (toxic and non-toxic) and benthic macroalgae. Using a variety of NASA satellite data products (Landsat, SeaWiFS, MODIS/Aqua, MODIS/Terra) along with historical nutrient and flow data from the two major rivers impacting this region (the Caloosahatchee and Shark rivers), we have reconstructed the major HAB events and their relation to land-based nutrient inputs. Major red tides (*Karenia brevis*) occurred off southwest Florida in 1995-1996 and again in 2005-2006, following periods of heavy rainfall and riverine discharges. These toxic red tides caused widespread mortality of marine biota, including commercially important fishes, shellfish, birds, and endangered manatees. Monitoring macroalgae for C:N:P ratios before and after the Caloosahatchee River discharges in 2004, we found that the HABs (both toxic red tides and red drift macroalgae) followed not only increased concentrations of ammonium and SRP, but also a decrease in N:P ratio. In contrast, increased discharges from Shark River to the carbonate-rich coastal waters of Florida Bay and the Florida Keys were associated with increased concentrations of ammonium but not SRP, which resulted in increased N:P ratios and P-limitation. These discharges were followed by regional-scale blooms of the cyanobacterium *Synechococcus* and benthic macroalgae, increased turbidity, hypoxia, fish kills, die-off of turtle grass (*Thalassia testudinum*), sponges, and reef-forming (hermatypic) corals. The USEPA is currently mandating the development and implementation of nutrient criteria for the state of Florida to moderate the problems of nutrient pollution, HABs, and their economic consequences.

Keywords: Southwest Florida, eutrophication, nitrogen, phosphorus, phytoplankton, macroalgae, hypoxia

Relationship between Seasonal Distribution of Dissolved Organic Nitrogen and Population Dynamics of Representative HAB Species in Daya Bay

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Abstract

The concentration and composition of dissolved organic nitrogen (DON) were investigated from January to December 2008 in aquaculture areas of Daya Bay, while phytoplankton community structure and population dynamics of representative harmful algae bloom (HAB) species were investigated synchronously. Results showed that urea and dissolved free amino acids (DFAA) were important parts of DON in aquaculture areas of Daya Bay. The concentration of urea showed remarkable spatial and temporal variation characteristics: it was significantly higher in autumn and the maximum value was found in October. DFAA was about 20–30% of DON. Lysine, glycine and threonine were found as the main amino acids species. Cell number of dinoflagellate was increased significantly in April and May with the dominant species as *Prorocentrum* spp., *Alexandrium* spp., *Scrippsiella trochoidea*, *Chattonella marina*, *Karenia mikimotoi*, *Akashiwo sanguinea* and *Dinophysis acuminata*. *Alexandrium minutum* bloom was reported in April, and its cell density was 3319 cells·m⁻³, the quantity peak of *Gymnodinium* sp. was found in May. Results showed that DON, urea played key roles in regulating the density of *Gymnodinium* spp. and *Alexandrium* spp.. Consequently, the rise in organic nitrogen included urea would play a trigger in the formation of *Gymnodinium* and *Alexandrium* bloom provided suitable environmental conditions.

Keywords: HABs; DON; urea; Daya Bay; *Gymnodinium* sp.; *Alexandrium* sp.

The role of nitrogen on the growth and colony development of *Phaeocystis globosa* (Prymnesiophyceae)

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Abstract

The effects of nitrate, ammonium and urea on the growth and colony formation of three strains of *Phaeocystis globosa* were investigated. Although ammonium and urea supported growth, nitrate was the favoured nitrogen source for the growth of solitary cells for all three strains of *P. globosa*. *P. globosa* CCMP 1528 and 629 formed colonies in all cultures where nitrate was the sole nitrogen source, but only a few colonies were observed within ammonium and urea treatments. Ammonium and urea were far less effective in supporting growth, biomass generation and colony formation in all strains of *P. globosa*. Once colonies developed, colonial cells accounted for at least 15% of the total cells when grown with nitrate; colonial chlorophyll also contributed up to 60% to the total chlorophyll. The growth rates of colonial cells when using nitrate were greater than solitary cells. Changes in colony size, colonial cell abundance and total *P. globosa* abundance as affected by the nitrogen source may influence the carbon flux within the pelagic food web.

Evaluating the effect of nutrient reduction policies on eutrophication and atmospheric CO₂ absorption in the Southern North Sea with the SR-MIRO-CO₂ model

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Abstract

Nutrient reduction measures have been already taken by wealthier countries to decrease nutrient loads to coastal waters, in most case however, prior to having properly assessed their environmental effectiveness. Here we use a coupled river-marine system biogeochemical model to estimate the performance of realistic nutrient reduction options to be applied in the Southern North Sea watershed to decrease eutrophication, (visible as Phaeocystis blooms and foam deposits on the beaches) as well as the consequences of these measures on air-sea CO₂ exchanges. The mathematical tool couples the idealized biogeochemical GIS-based model of the river system (SENEQUE-RIVERSTRAHLER) implemented to the eastern Channel/Southern North Sea watershed to the existing 3D biogeochemical MIRO-CO₂ & CO model implemented in the marine domain. Model simulations explore how nutrient reduction options regarding diffuse and/or point sources in the watersheds would affect the Phaeocystis colony blooming in the simulated marine domain and the spatio-temporal distribution of air-sea CO₂ fluxes. The reference and prospective simulations are performed for the year 2006; nutrient reduction scenarios consist of upgrading of wastewater treatment plants and changing agricultural practices including an idealized shift towards organic farming. Results obtained are discussed in terms of Phaeocystis bloom reduction (magnitude and duration) and atmospheric CO₂ absorption capacity; they point the dual effect of changing nutrient loads with respect to eutrophication reduction and increased atmospheric CO₂ mitigation.

Keywords: North Sea; eutrophication; air-sea CO₂ fluxes; nutrient reduction; biogeochemical models; land-sea continuum

The world's largest green-tides: recurrent macroalgal blooms caused by expansion of coastal aquaculture in the Yellow Sea off China

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Abstract

The largest macroalgal blooms ever recorded occurred in the Yellow Sea of China in 2008 and 2009 and resulted in extensive green tides along the Shandong Province coastline, including at Qingdao. At their peak these *Ulva prolifera* blooms covered more than 4,000 km² and affected 40,000 km². Smaller blooms were also recorded in 2010 and 2007, but not earlier. Using remote sensing methods, we tracked the source of the 2008 and 2009 blooms to an area along the Jiangsu Province coastline near Yancheng, over 200 km south of Qingdao, where there had been rapid expansion of *Porphyra* aquaculture to as much as 13 km offshore, prior to the appearance of the first bloom in 2007. *Porphyra* is grown on rafts which can become heavily fouled with *U. prolifera* which is disposed of into the sea when the *Porphyra* is harvested. The timing of the blooms occurred post the April harvest period when daily tidal ranges in this region can be in excess of 7 m. This provides the mechanism for transportation of the floating algae offshore and into the warm nutrient rich waters of the Yellow Sea where it grows rapidly forming large patches. As the patches of algae grow and join, they gradually move north, as a result of wind driven surface currents that prevail in the Yellow Sea in summer, ultimately washing ashore on the Shandong Peninsula. We present a range of oceanographic, biological, ecological and genetic data to support the hypothesis that *Porphyra* aquaculture provides the source biomass for the Yellow Sea green-tides. Improved aquaculture waste disposal methods in the southern area of Jiangsu Province are likely to reduce or prevent the Yellow Sea green tides and present a feasible solution to a recurrent problem.

Keywords: Yellow Sea, macro-algal bloom, green-tide, *Porphyra*, *Ulva*

Session: B6 Keynote

Cross-boundary Exchanges of Carbon and Nitrogen in the Marginal Seas

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Abstract

Continental marginal zones are characterized as those areas where rivers, lands, oceans, the atmosphere, sediments and biota meet and interact. Despite their moderately-sized surface areas, marginal zones play a significant role in the biogeochemical cycles of both carbon and nitrogen in that they receive huge upwelled and riverine inputs of both. It has now been firmly established that continental shelves, excluding estuaries, are sinks for CO₂ mainly because of the biological pump. However, although the riverine flux of nutrients has continually been on the rise the major source of nutrients fueling the biological pump is upwelling of subsurface waters from offshore. As a result, the shelves export $50 \cdot 10^{12}$ mol y⁻¹ DOC, $45 \cdot 10^{12}$ mol y⁻¹ POC, $5 \cdot 10^{12}$ mol y⁻¹ PIC, $5 \cdot 10^{12}$ mol y⁻¹ DON and $5 \cdot 10^{12}$ mol y⁻¹ PON to the open oceans.

Keywords: marginal zones; carbon; nitrogen; flux

Session: B6 Oral

Production and preservation of organic carbon in the intertidal area of Yellow River Delta

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Abstract

Intertidal area in coastal region has been realized to plays a more important role in biogeochemistry of organic carbon, associating with climate change, for its high productivity and accumulation rate in the sediment. The production and preservation of organic carbon were studied from July 2007 to July 2008 in the intertidal area of the Yellow River Delta, a region with most rapid sedimentary and labile geological environment in the world. It was discovered that the primary productivities were comparable to those in other similar intertidal areas, ranging at 0.2-29.6 mg C/m²/d in the overlying water and 106.0-1598.2 mg C/m²/h in the surface sediment, but relative low contents of organic carbon were accumulated, ranging at 0.10-0.82 %. A rapid degradation was responsible for the low accumulation on organic carbon, with a decreasing rate of 0.14 %/cm from the surface to 5 cm depth. The natural organic carbon was absolutely dominated by production and/or reproduction in situ, in which the contribution by micro-algae was similar to that by bacteria, indicated by the lipid compositions. Further than that, the percentages of bond lipids increased to over 50 % in deep sediment, which suggesting an intensive and more stable transformation.

Keywords: Intertidal area; Yellow River Delta; organic carbon; production and preservation; lipid biomarker

Carbon Uptake in Polar Continental Shelf Regions

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Abstract

High latitudes in both the Southern and Northern Hemisphere are ecologically sensitive areas where the impacts of climate change are expected to be large. These regions are also particularly responsive to increases in atmospheric carbon dioxide (CO_2) and especially susceptible to the effects of ocean acidification. At present, the Arctic continental shelves are collectively undersaturated with respect to atmospheric CO_2 may therefore potentially act as a CO_2 sink. Seasonal variations of the inorganic carbon system in the Amundsen Gulf region of the Arctic Archipelago were investigated using observations covering a complete annual cycle. Freshwater fluxes from the formation/melting of sea-ice dominated changes in mixed-layer properties. Biological production by under-ice algae lead to an uptake ($\sim 20 \text{ micro-mol kg}^{-1}$) of inorganic carbon in the region roughly two months before the onset of ice-melt in late June. Surface warming (of 8°C) limited the uptake of atmospheric CO_2 (to less than 1.5 mol C m^{-2}) during the open water season despite an ongoing CO_2 drawdown of 4 mol C m^{-2} by photosynthesis. This shows that the observed undersaturation of Arctic surface waters does not translate directly into a CO_2 sink. Comparison of the CO_2 system in Amundsen Gulf to an Antarctic continental shelf system, suggests a similarly long lead time between spring under-ice CO_2 biological drawdown and ice melt, but less influence of seasonal warming on air-sea exchange in summer. This work highlights the need for baseline assessments of the inorganic carbon system in polar continental shelf regions as a first step towards projection of possible changes in air-sea CO_2 exchange, ocean acidification, and calcium carbonate saturation states.

Downstream nutrient transport by the Kuroshio in the East China Sea and its temporal variations

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Abstract

Using in situ data from 88 cruises from 1987 to 2009 in the East China Sea, the downstream nutrient transport by the Kuroshio was examined. The velocity was first obtained by inverse method by assuming the conservation of mass and salt within five isopycnal layers in an enclosed area. The nutrient flux density (=product of velocity and nutrient concentration) was then calculated at a section across the Kuroshio. The presence of a maximum core of nutrient flux density in the middle layer, which has been demonstrated at several sections across the Gulf Stream, was confirmed for the section across the Kuroshio in the East China Sea. Its temporal variations were further investigated. The seasonal variation in the nutrient flux density was not significant and was much smaller than the inter-annual variations. The change in the magnitude of Kuroshio speed and the change in the current structure are the major causes for the inter-annual variations in the nutrient flux density. The total downstream nitrate flux transported by the Kuroshio in the East China Sea has a mean value of $170.8 \text{ kmol s}^{-1}$. Its seasonal variation ranged from ~ 160 to $\sim 177 \text{ kmol s}^{-1}$ and its inter-annual variation ranged from ~ 100 to $\sim 280 \text{ kmol s}^{-1}$. The phosphate flux can be approximately estimated by the ratio (13.64) of nitrate concentration to phosphate concentration.

Keywords: East China Sea; Kuroshio; interannual variations; nutrient transport; nutrient stream

» ABSTRACTS B6 «

The Role of Terrestrially-Derived Organic Carbon in the Coastal Ocean: A Changing Paradigm

CO₂ fluxes and microbial roles in the coastal waters near the Pearl River estuary

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Abstract

Approximately 87% of Earth's land surface is connected to the ocean by rivers. Consequently, there has been increased interest in understanding how the flux of materials from rivers to the ocean have been altered, including global community programs such as the International Geosphere Biosphere Programme (IGBP) and its major project, Land and Ocean Interaction in the Coastal Zone (LOICZ). The 0.25 Pg of dissolved organic carbon (DOC) discharged from rivers annually can account for the mean radiocarbon-based turnover times of oceanic DOC (4000–6000 yr). However, only very small amounts of terrestrially-derived DOM have been identified in seawater using both organic biomarker and stable carbon isotopic approaches. This has been one of the major enigmas in chemical oceanography for the past decade or so.

Vascular plants represents the largest component of living biomass on Earth and plant detritus is the dominant component of reactive OM in terrestrial and aquatic environments. Co-metabolism and/or priming is commonly defined as a set of processes whereby refractory organic material (e.g. terrestrial OC) is broken down more efficiently when mixed with labile material (e.g. marine algae), via higher microbial turnover rates. The coastal margin is an ideal location for examining the potential effects of priming on the utilization of terrestrially-derived organic matter.

Emphasis will be placed on the renewed interest in priming effects in soils and the lack of comparative studies in coastal systems. I also postulate that while photo-oxidation of DOM in coastal regions has been recognized in part as an important controlling factor in altering terrestrially-derived DOM, priming effects have largely been ignored. The ramification of priming and photo-oxidation may also have serious implication for the age and recalcitrance of deep ocean DOC. Similar arguments are made for the deficiency of terrestrially-derived organic buried in coastal sediments ca. 30%, relative to global riverine inputs.

Keywords: priming; co-metabolism; vascular plants; carbon cycling; soils; sediments; dissolved organic matter

The Role of Terrestrially-Derived Organic Carbon in the Coastal Ocean: A Changing Paradigm

CO₂ fluxes and microbial roles in the coastal waters near the Pearl River estuary

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Abstract

Long term DO data in recent 10 years showed that DO was generally undersaturated in Hong Kong coastal waters near the Pearl River estuary. In addition, Hong Kong waters were a CO₂ source to the atmosphere during 2005–6, despite the seasonal shifts between heterotrophy and autotrophy. The degree of DO undersaturation in the waters near sewage discharge site was more than the Pearl River influenced waters throughout the year, due to the anthropogenic influence. In the winter dry season, net community production (NCP) was low ($-100 \pm 50 \text{ mmol C m}^{-2} \text{ d}^{-1}$) in all three areas, and reached up to $600\text{--}1000 \text{ mmol C m}^{-2} \text{ d}^{-1}$ in the summer wet season. Highly positive NCP corresponded to a CO₂ source and O₂ sink, which likely due to the influences of southwest monsoon-induced upwelling which bringing cold, low DO and high DIC water to the surface in the wet season.

Besides physical factors, bacterial respiration plays an important role in regulating DO and CO₂. Bacteria accounted for 50–80% of total dark community respiration (DCR) and ~50% of the gaseous CO₂ flux in coastal/oceanic waters with less nutrient inputs, but increased to >90% of DCR in more eutrophic waters near the sewage discharge site. Many factors could affect bacterial growth and consequently modulate carbon cycling. Both field and experimental results appeared to show that the high N:P ratio influenced by the Pearl River estuary might result in potential limitation of inorganic phosphorus for the respiration of bacteria and larger plankton, and phosphorus addition increased bacterial production and respiration by ~50 and 20% respectively in the wet season. In addition, the degree of heterotrophy in coastal waters may decrease due to strong ultraviolet radiation, as evidenced by our incubation experiments in the South China Sea which showed that phytoplankton was less inhibited than bacteria when exposed to strong ultraviolet radiation in short term.

Keywords: dissolved oxygen, CO₂, bacteria, Pearl River estuary, South China Sea

Limiting nutrient in estuarine ecosystems and beyond: changing nutrient inventory

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Abstract

The limiting nutrient in estuarine ecosystems is of wide interest because of its importance in understanding carbon fixation, coastal eutrophication, and waste management. The recent study of Lui and Chen (2011, Shifts in limiting nutrients in an estuary caused by mixing and biological activity, Limnology and Oceanography, 56(3), 989-998.) shows that the N:P molar ratio in an estuary is a nonlinear function of salinity, and a shift in the limiting nutrient status at a particular salinity, $S_{N:P=R}$, is a function of the biological N:P uptake ratio (R), albeit complicated by biological consumption and remineralization. In this study, we show that changes in the N:P ratio in an estuary as salinity changes are a result of changes in nutrient inventories. In the case of P-limited riverine water mixing with N-limited seawater, when salinity is less than $S_{N:P=R}$ productivity is limited by the P inventory that comes from the riverine and seawater P inputs. On the other hand, as the salinity exceeds $S_{N:P=R}$, productivity is limited by the N inventory that comes from the riverine and seawater N inputs. Although denitrification or the addition of P from sediments is not necessary to be involved, they may accelerate the change from P to N limitation. The shift in limiting nutrient combined with the change in nutrient inventories provides a possible explanation that in some cases N, but not P, loading leads to eutrophication in some coasts that are influenced by P-limited riverine waters but N-limiting seawater. Since the limiting nutrient may shift across estuarine ecosystems, the management of eutrophication should be different from rivers to estuaries, and to coastal regions.

An Integrated Approach for Predicting Nutrient Transports from the Land to the Ocean

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Abstract

The important to understand how upland landscapes and coastal waters, which are connected by watersheds, respond to changes in hydrological and biogeochemical cycles resulting from changes in climate, extreme weather events, and land use. This talk describes a multi-scale and multi-disciplinary earth system modeling framework developed under the prior United States NASA Interdisciplinary Research in Earth Science (IDS) project that includes a regional climate model (WRF) nested within a global climate model (CCSM), an improved land surface (energy and water balance) model with multi-physics options (Noah-MP), a newly developed river routing model (RAPID) in conjunction with NHDPlus datasets and parallel computing, and terrestrial and aquatic ecosystem models. Some highlights of the project will be presented. This paper also introduces the newly approved NASA IDS project. In the new IDS project, we will extend this framework to include a mesoscale meteorological model with online chemistry (WRF-CHEM) to address the biosphere-atmosphere exchanges of momentum, energy, water, and other materials, taking full advantage of satellite datasets such as the land use and land cover change, the burned area, surface albedo, trace gases and aerosols. WRF-CHEM can also compute dry and wet deposition of nitrogen (N) species and other pollutants, providing important input to watershed N budgets, riverine N exports, and the N balance in the coastal waters. Our modeling domain will cover the contiguous United States and the surrounding oceans, especially the Gulf of Mexico. While our modeling domain focuses on the watersheds in Texas and the western Gulf of Mexico, the modeling framework is expected to be applicable elsewhere.

Keywords: biogeochemical cycles; biosphere-atmosphere exchanges; climate change; extreme weather events; Gulf of Mexico; nutrient transport

Nitrogen dynamics in intertidal marshes of the Yangtze Estuary

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Abstract

Over the past several decades, reactive nitrogen production has increased by 120%, and global nitrogen overload was identified as a main emerging environmental issue in this century. The reactive nitrogen has exerted a serious threat to the environmental quality of estuarine and coastal ecosystems. To some extent, increasing nitrogen input is an important driver of water pollution (e.g. coastal eutrophication, the development of hypoxic zones, and harmful algae blooms). Therefore, an improved understanding of nitrogen transformations on local and global scales is required to develop strategies to protect the water quality and health of coastal environments and other aquatic ecosystems. The present study investigated the fluxes and transformations of nitrogen in intertidal marshes of the Yangtze Estuary through continuous-flow experiments combined with a N-isotopic technique. It is shown that the fluxes of ammonium and nitrate (plus nitrite) across the sediment-water interface on average ranged from $6.33 - 30.52 \text{ mg/(m}^2\text{ d)}$ and $-97.98 - 16.82 \text{ mg/(m}^2\text{ d)}$, respectively, indicating that intertidal sediments are an internal source for ammonium but as significant sink for nitrate. Additionally, $^{15}\text{NO}_3^-$ -based transformation rates varied from $0.38 - 20.37 \text{ umol N}^{15}/(\text{m}^2 \text{ h})$ for anaerobic ammonium oxidation (Anammox). This implies that denitrification is the main removal pathway of nitrate.

Keywords: Nitrogen; biogeochemical cycle; intertidal marsh; Yangtze Estuary

Spatial and temporal distribution of transparent exopolymer particles (TEP) in the Pearl River estuary, China

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Abstract

The concentrations and size of transparent exopolymer particles (TEP) were measured along the Pearl River Estuary (PRE), China, during wet and dry seasons. The percent of carbon of TEP in total organic pool show higher (with average of 14.21%) in January cruise (dry season) than in wet season, due to diminution of anthropogenic and terrestrial input. In summer cruise, PRE show partially mixed, the TEP concentrations increased from upper estuary to the mid-estuary, but decreased at the near oceanic station in surface. In bottom TEP maximum tended to occur in the mull point at the head of estuary. During dry season, PRE showed well mixed, and the TEP concentrations positively correlated with the turbidity, which indicated that some TEP was derived from sediment. TEP size generally increased seawards along the longitudinal section during two cruises, with dominated sizes spectrum of 2-30 μm . There was a positive correlation between in situ TEP stickiness (calculated by the ratio of TEP:Chla) and Ca^{2+} concentrations for salinity lower 25, which certified that the concentrations of divalent cations could influence the aggregate of TEP via changing the stickiness of TEP in estuary. However, this relationship was not applicable for the samples from the mouth (with salinity $\square 25$) and the samples with the highest concentration in two cruises (at the head of estuary), where the physical factor and the phytoplankton community characterize might play more effect than the divalent cations on TEP formation. The effect of TEP on flocculation in estuary was supported by the positive correlation between the TEP stickiness and the turbidity. This study suggests that the formation of TEP in estuary was one complex process involved physical and biochemical factors interplay.

Keywords: Transparent exopolymer particles; Pearl River estuary; stickiness; turbidity; hydrodynamics.

Spatial and inter-annual variation on HCO_3^- and pCO_2 in the Changjiang River system

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Abstract

For the precise calculation of carbon budget of terrestrial systems at both regional and global scales, investigation on spatial and temporal variation on HCO_3^- , the flux and pCO_2 in the Changjiang River system were carried out based on the monitoring data sets of 19 stations during the period of 1960–2010. Results showed no temporal trend was found on HCO_3^- concentration at the Datong Hydrological Station (DHS, the river mouth) during 1960–1999 (range, 86–122 mg L⁻¹), while the HCO_3^- concentration (range, 49.4–122 mg L⁻¹) in the upper reach of river mouth in 2010 was close to that in the past 40 years. The HCO_3^- concentration in the river displayed big variations spatially (range, 16.8–218 mg L⁻¹); The river exported 18.7±2.25 Mt C yr⁻¹ of HCO_3^- to the estuary with no inter-annual variations during 1960–2010. The annual average pCO_2 was 2308±1604 μatm during 1960–1999, which was close to that in the upper reach of the river mouth in 2010. However, the pCO_2 increased significantly at the DHS after 1990($p<0.01$). It increased from upstream downwards (range, 893±239–1529±492 μatm) in the mainstream and was highest in Poyang Lake (2884±2430 μatm) in the river system; Riverine pCO_2 was higher in high flow period and lower in low flow period, except that in the Minjiang River, which was quite the contrary on seasonal variations. The river system released about 12.1 Mt C yr⁻¹ of CO_2 to the atmosphere, about 64% of the river's total HCO_3^- flux and 4.7–6.4% of the China terrestrial net carbon sink and ignoring the spatial variations can lead to a 15% error in total system CO_2 gas flux estimation. Our study provides a first regional scale of the whole river system overview on pCO_2 and its temporal variation, help to improve the river carbon budget estimate.

Keywords: pCO_2 ; HCO_3^- ; temporal variation; spatial variation; the Changjiang River

Daily Variability of Biogeochemical Processes in Upper Water Column of Sagami Bay, Japan

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Abstract

Data from daily observation of profiling buoy was utilized to infer the episodic term (days-weeks) of biogeochemical variability in Sagami Bay, Japan during winter period. Variations in Chl and nitrate were explainable when examined in the context of episodic physical events of meteorological (winds, air temperature, precipitations, etc) and physical-oceanographic (temperature, salinity, density, current speed and directions, etc) variability in the bay. During the study period, we were able to capture several water masses intrusion events into the bay and subsurface upwelling as well as the influence of high wind velocity to the biogeochemical processes. By combining with the satellites data, the large scale monitoring of the phenomena also can be observed. The present study demonstrates the high temporal-resolution measurements from underwater profiling buoy systems and model can be exploited for a better understanding of biogeochemical process in upper water column in a high dynamic coastal ocean.

Keywords: Profiling buoy, Episodic Events, Chl a, Nitrate, Biogeochemical Process, Sagami Bay-Japan

Effects of air-drying and freezing on phosphorus fractions in soils with different organic matter contents on the east side of Yantai City, China

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Abstract

Little is known about the effects of air-drying and freezing on the transformation of phosphorus (P) fractions in soils. It is important that the way in which soils respond to such perturbations is better understood as there are implications for both P availability and loss to surface waters from soils under climate change. In this study, the effects of air-drying and freezing were investigated using two soils, one being a forest soil (FS) high in organic matter and the other being a sterile soil (SS) low in organic matter. Soil P was fractionated using a modified Hedley fractionation method to examine the changes of phosphorus fractions induced by air-drying and freezing. Generally, there were no significant differences of total phosphorus among the three treatments ($C.V\% < 10\%$). Compared with field moist soils, freezing the soil evoked few changes on phosphorus fractions except that the resin-P increased in FS soil. On the contrary, air-drying significantly changed the distribution of phosphorus fractions for both soils: increased the labile-P (especially resin-P) and organic-P ($NaHCO_3$ -Po, $NaOH$ -Po and $Con.HCl$ -Po) at the expense of $NaOH$ -Pi and occlude-P(Dil. HCl -P and $Con.HCl$ -Pi). Resin-P significantly increased by 31% for SS soil and by 121% for FS soil upon air-drying. The effect of air-drying seemed to be more pronounced in the FS soil with high organic matter content. These results indicated that drying seem to drive the P transformation from occlude-P to labile-P and organic-P and accelerated the weathering of stable P pool. This potentially could be significant for soil P supply to plants and P losses from soils to surface waters under changing patterns of rainfall and temperature as predicted by some climate change scenarios.

Keywords: P transformation; Hedley fractionation; Air-drying; Climate Change; Forest soil; sterile soil.

Nutrient dynamics in the macro-tide Jiulong River estuary, China: distribution and export fluxes to the sea

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Abstract

As the only water discharge passage of the second largest river in Fujian Province, China, the Jiulong River Estuary (JRE) is a typical macro-tide estuary located in the western coast of the Taiwan Strait, which is one of the most highly developed regions in China. Surrounded by two populated cities of Xiamen and Zhangzhou, the estuary has been greatly impacted by anthropogenic activities. In this study, for the purpose of nutrient dynamics investigation, nine surveying cruises were conducted in the JRE during April 2008 to April 2011, covering all the four seasons. During these cruises, water depth samples were collected at selected sites for salinity and nutrient determination. We found that the distributions of dissolved inorganic nitrogen (DIN) and silicate were nearly constant during all these cruises and basically followed conservative dilution in the estuary, while concentrations of phosphate varied narrowly (1-2 M) in the upper estuary ($Sal > 25$) and they were quickly diluted in high salinity region by relatively oligotrophic near-shore seawaters. Following the methodology of Officer (1979), we estimated the effective export concentrations of the nutrients elements as 3.0 M for phosphate, 262 M for silicate and 255 M for DIN. Based on the water discharge dataset published in website of Bureau of Hydrology, Ministry of Water Resources, China, we obtained first order estimation of export fluxes of phosphate, silicate and DIN from the JRE to the adjacent Taiwan Strait as 0.35×10^8 mol P/year, and 32.0×10^8 mol Si/year, and 31.2×10^8 mol N/year, respectively. Significantly, the above-estimated export fluxes of DIN and silicate from the JRE account for 2.9% and 4.5% of the export fluxes from the Changjiang River in the late 1990s, although the annual water discharge from the Jiulong River is only equal to 1.5% of that from the Changjiang River. Furthermore, by compared with historical datasets collected in the 1980s, the export fluxes of DIN and phosphate have increased 2-6 times, while the export flux of silicate decreased from 125,000 ton Si/year to 89,000 ton Si/year. Such nutrient changes may fundamentally contribute to recent algal bloom events in Xiamen Bay and the JRE.

Keywords: Jiulong River Estuary; nutrient; eutrophication; export flux

Air-sea CO₂ fluxes in the southern Yellow Sea: an examination of continental shelf pump hypothesis

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Abstract

We estimated air-sea carbon dioxide (CO₂) fluxes in the southern Yellow Sea (SYS) using surface water partial pressure of CO₂ (pCO₂) measured in winter, spring and summer, as well as that estimated in fall via the relationship of pCO₂ with salinity, temperature and chlorophyll a. The results indicate that overall, the entire investigated area was a net source of atmospheric CO₂ during summer, winter and fall, whereas a net sink during spring. Spatially, the nearshore area was almost a permanent CO₂ source, while the central SYS shifted from a CO₂ sink in spring to a source in the other seasons of the year. Overall, the SYS is a net source of atmospheric CO₂ on an annual scale, releasing ~7.38 Tg C (1 Tg = 1012 grams) to the atmosphere annually. Thus, the updated CO₂ uptake flux in the combined SYS and ECS is reduced to ~0.86 mol C m⁻² yr⁻¹. If this value is extrapolated globally, the global continental shelf would be a sink of ~0.29 Pg C yr⁻¹, instead of 1 Pg C yr⁻¹ (1 Pg = 1015 grams).

The SYS as a net annual source of atmospheric CO₂ is in sharp contrast to most mid- and high-latitude continental shelves, which are CO₂ sinks. We argue that unlike the ECS and the North Sea where carbon on the shelf could be exported to the open ocean, the SYS lacks the physical conditions required by the continental shelf pump to transport carbon off the shelf effectively.

Keywords: air-sea CO₂ fluxes; carbon export; continental shelf pump; southern Yellow Sea

Distribution of partial pressure of CO₂ in Jiaozhou Bay, an area highly affected by urbanization

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Abstract

Distribution of partial pressure of carbon dioxide (pCO₂) in Jiaozhou Bay was investigated based on the cruises in November 2007 and February 2008. Results showed that surface seawater pCO₂ ranged from 315 μatm to 720 μatm with an average of 418 μatm in autumn and biological activities controlled the spatial distribution of pCO₂. In winter, sea surface pCO₂ ranged from 145 μatm to 315 μatm with an average of 249 μatm , and the spatial distribution of was mainly controlled by biological uptake. Air-sea CO₂ flux in fall (November) was 2.87 mmol m⁻² d⁻¹, while -16.22 mmol m⁻² d⁻¹ in winter (February). Temperature and biological uptake were the main factors that manipulated the seasonal variation of pCO₂ from fall to winter, whereas respiration process cannot be neglected either.

Keywords: biological activity; Jiaozhou Bay; pCO₂; respiration; temperature

Session: C1/A5 Keynote

Developing a baseline of European coastal governance

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Abstract

This paper reports preliminary results of the application of the LOICZ handbook for assembling a baseline for the analysis of governance responses to ecosystem change (Olsen et al., 2009), using case study applications at the sub-national, regional level from around Europe. This methodology has been developed at a crucial juncture as new systems of governance in marine and coastal areas are seeking to respond to strong development agendas. There is a commitment at the highest level of decision-making in Europe to move forward Integrated Coastal Management and Maritime Planning. The system is on the threshold of change, still not understanding how effective current practice has been. The LOICZ methodology provides the opportunity to build this understanding amongst the academy and practitioners. The paper reports on two methodological challenges. Firstly we outline the key challenges in developing a baseline for comparative analysis, including: methods for institutional analysis, dealing with already existing local initiatives with their vested interest throughout multiple, nested scales of planning and management; developing a global terminology; conceptualising

governance where regimes cross the land-sea divide; the balance of stakeholders vs. expert assessment; and the development of long term analysis of governance. Secondly, we consider some of specific characteristics of European governance, including: the importance of the supranational dimension; the influence of legal and administrative traditions; the long history of land-use and sectoral management; and the nature of bureaucracy, reflected in agency led delivery of directives and regulations with the adaptive capacity it requires. By applying the LOICZ methodology, we seek to move beyond current process-based methodologies in the literature, to an assessment of nested governance which links outputs to outcomes in coastal regions around Europe.

Marine Functional Zoning (MFZ) in China

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Abstract

Marine Functional Zoning (MFZ) means that according to condition of geographical location, the natural environment and natural resources, status of development and protection, and the needs of economic and social development, the sea area is divided into different functional zones with different use types and environment quality requirements. There are five basic principles of MFZ. First, scientifically defining the functions of the sea areas in light of such natural attributes as their geographical location, natural resources and natural environment; Second, making overall arrangements for the use of sea areas among various related sectors according to the needs of economic and social development; Third, protecting and improving the ecological environment, ensuring the sustainable utilization of the sea areas and promoting the development of the marine economy; Fourth, ensuring the maritime traffic safety; Fifth, safeguarding the security of national defense and guaranteeing the needs in the military use of the sea areas. In China, MFZ can be classified into three administration grades. National MFZ is made by State Oceanic Administration, in conjunction with the relevant departments under the State Council and the coastal provincial, autonomous regional and municipal governments, and must be submitted to the State Council for approval. Provincial MFZ is made by oceanic administrative departments of provincial government in conjunction with the departments concerned in this government and must be submitted to the State Council for approval. City and county MFZ are made by oceanic administrative departments of city and county governments in conjunction with the departments concerned in this government and must be submitted to the provincial government for approval. MFZ classifies functional zones into Port and shipping area, Agriculture and fisheries area, Mineral and energy area, Tourism area, Protection area, Industrial and urban area, Special use area, Reserved area.

Keywords: Marine Functional Zoning; China; Basic principles

Session: C1/A5 Oral**Shifts in maritime boundaries due to sea-level rise-legal implications and potential conflicts**

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Abstract

One of the less studied impacts of accelerated sea-level rise (SLR) is its potential effect on the delimitation of maritime zones, such as the exclusive economic zone (EEZ). Retreating coastlines and submergence of territorial islands can affect this delimitation in various ways, for example by altering the baseline from which the EEZ is defined or by rendering regions uninhabitable due to frequent flooding or saltwater intrusion into aquifers. According to Article 131 (1) and (3) of the United Nations Convention on the Law of the Sea (UNCLOS), islands must be naturally formed land areas, above water at high tide and able to sustain human habitation or economic life in order to generate baselines upon which EEZ claims may be based. In the present study we explore legal implications and conflicts that could arise from shifts in maritime boundaries due to SLR. First, we explore the response of coastal baselines under a scenario of 1.5m of global mean SLR in geographically and legally distinct regions. Based on this scenario we estimate the modified delimitation and extent of the EEZ for the coastal states involved. We then discuss the implications of frequent flooding, saltwater intrusion and availability of water resources for the delimitation of the EEZ. Based on these findings, we identify hot spots where such changes of coastlines and territorial islands could not only cause the respective regions to become uninhabitable in the near future, but might consequently have profound impacts on maritime boundary delimitation, amplify existing conflicts or trigger new ones between coastal states. The study shows that adaptation to climate change has a significant legal component which will become increasingly relevant.

Keywords: sea-level rise; maritime boundaries; exclusive economic zone

The coastal innovation paradox and imperative: Reframing coastal governance

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Abstract

Business and technological innovations imperil coastal communities because past and prevailing practices have destroyed, transformed and degraded the ecosystems that sustain coastal livelihoods. Consequently, coasts are the ‘frontline’ in humanity’s endeavour to learn to live sustainably in the face of global change. Governance innovations have done little to stem the tide of unsustainable coastal activities. Paradoxically, innovation is necessary to navigate a way out of the ‘vulnerability trap’ that past innovation has unwittingly set. This presentation explores the coastal innovation paradox and imperative. The nature and dimensions of innovation are outlined, including distinctive features of governance innovation. Notwithstanding wholesale innovations in governance and public sector management, the sustainability crisis is deepening. Why is it so difficult to mobilise effective collective action for coastal sustainability? Locating coastal management within the wider milieu of evolving and multi-layered governance helps to answer this question. Resolving the coastal innovation paradox necessitates coherent innovation across governance episodes, processes and cultures. The coastal innovation imperative is to reframe and underpin business and technology with coherent governance innovations that lead to social transformation for coastal sustainability. How might coastal management help to facilitate this transition? Coastal management needs to be reconceptualised as a transformative practice of deliberative coastal governance. A foundation comprising four deliberative or process outcomes is posited. First, human and social capital needs to be built through issue learning and improved democratic attitudes and skills. Attention then shifts to facilitating community oriented action and improving institutional capacity and decision-making. Together these endeavours enable improved community problem-solving. The ultimate process goal is to build more collaborative communities. Instituting transformative deliberative coastal governance will chart new sustainability pathways and help to resolve the coastal problématique.

Keywords: Coastal innovation paradox, coastal innovation imperative, transformative innovation, deliberative coastal governance

» ABSTRACTS C1/A5 «

Social-Ecological Systems (SES) and Scales in the North Sea

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Abstract

The foremost challenge for coastal and marine management in the North Sea is to govern a complex maritime system that is linked to several policy arenas and covers several interconnected scales. The North Sea is characterized by strong transnational linkages between adjacent countries and European policies and transnational regulations as additional policy levels. The presentation will discuss aspects of institutional settings and effects of scaling in the North Sea with particular reference to offshore wind farm development, which is the main driver for sea use change in North Sea countries. However, offshore wind farm development is embedded in a complex organizational and institutional setting, which is characterized by a highly complex web of policies, institutions and mechanisms that cut across a range of different spatial and jurisdictional scales. As well, natural scales can be highly important when assessing impacts from human activities on the ecosystem. One particular challenge in Europe is the transnational character of EU policies, which requests integration between the Member States, who at the same time all have to deal with integration of their own sectoral policies including the involvement of public and private actors.

Keywords: Scale; Social-Ecological Systems; Offshore Wind farming; North Sea; sea use change; marine policies

Planning for ocean energy development in the EU: spatial needs and future requirements

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Abstract

Across Europe marine renewable energy, in the form of offshore wind, wave and tidal, has been identified as a key way in which countries can address their renewable energy obligations, carbon emissions and security of energy supply. Planning for such developments will be a key challenge given the variety of device types, their environmental effects, required onshore infrastructure and sheer size of the structures involved. Many EU Member States have set specific targets for ocean energy in their National Renewable Energy Action Plans (NREAPs). Numerous other industry association roadmaps, government strategies and economic 'think-tank' organisations have also put forward a range of scenarios for ocean energy development. This paper reviews Maritime Spatial Planning systems in the EU and how these currently address planning for ocean energy development, if at all. Using available information on the spatial requirements for specific devices, an estimate can be made of the number of wave and tidal energy farms that will be required to achieve the proposed Member State targets and what the spatial footprint of such farms will be in the marine environment. This will assist in determining probable effects on existing maritime activities and inform the development of a more suitable planning process.

Keywords: ocean energy; Maritime Spatial Planning; spatial footprint; European Union.

Research on coastal principal function zoning: a case study on Wenzhou, China

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Abstract

China's 11th Five - Year Plan calls for the principal function zoning in the whole country, which is to distinguish four kinds of principal function sections from the whole country according to the ecological carrying capacity, the exploitation density and the development Potential. However, the formulation and implementation of the principal function zoning is a long time-span complex process. Especially, there is not a corresponding theoretical and methodological system in coastal area, coastal principal function zoning is a coordinated way to formulate the reasonable developing patterns and structures, according to the existing developing technologies and potentials, based on maximizing the total function and coordinating the development in different coastal zones. The paper attempts to put forward an ecologically based technique for the principal function zoning and takes Wenzhou as an example to mainly discuss the general principles, the basic flow, the index system and the distinguishing techniques. The results will provide new references for coastal spatial planning and coastal management.

Keywords: Coastal principal function zoning; Case study; Wenzhou

Coastal Principal Functional Zoning (CPFZ) in China

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Abstract

As an innovative guiding ideology in China, principal functional zoning (PFZ) adopted by the state council was firstly proposed in the national “the Eleventh Five-Year Plan” in 2005 and further promoted by the national “the Twelfth Five-Year Plan” in 2011. Until now, both PFZ of land and sea territory have been finished primarily and formed a two-level (national and provincial) zoning system. PFZ is a new practical way of dividing the territorial space into four principal functional zones (centralizing development, optimizing development and prohibiting development zone) with special policy and development orientations, according to the resources and environmental carrying capacity, the existing developing intensity and development potential. Because of their importance in politics, society, economy and culture, complexity of natural process and vulnerability of ecology and environment, coastal principal functional zoning (CPFZ) is an urgent need for regional management as a brand new and more effective zoning in coastal areas, zoning the development space to optimize the reasonable developing patterns and structures in a coordinated way, based on maximizing the total function and coordinating the development in different zones, fully considering land-sea interaction. The background, aims and objectives, theories, methodology and progress of PFZ are summarized in this paper. Due to the short development history of PFZ in China, there are still many problems (the significance and roles of PFZ in the context of existing spatial management system; the results of zoning; approaches and methods; legal basis; stakeholder participation; management system and so on) to be solved. Based on the critical review on both within China and international evolvement on the coastal and marine zoning experience, a proposal of how to develop CPFZ framework from the perspective of boosting equilibrium and sustainable coastal development in China is offered in this paper.

Keywords: principal functional zoning; principal functional zone; spatial management; coastal principal functional zoning

» ABSTRACTS C1/A5 «

Maritime spatial planning in a cross-border context: the Belgian/French experience

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Abstract

Cross-border issues are crucial to implement maritime spatial planning (MSP). Indeed ecologically as well as economically, transnational perspectives are essential to manage maritime environment with an ecosystem approach. Departing from Belgian/French border case, the presentation aims to assess the added-values and constraints to integrate a cross-border approach to MSP. We will lay out how integrated and prospective approaches of MSP meet national borders, which consequences can be expected especially for fisheries and future marine protected areas. The European legislation already strengthens cross-border cooperation at sea through Marine Strategy Framework Directive and Water framework Directive among others. Moreover, European Commission is currently assessing a possible legal improvement concerning integrated coastal zone management and MSP, we will analyze how cross-border cooperation could be improved in such a way. Departing from a concrete case study, the presentation will draw more broadly cross-border issues for MSP and investigate possible options to improve current cooperation.

Keywords: Maritime Spatial Planning, Cross-Border Governance, European Law, Sea Use Management

The Spatialized Markov Method for Land-Use Change Simulation: a case study in Shandong province, China

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Abstract

In this study, based on land use data of Shandong province in 1990, 1995, 2000 and 2005, the Spatialized Markov Model has been put forward and applied to simulate the land use change. In detail, the Markov mathematical theory and GIS spatial analysis techniques were combined together, and three scenarios were designed to test its performance; for each scenario, the initial situation matrix, the primary transition probability matrix were created on 1km scale. For the first scenario, land use map in 2000, 2005 and 2010 were simulated based on real land use map in 1990 and 1995. For the second scenario, land use map in 2005 and 2010 were simulated based on real land use map in 1995 and 2000. And for the third one, land use map in 2010 was simulated based on real land use map in 2000 and 2005. The deviation index, Kappa coefficient and error matrix were used to evaluated the modeling results, and seven 10 km * 10km cells were selected to evaluate the spatial differences of model performance. The results shows that: overall, the simulation precisions of farmland, grassland and forest are higher than that of urban area, country and construction land, and the shorter the simulation period, the better the performance; furthermore, the performance shows notable spatial differences and complexities. Overall, the Spatialized Markov Model performs well to simulate land use changes, and very different from most of the other leading LUCC models being used, the Spatialized Markov Method has two unique merits, the first, it's unnecessary to carry out driving forces analysis and therefore can be easily transfer to other regions; and the second, the outputs include ratio scale maps for each land use type and nominal scale land use map, both of them will be valuable information for related cross studies such as hydrological and ecological modellings.

Keywords: land use change , Spatialized Markov Method, Shandong province, spatial analysis

Seeing another's perspective: the role of spatialised fuzzy cognitive mapping and visualisation in conflict resolution, stakeholder participation and knowledge integration for marine spatial planning

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Abstract

Methods and techniques for the successful implementation of marine spatial planning (MSP) are needed. Before creating a marine spatial plan, the diverse and often competing interests of a range of stakeholder must be sought and, as far as possible, reconciled and integrated within a single conceptual framework. This requires an inclusive, participatory approach to management, involving shared identification of key elements, processes and functioning within the marine system; mutual understanding of critical interrelationships; and broad agreement regarding the likely or anticipated outcomes of any policies or decisions embodied in the proposed spatial plans. It also necessitates recognition that the maritime domain is dynamic, nuanced, and subject to multiple interpretations and perspectives.

Eliciting these essential layers of information is a challenging task, and requires a combination of bottom-up and top-down approaches. Marine planners, managers and decision-makers need access to good quality, scientifically sound information, as well as an awareness of the concerns and interests of various marine stakeholder groups; the sustainability of any MSP also requires informed buy-in from users of the relevant marine space. We propose participatory fuzzy cognitive mapping (FCM) to overcome these challenges. FCM links to and extends traditional systems analysis, especially, the more recent “soft systems methodologies”. It facilitates explicit identification of conflicting stakeholder perceptions regarding the roles and relationships among key system elements, processes and functions, allowing such conflicts to be addressed and negotiated in a mediated group setting. We present here an extended and spatialised FCM framework, to take account of the inherently geographical dimensions of marine spatial planning. This allows scenarios of proposed system state changes, resulting from marine spatial planning interventions, to be visualised and presented to stakeholders, encouraging dialogue, accommodating the demand for knowledge integration, and facilitating informed deliberation regarding the ramifications of a given marine spatial plan.

Jakarta Bay Indonesia: Identifying strategic issues for governance reform in conflict resolution, stakeholder participation and knowledge integration for marine spatial planning

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Abstract

Jakarta Bay is located at the north-west part of Java Island, Indonesia. The length of Jakarta Bay is about 35 km, stretches from Tanjung Pasir at the west and Tanjung Karawang at the east facing the Java Sea to the north. At the west part of the Bay lays around 100 small islands lengthwise to the north-west direction. The Bay spreads in three provinces which have a total population of 63 million people. The Bay is in a deprived state due to several reasons. These include water pollution, uncontrolled coastal resources exploitation and as the impact of conflict between users. Water condition particularly in a strip of five kilometres wide from the shoreline experiences a severe pollution including high heavy metals, nutrients and pesticides concentration and pooled of garbage. Garbage pooled along shoreline and in the estuaries drift from inland by 13 rivers and canals which run onto the Bay. Destructive fishing practices, sand mining and coral reef extraction also happened in the Bay. Transformation of natural ecosystem that involves mangrove area conversion and land reclamation is another issue that happens in the Bay. Furthermore social issues occur due to competition between users and the group that harshly affected is local fishermen. The position of the Bay that administratively under three different provinces and four different cities adds further problems and complexity in managing the Bay. These multi-problems show that coastal ecosystem approach is insufficiently applied in managing Jakarta Bay and as well as sustainable development strategy. This paper looks into how Indonesian government manages the Bay and identifies the strategic issues; as the first step toward wiser governance.

Keywords: Jakarta Bay; pollution; overexploitation; users conflict; land use; governance.

Ecosystem-based Fisheries Management (EBFM) to Secure the Vulnerable Fisheries of Central Java Province-INDONESIA: An adaptive Strategy to Solve the Climate Change Phenomena

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Abstract

Indonesia is a maritime country, it composed about 17,500 islands with 220 millions in population. Central Java province is considered as the densely populated province with population of 35 million persons. Central Java shared a significant role in man-powering fisheries sector in Indonesia. In the northeast of Central Java are found many fishing landing places, e.g. Tegal, Pemalang, Pekalongan, Pati and Rembang, whereas Cilacap is the biggest landing place in the southern coast of Central Java. From those landing places are signaling a decreasing in fish production. The fisheries resource is almost and/or had have been over-exploited. A lots of efforts have been putting on to manage the fisheries resource. Several conventional fisheries management had have been employed but might not performed effectively some how. It is adversely by the climate change, in facts many parties have not prepared yet to react for the adaptation with such uncertain situation. This study is aimed to explore the possible alternative of facing out of the fisheries management. Then, ecosystem-based fisheries management (EBFM) is introduced in Central Java province as the pilot project. Primary data are collected from the relevant parties or stakeholders. Discussion and FGD with key-persons and other competence persons were carried out, while secondary data are used to enrich the analysis. The study employed a GIS in marine meteorology and socio-economics approaches (Susilowati, et al., 2008; 2010) with necessary modification. Several salient findings of the study, among others are: (1) evidence of climate change in some extents of small scale fisheries in Java; (2) evidence of the impact on vulnerable fisheries in the selected area; and (3) a short term prescription on adaptation strategy to cope the climate change in small scale fisheries sector in Java. Of course, in the short term the EBFM has not yet proven precisely as the suitable approach of fisheries management in Central Java. However, this form of management is indeed need to be encouraged for further research and trials as the promising new paradigm of fisheries management for Indonesia.

Keywords: fisheries, management, vulnerable, ecosystem, climate change, Indonesia.



Session: C2 Keynote

Tension between resilience and sustainability in a rapidly urbanizing coastal zone, Quintana Roo, Mexico

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Abstract

Urbanization is a physical process but also a social and cultural one. Urbanization processes, especially labour migration, layered on top of expectations about political and economic inclusion shape greatly the relationships between dominant development processes and alternatives. Drawing from field work in Quintana Roo, Mexico's most rapidly urbanizing coast line, this paper explores the ways in which values underpin and are reproduced by patterns of local social organisation. In particular, the impact of Hurricane Dean on this process is explored. The finding is that while the status quo is very resilient – flexible in everyday activity while retaining a core vision of development – the core development process this protects, mass-high-impact-tourism funded by external capital is unsustainable.

Research on Integrated Disaster Risk Governance of Coastal Zone in the Context of Global Environmental Change

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Abstract

To achieve sustainable development, understanding of the impact of global environmental change on natural resources and the frequency, intensity, and spatial-temporal patterns of all kinds of hazards should be advanced. In recent years, severe losses of human lives and property have been caused by very large-scale natural hazards all over the world, such as the freezing rain and snowstorm disaster in China in 2008, Typhoon Sidr in Bangladesh in 2007, and Hurricane Katrina in the United States in 2005. Strengthening the study on integrated disaster risk governance has become a pressing issue of sustainable development. Supported by the Chinese National Committee for the International Human Dimensions Program on Global Environmental Change (CNC-IHDP), its Working Group for Risk Governance proposed to the IHDP in 2006 to launch a new international research project on integrated risk governance (IRG) in the context of global environmental change. The IRG-Project was accepted by the IHDP Scientific Committee as a pilot science project in 2008 and was approved in 2010 as a full IHDP core science project under the Strategic Plan 2007–2015. The research foci of this international science project will be on the issues of science, technology, and management of integrated disaster risk governance based on case comparisons around the world, in order to advance the theories and methodologies of integrated disaster risk governance and to improve the practices of integrated disaster reduction in the real world.

Keywords: catastrophic disaster coping; disaster risk; global environmental change; sustainable development



» ABSTRACTS C2 «

Session: C2 Oral

The research on effects of the leading cities in Shandong Peninsula Urban Agglomeration for regional urbanization

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Abstract

Since the reform and opening, the development of urbanization in Shandong Province has been rapidly increasing, ranking the top level in China. Particularly, the Shandong Peninsula Urban Agglomeration (SPUA), who performs the most prominent in the development of urbanization, has become an area with the fastest urbanization speed and the uttermost level in Shandong Province. Compared to agglomerations of the Yangtze River Delta and Pearl River Delta, however, the leading cities in SPUA, such as Jinan and Qingdao, have not played their radiating and exemplary roles adequately, and effects on the promotion to regional economy are limited. From the respective of economic base, industrial structure and economic hinterland, this article analyzes the reasons why the development of leading cities in SPUA has lagged behind that in the Yangtze River Delta and the Pearl River Delta. Furthermore, to make most use of the geographical advantage to develop foreign trade, to enhance the adjustment of industrial structure, product structure and enterprise structure, and to improve the development of regional unique economy are suggested countermeasures to intensity the stimulating efforts of leading cities in SPUA.

Keywords: Leading cities; radiating and exemplary effort; Shandong Peninsula Urban Agglomeration (SPUA); urbanization

Climate Change and Coastal Cities of the Future: Challenges for the sustainable use of Energy and Water

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Abstract

(Coastal) Cities play a major role in tackling global climate change. (1) Nearly $\frac{3}{4}$ of the global energy production is consumed in urban areas and it is mostly fossil energy. Furthermore their population is rapidly growing – as well as their demand for energy and water. (2) Simultaneously urban centres, especially those in coastal areas, are highly vulnerable to impacts of climate change. (3) Finally, coastal areas are centres of energy production. This in turn contains risks and has various impacts on water resources. Consequently, the resilience of the energy and water system is crucial for the sustainable functioning of coastal cities. The interplay between energy supply and water management in urban coastal areas are being systematically analysed referring to the concept of vulnerability and resilience. It is distinguished between industrialized countries and developing countries (Case Studies from Germany and Ghana are presented). It is shown that cities of industrialised countries are characterised by a high energy demand. Places of fossil-nuclear energy production are often located in the coastal zone. Accordingly the desired transformation to low carbon cities implies that few central places of energy production are replaced by area-intensive renewable energies. This would alter the relationship between the urban area and its hinterland (respectively the land use in the coastal zone), which needs new governance arrangements.

However, in developing countries the energy and water infrastructure is not yet fully established: water and energy shortage is a major barrier for the economical development and social equity. In addition poor water quality is a serious health hazard and has negative impacts on the coastal and marine system. That is why the challenge is twofold: There is a strong need to set up a sustainable water and energy infrastructure that is already adapted to a changing climate, and it must be oriented on the vision of a low carbon, climate proof city. However, the general conditions of coastal cities in developing countries concerning development status and mitigative and adaptive capacity of the governance system is rather disadvantageous. In the conclusion selected challenges for a sustainable energy and water management of coastal cities and future research questions are highlighted.

Keywords: adaptation, renewable energy, mitigation, urbanisation, water quality

An integrated plan for coastal area in the context of urbanisation and climate change

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Introduction

Asia is going through a rapid economic growth as well as urbanisation. Asia has a long coastline and it is being affected by unsustainable pattern of development, pollution, soil erosion and sedimentation, ecological damage and occasional threat due to sea level rise and natural disaster. Integrated coastal planning and management has been emphasised and coastal zone regulations have been enforced in some countries but in the changing landscapes of coastal urbanisation, an integrated plan with concepts of conservation, environment and development is urgently necessary.

2. Case Study: Aqueous Bengal Delta

Bengal delta is the largest delta in the world and lower delta near the Bay of Bengal is Sunderbans which has a dynamic physiographical and geomorphological evolutionary history. It is part of UNESCO's biosphere programme with biodiversity area, wild life sanctuaries, mangroves and wetlands of various kinds and islands.

3. Coastal Area – Environmental Parameters

Some of the suggested studies may include (a) a comprehensive inventory of rivers, canals, wetlands and estuaries from physical, ecological, hydrological and socio-economic aspects (b) prevention of soil erosion as well as sedimentation and abatement of pollution (c) restoration of water bodies dried up canals etc. Conservation of mangroves and bio diversity area (d) preservation of culture and craft of people and participatory development (e) Adaptation and mitigation measures for natural disasters control on aquaculture and land use development.

4. Conclusion

Because of complexity of environmental issues and variety of uncoordinated projects by Government and private organisations and peoples livelihood options an integrated long range holistic regional environmental management plan is necessary within this. A periodical environmental audit for coastal areas will also be required.

Keywords: Biodiversity, Biosphere, Conservation, Ecology, Mangroves.

Will sea level rise lead to migration in the megacities? A case study of Shanghai city

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Abstract

Shanghai is one of the most important megacities in China. Being a low-lying coastal megalopolis, Shanghai has been seriously warned about the climate-related risks: sea level rise (SLR), storm surges, saline water intrusion, flood hazards, and etc. Although we realize the increasing frequency and intensity of these climate-related risks under the global warming, whether and to what extent will they lead to migration? The uncertainty of climate-related forecast and especially the local adaptation measures make the migration estimation challenging. This paper first establishes a conceptual model of climate risk-migration response. Then based on literature review, it identifies the climate-related risks that Shanghai will face and forecasts the frequency and magnitude under various scenarios. It also evaluates the adaptation measures that Shanghai government had already taken. This paper conducts cost-benefit benefits assuming three conditions: inadequate adaptation, improved adaptation, and enough adaptation. Then through GIS based analysis, this paper estimates the inundation and migration possibility. At last this paper put forward some policy suggestions about the adaptation and migration.

Keywords: Migration; Sea level rise; Shanghai

Session: C3 Keynote

Coastal disaster narratives: Learning from Katrina, the BP Oil Spill and Climate Change

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Abstract

Coasts are the locus of humanity's struggle to come to terms with the limits to growth. Business as usual is unsustainable, and disaster risk is escalating. Building sustainable, hazard-resilient communities is the pre-eminent challenge of the 21st Century. What can we learn from coastal disaster narratives to build such communities? I reflect on three interwoven stories: Hurricane Katrina, the BP oil spill and the unfolding climate change peril facing coastal communities in Louisiana, USA. These narratives are pertinent to all coastal nations, given the prevalence of natural and anthropogenic hazards in this era of global change. Hurricane Katrina is primarily a story about a natural hazard that became a human-induced disaster because of inappropriate coastal development, the levee-failure induced flooding of New Orleans, a failed response effort and, in particular, persistent and deeply entrenched social vulnerability in the world's 'richest' nation. Does a 'Katrina' await other coastal nations? The BP oil spill is an example of a technological disaster with massive socio-economic and environmental ramifications. It is, however, primarily a story about the failure to reconcile the creation, bearing and sharing of private and public risk; a challenge that faces all coastal nations. Louisiana is a global hotspot for climate change. The lessons learned from efforts to adapt to the impacts of this slow onset disaster have the potential to inform vulnerable coastal communities around the world. These distant stories reveal important insights for local disaster risk reduction and resilience. I explore two insights: First, we face an 'innovation paradox.' Human ingenuity and innovation have yielded many benefits but 'business as usual' imperils our future. A new kind of innovation is needed to reduce disaster risk and facilitate the transition to sustainability. Business and technological innovation needs to be reframed and underpinned by transformational governance innovation for sustainability. Second, there is no governance panacea for reducing disaster risk and building resilience. A framework is presented to show that a repertoire of governance modalities can be drawn upon, experimented with and a choice of modality negotiated to 'fit' changing circumstances – which range from transient shocks to long-term stresses. In the face of adversity and change, there is a need to align specific governance episodes, dominant governance processes and evolving governance cultures. Transformational innovation can be mediated by elicitive meta-governance endeavours that build 'layers of resilience' to ameliorate 'waves of adversity.'

Keywords: Coastal disaster narratives, coastal governance, resilience, sustainability

Session: C3 Oral**Environmental assessment on erosion/siltation in Jiaozhou Bay (China) over a 75-year period, regarding P-A relationships**

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Abstract

On the basis of seabed bathymetry and coastline comparisons from sea charts (1936-2002) and Landsat-5 TM images (1986-2011), the sedimentary environment, in terms of erosion/siltation in Jiaozhou Bay, has been assessed for the past three-quarter century. The assessment index is put forward for nine types of sedimentary environment, according to the deposition rates. Results show that the slight siltation was generally present from 1936 to 1963 in Jiaozhou Bay, except for some patched slightly erosion within the embayment. However, the main channels in the central embayment turned into a slightly erosion pattern from 1963 to 1982, together with a relative stable sedimentary environment in total. Subsequently, most of the coastlines had been extended significant towards the sea, with a rate of $101\text{-}102 \text{ m yr}^{-1}$ since 1986, due to human activities, mainly reclamation over the northwest tidal flat and harbor construction along the east and south coast, while the seabed in deep water (bathymetry $> 5 \text{ m}$) was in a slightly erosion pattern indicating navigation channels maintained. In addition, an equivalent friction coefficient (EFC) is proposed to evaluate the P-A relationship of the large tidal inlets in Jiaozhou Bay. The result shows that the current velocity amplitude and EFC decrease, indicating an unstable trend in Jiaozhou Bay over the past decades. However, the bay entrance is composed of basement rock and thus the entrance area cannot adjust with the hydrodynamic patterns. The equilibrium of such kind of tidal inlet is controlled not only by the feedback mechanism between hydrodynamics (e.g. tidal prism and current-velocity amplitude) and sediment deposition rates, but also the entrance lithology.

A holistic and integrated framework for assessing adaptive capacity to climate change

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Abstract

Adaptive capacity to climate change is generally considered as essentially determined by economic features. It is thus usually acknowledged that ‘the poorest communities are the most vulnerable to climate change because they lack adaptive capacity’. This limited conception however does not reflect all of the fundamental characteristics of a society (e.g. territorial identity, social relationships and traditional knowledge) which explain its ability both to cope with and to anticipate natural hazards. Moreover, it tends to favour the import of standardised adaptation strategies that finally entail the degradation of local specificities (e.g. indigenous knowledge, social networks), while they might be powerful adaptation levers. It is thus crucial to renew our conception of what makes adaptive capacity to climate change, especially when considering local scale contexts. From our viewpoint, this biased but widespread conception of adaptive capacity takes root into a relative immaturity of the science of adaptation in understanding the true underlying processes and determinants of the (un)ability of a community to cope with future climate threats. This immaturity results in a lack of a comprehensive and integrated framework for studying adaptive capacity. This will thus be the goal of this communication to present an innovative framework based upon four influential factors of adaptive capacity: the “societal cohesion”, the “economic diversification”, the “political and administrative structure” and the “general living conditions”. The influence of environmental features (“spatial configuration” and “environmental sensitivity”) in reinforcing or weakening adaptive capacity will also be discussed. Based upon local scale examples from developing countries, we will highlight the way in which each factor influences adaptive capacity and how it interacts with others. We will thus demonstrate that such a holistic and integrated framework is relevant to emphasize empirical knowledge on adaptive capacity, and then to identify the true room for manoeuvre of local communities.

Keywords: Research framework, Adaptive capacity, Climate change.

Is vulnerability “to climate change” measurable?

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Abstract
 Climate change will be an important driver of change in coastal areas. Considerable efforts have thus been made during the past two decades to assess, from a quantitative and economic-based perspective, communities’ vulnerability to future climate change. We however argue that because of the complexity of the relationships between climatic changes and long-term societal dynamics, this quantitative goal cannot be fully achieved and that parallel approaches are needed, especially those focusing on the “trajectories of vulnerability”.

According to the IPCC, a territory’s vulnerability to climate change leans on three components: its exposure to natural hazards, the sensitivity of its ecosystems and the adaptive capacity of its society. Yet, uncertainties remain considerable and partly uncompressible at the same time in terms of the impacts of climate change at a local scale, of specific ecosystems’ responses to future pressures and of tomorrow societies’ ability to cope with future threats. Quantitative assessments of future long-term vulnerability thus turn out to be often more speculative than based upon empirical knowledge.

We argue here that paying attention to the evolution of vulnerability could provide more robust insights than trying to measure its level several decades before changes occur. This implies considering two steps: (i) a comprehensive understanding of the current vulnerability; i.e. its processes and drivers (e.g. cultural values, relations to the environment, socioeconomic inequalities); (ii) the analysis of its temporal dimensions, i.e. its anthropogenic and environmental roots and rationales. Linking the past and the present leads to highlight “trajectories of vulnerability” and thus to emphasize a trustworthy knowledge to confront to the potential impacts of climate change in order to say something tangible about future vulnerability. Additionally, while quantitative analysis remain descriptive, analysing “trajectories” favours a comprehensive understanding based upon empirical knowledge, what is crucial for building realistic adaptation strategies.

Keywords: Climate change, vulnerability, assessment, trajectory of vulnerability.

Ecological risk assessment of typhoon and storm-surge disasters in the coastal land of China

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Abstract

Natural disaster’s risk is an important issue in vulnerable coastal zone. Formerly, people pay more attention to hazards of economic damage and injure numbers. This study focuses on ecological risk assessment of typhoon and storm-surge disasters in the coastal land of China. The risk sources, typhoon and storm-surge, their intensities are expressed by occurrence probability during the past fifty years. Risk receptor are ecosystems, their value are expressed in ecosystem capital, a synthesizing result of ecological material products and ecosystem services. And ecological- environmental vulnerability was taken into consideration. The ecological risk bases on relative assessment model, equal to the ecological-environmental vulnerability multiplied by the ecosystem capital multiplied by risk source occurrence probability. All the processes of assessment and mapping are in the unit of 1km*1km grid cell by GIS. The assessment results show the grades distribution of ecological risk of typhoon and storm-surge disasters, and every grade covered ecosystems. It provides scientific support for ecological risk identification and prevention. This research is supported by the Project (40830746) of NSFC and National Key Technology R&D Program (2006BAD20B07) of China.

Keywords: Ecological risk assessment; typhoon; storm-surge; disaster risk; coastal zone; China



Probabilistic modelling of extreme wave climate along the Dutch coast

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Abstract

Due to the unprecedented population and economic development along the coast zone all over the world, knowledge about future extreme oceanographic events will assist in ensuring human and property safety, a task with increasing significance in the light of projected climate change impacts. A joint estimation of extreme storm events variates on deep water wave conditions was performed. It can be used for multivariate description of wave climate variates, such as wave height, period, steepness, and storm duration, etc. These storm process elements can be simulated and extrapolated from limited observational data for optimal structure protection strategies and various disaster risk analysis, like erosion or overtopping. The analysis shows state of the art probabilistic model improves probabilistic design reliability in coastal risk assessment framework and comprehensive management planning. Using the Monte-Carlo method, base on extreme value theory, physical relationships and copulas, the marginal probabilistic density function of wave climate variables and the correlations between them were derived. This approach was employed on Dutch coast with the observation data from 1979 to 2009 of buoys near the Noordwijk beach. The simulated data group perform a reasonable similarity to the field measurements through the goodness of fit test and a visual judgment. The paper also illustrates how the results of this statistical analysis can be used within the context of probability design and land-using planning.

Effect of climate change on the coastal land: A case study of a storm surge hazard in a selected embankment in Bangladesh

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Abstract

Bangladesh hosts the largest delta on earth – the Bengal delta. A Coastal Embankment Project (CEP) was accomplished in the early 1960s for increasing agricultural return in the coastal zone of the country. Initially this project reclaimed large tracts of coastal lands from regular flooding, which enabled farmers to utilize the resource in various different productive activities. Due to a combination of human interventions and climate change induced effects, the embankment system started to wreck havoc on the lives and livelihoods of poor coastal inhabitants. This research deals with the storm surge hazard that affects the coastal land. This study has been conducted on Polder no-5 that was severely affected by a cyclone induced storm surge hazard ‘Aila’, occurred in May 2009. Considering Aila as a representative event with 12.5 year return period for future impact analysis under SRES-A1B scenario, it is found that the observed surge height of 6.1m would increase to 6.9m, 7.2m and 7.5m in 2030, 2050 and 2100, respectively. Using the Digital Elevation Model in a GIS interface, the study finds clear indication that the inhabited and cropped areas within the case embankment would be increasingly susceptible to surge induced saline flooding with climate change. While only 22.7 per cent of the areas were found to be inundated under the case event, the study reports a projected escalation of inundated areas upto 41.4, 64.2 and 86.3 per cent for the three scenario years 2030, 2050 and 2100, respectively. A new land use planning must be initiated involving local government institutions and local people in a bid to avoid significant losses in production and potential large-scale out-migration from the affected embankment.

Keywords: Dependency, extreme value theory, Monte-Carlo method; probability; wave climate;

Keywords: Climate change, storm surge, embankment, inundation, coastal land, vulnerability.

Vulnerability assessment of coastal coupled social-ecological system based on Meso-scale of land use

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Abstracts

Coastal zone are complex and coupled systems accompanied with numerous hazards, which possess the complex and fragile characteristics. However, the vulnerability assessment of coastal systems evaluation is a hot issue but faced with a few difficulties. Among them, the scale is one of focuses addressed in the vulnerability assessment. In the current studies, some was the evaluation of long time scale in decades, and others in short-term. At the same time, the spatial scale varies with in community or in states etc. The scale of the vulnerability assessment is still not well resolved. The purpose of this paper is to divid the whole of coastal zone in line with different types of land use, which have different sensitivities to risks of coastal hazard. This can be a good solution for spatial scale in coastal vulnerability assessment.

Abstract

Rising sea-level under condition of global warming, together with rapid sinking of deltas has drawn public concern, yet they are both poorly understood. In this paper, we make an assessment of the rising sea-level and delta's sinking building on the available information in published literature. Most deltas are sinking much faster than sea level is rising. The rising sea-level is a global pattern whereas the magnitudes and causes of sinking vary from delta to delta. We list some problems in our understanding of global sea-level rise, and highlight the threat of temporary sea-level rise deriving from storm surges. And we summarize the possible sinking sources for the world's deltas, with a sketch showing the general sinking mechanism. We find the sinking is a result of coupled natural and anthropogenic processes, and these candidate processes can be as diverse as sediment compaction, tectonism, permafrost thawing, peat oxidation, seism-induced sand/silt liquefaction, thermal mantle convection, plate-subduction, isostasy, subsurface resources extraction etc. These processes operate at different time-scales, ranging from seconds to minutes, under condition of earthquake, or multi-decadal to millennial or ~Ma scales in the cases of sediment consolidation, tectonism, isostasy et al. Spatially, the sinking is not merely a shallow process primarily concerning young sediment compaction, rather includes large tectonic components from deep crust and mantle. Natural subsidence is generally a chronic process beyond human control, whereas triggered subsidence is much faster and usually characterized by a time-delay and attenuation with time. Better understanding of the rising sea-level and delta's sinking calls for multi-discipline study and an integrated monitoring system.

Keywords: sea-level rise, delta, sinking,

Coastal Hazards: An approach to assess long-term changes in wind, wave, and storm surge climate

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Abstract

The development of appropriate adaptation strategies to changing coastal hazards depends crucially on the availability of long and homogeneous data sets from which long-term changes in coastal hazards can be assessed. Often, information on changing wind (storms), waves, or storm surges are needed that are often unavailable either due to missing or long-term monitoring programs or too short or spatially too scattered records.

An approach has been developed to derive such information from a compilation of coastal analyses and scenarios derived from numerical models driven either by observed data in order to achieve the best possible representation of observed past conditions or by climate change scenarios for the near future. Contrary to direct measurements which are often rare and incomplete, this approach offers a unique combination of consistent atmospheric, oceanic, sea state and other parameters at high spatial and temporal detail, even for places and variables for which no measurements have been made. So far, this approach - known as coastDat - was applied mainly to the North Sea region. We present results and assessment of long-term changes in wind (storm), wave, and storm surge climate together with applications from ship design, oil risk modelling and assessment, on the construction and operation of offshore wind farms, demonstrating the potential of the approach in the assessment of coastal hazards and vulnerability. In a collaboration between the Helmholtz-Zentrum Geesthacht, Germany and the Institute for Ocean Management at Anna University Chennai, India we aim to apply a similar methodology to Indian coastal regions. Strategy and results from a first pilot study will be presented and discussed.

Keywords: wave climate; storm surge; coastal hazards; hindcasts; climate change scenarios; India; North Sea

Identifying Pro-Poor Economic Activities in Coastal Southwest Bangladesh climate

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Abstract

Providing livelihood options to rural poor has been a major concern amongst development practitioners. Most such initiatives remain largely confined to self-employment activities, having greater potential in areas better connected with growth centers and/or have vibrant local markets. Large parts of coastal south in Bangladesh lack both these attributes – communication is slow and local habitats are sparsely distributed, often distanced by unfriendly rivers. Moreover, frequent cyclones raise the risk of investment, while the closest urban centers have remained financially stagnant or on decline over a decade or more; largely attributed to increasing salinity. The coastal areas have however experienced major transformation to cash economy with significant increases in demand for fish cultivated or captured in the area. Thus, in spite of early social resistance, shrimp cultivation has shaped the physical, financial and social canvass of the area over more than last two decades. In addition, the villages facing the Sundarban (mangrove) have also been influenced by the various legal and extra-legal options of livelihood through extraction of forest and mangrove resources.

The paper identifies economic activities that hold prospects for increasing employment and income of the poor. An approach for empirical undertaking is proposed – that compiles calendar of economic activities in the area and current practices revealed in the activity-specific employment reported by poor households. The activities are then grouped into pre-defined categories; following which the technology and institutional canvass pertaining to these activities are described to assess potential entry points for pro-poor income and employment generation. For most such activities, numerical illustrations are provided for the field-level practitioners to localize the content for effective use in decision-making. The concluding section summarizes the findings and makes several recommendations to development practitioners and policymakers keen on promoting employment and income of poor households in the coastal southwest of Bangladesh.

Keywords: coast, Bangladesh, poor, economic activities, value chain, employment calendar

» ABSTRACTS C3 «

Reducing Vulnerability of Coastal Communities to Coastal Hazards through Building Community Resilience

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Abstract

This paper contains two parts: Part one describes the comprehensive approach adopted by our project to build social, economic, institutional and environmental resilience of the tsunami affected communities in Sri Lanka to cope with future natural disasters. Community development, Coastal resource management and Disaster management are the three pillars of this model and these were built simultaneously to bring the community into a higher level of resilience to coastal hazards. Second part describes the application of Coastal Community Resilience (CCR) Assessment framework to evaluate the progress achieved by the project in building overall resilience of the communities during its period. It further describes how to estimate the contribution of this specific project for the improved resilience status of the selected communities in a multi stakeholder environment.

Abstract

This study is aimed at identifying the association between maternal and child health and coastal pollution (heavy metal, pesticides, waste water, salinity intrusion, etc) through comparisons between the non-coastal and coastal zone. The coastal area of Bangladesh is one of the most densely populated areas in the world, with a population density of 544 persons per sq km living within 100km of the coast. The total area is 47,201 sq km with the largest mangrove forest, Sundarban-140,000 ha. Although geographically it is vulnerable to natural pollution (arsenic poisoning, salinity intrusion), there are various man made causes that increase vulnerability of the population living in this environment. For example, about 52% of all ocean going big ships are dismantled in Bangladesh without any environmental precautions. In addition and perhaps surprisingly given the abundance of food in the area, the coastal districts have the highest Maternal and Infant Mortality Rates in the country. The degree to which these rates are related to coastal pollution has not been determined except for some specific pollutants (e.g., heavy metals on Maternal and Child health and pregnancy outcome, water salinity and arsenic). The objective of this study is to analyze the trends in maternal and child health, and relate them to changes in coastal pollution over the same period. A comparison between the non-coastal and coastal zone will aid in identifying risks and could serve as a platform for corrective interventions.

Keywords: Coastal pollution, Maternal and child health, adaptation.

Health Systems Adaptation to Changing Health Profiles of Women and Children Resulting from Increasing Coastal Pollution – A Case Study on the Coastal Area of Bangladesh

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Levels and distribution of antibiotics in Laizhou Bay, North China: impacts of river discharge

Vulnerability of coastal communities and progress in climate change adaptation: the case of
South East Queensland, Australia

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Abstract

Eleven selected antibiotics belonging to three groups (sulfonamides, trimethoprim and macrolides) were investigated in river water around Laizhou Bay and seawater of Laizhou Bay, North China. Trimethoprim, sulfamethoxazole and erythromycin-H₂O were ubiquitous in seawater throughout the Laizhou Bay with detection frequencies of 100%. Their average concentrations ranged from 2.6 ng L⁻¹ to 53.2 ng L⁻¹. In general, the contaminated level of antibiotics in Laizhou Bay was relatively lower than those in other coastal seawater, such as Bohai Bay and Victoria Harbour. The predominant compounds in seawater were also dominant in the rivers flowing into Laizhou Bay. And for each antibiotic, its concentration in the rivers was significantly higher than its corresponding value in the bay, indicating a river discharge source. The rivers flowing through cities, suburbs and industrial zone showed higher levels of antibiotics than those flowing through rural and agricultural region, which emphasizes that the effects of human activities on exposure of antibiotics in the environment. Although the concentrations of antibiotics in the Laizhou Bay were relatively low, the long-term ecological effects caused by the continuous discharge of antibiotics on the Laizhou

**Vulnerability of coastal communities and progress in climate change adaptation: the case of
South East Queensland, Australia**

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Abstract

The high concentration of growing human settlements within the low-lying coastal zone of South East Queensland, Australia, has prompted the IPCC AR4 to explicitly identify the coastal SEQ region as highly vulnerable to the impacts of climate change. Here Coastal settlements, distributed across five coastal councils, are extremely vulnerable to sea-level rise (SLR), changing wave climate and extreme sea levels associated with storm tides. We present here the results of a study looking at vulnerabilities and adaptation level at the local scale. Following the IPCC recommendation, we use an approach combining exposure, sensitivity and adaptive capacity as a proxy of vulnerability. These results are then compared to the progress in adaptation using an ad-hoc indicator based on the analysis of existing adaptation policies in the coastal zone.



Source identification of oil spills based on the distribution of pyrrolic nitrogen compounds

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Abstract

Oil exploitation and marine transportation developed rapidly in China, bringing increased risk of oil spills. China experienced 2,635 oil spill accidents in its seas and along its coastal areas from 1973 to 2006. Oil spills may cause extensive damage to marine and terrestrial life, human health, and natural resources. Therefore, characterization of chemical compositions and identification of oil spill sources are, in many cases, critical for providing forensic evidence in the investigation of oil spill accidents and settling disputes related to liability. The most common approaches to the characterization of spilled oil are made on the basis of the molecular distribution of aliphatic and aromatic hydrocarbons, or more specifically biomarker fingerprints. However, such data can be ambiguous and inconclusive, since oil is quickly affected by weathering processes such as evaporation, photooxidation, or biodegradation. Correlation of spilled oil to its suspected source requires other discriminative parameters that are relatively insensitive to weathering processes.

Nitrogen is a common element in petroleum. Pyrrolic nitrogen compounds (PNC) have been proposed as molecular tracers for monitoring petroleum migration. Although the distribution of PNC has been found increasing application in petroleum exploration in recent years, there have been few reports of use of these compounds for forensic oil spill investigations. Besides fractionation during petroleum migration, the most likely factors affecting the distributions of PNC in crude oils appear to be the original source material, paleoenvironment and thermal maturation. So the distribution of PNC may provide another diagnostic means for correlation and differentiation of spilled oils, the source of which may be difficult to identify using routine biomarker techniques. Moreover, the distinct characteristic nitrogen isotopic signatures of different crude oils can be potentially extended from oil migration studies to for identification of oil spill.

In the study, a variety of oils from the three biggest oilfields of China, weathered both artificially and naturally, were analyzed by GC-MS. The effects of weathering on alteration of PNC distributions have been quantitatively investigated. The results showed that the relative concentrations of carbazole decreases for weathered oils, but that of alkylated carbazole increase. In cases where samples have lost their more volatile n-alkanes as a result of weathering, the ratios of benzof[a]carbazole/[benzo[a]carbazole+benzo[c]carbazole], 1-/4-methylcarbazoles, 1,8-/2,4-dimethylcarbazoles, proposed as maturity, sedimentary environment dependent tool in petroleum geochemistry, are not found to be extensively affected. Hence, such diagnostic ratios of PNC have been developed and used in environmental forensic oil fingerprinting and spill source identification. Characterization of PNC by GC-MS provides an alternative and useful method for correlating degraded samples with their nondegraded sources.

Keywords: Oil spill; source identification; pyrrolic nitrogen compounds; moderated weathering

Planting exotic species for coastal protection: Evaluating the storm protection services of native vs. exotic species

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Abstract

The escalation in natural calamities affecting coastal areas and simultaneous proof of by some anecdotal evidences and research papers that presence of coastal vegetation has resulted in reduced damages, have resulted in promotion of coastal bio-shields in many parts of the world. However, researchers are concerned that the promotion of coastal bio-shields as coastal buffers has lead to inappropriate coastal development in some places due to planting of exotic species alien to the native ecosystem and it may reduce biodiversity and not deliver the expected results. This paper partially addresses the above concerns by examining and comparing the storm protection service in the form of saving human lives, for three different types of coastal forests i.e. mangroves, non-mangrove native forests and casuarinas, during a super cyclone that hit Indian state of Orissa. Of the three, mangroves and native forests are the indigenous varieties whereas casuarinas are the exotics planted under the Coastal Shelterbelt Plantation Scheme of the government. I studied 428 coastal villages from the state's Kendrapada district, where mangroves are the main forest along with a few patches of casuarinas, and 391 coastal villages from the state's Puri district, where the dominant forest type are the casuarinas along with a few patches of native forest. Both these districts were severely affected by the cyclone. After controlling for cyclone impact, coastal distance, spatial and economic discrepancies, multiple regression results showed both mangroves and native forests to have reduced deaths. The casuarinas coefficient was found negative and insignificant for Puri, where they were wide spread, but positive and significant for Kendrapada meaning to have caused more deaths. These results suggest native forest to be providing storm protection, but not the exotics and question whether planting of casuarinas as storm buffers should be promoted in cyclone prone areas?

Keywords: Casuarinas; Coastal_bioshields; Mangroves; Native forests; Orissa; Storm protection

Occurrence and distribution of antibiotics in the Beibu Gulf, China: impacts of river discharge and aquaculture activities

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Abstract

The occurrence and distribution of eleven selected antibiotics belonging to three groups, sulfonamides, trimethoprim and macrolides were investigated in Beibu Gulf. In addition, the potential effects of discharged water from four rivers and aquaculture activities were also analyzed. Trimethoprim, sulfamethoxazole and erythromycin-H₂O were the most frequently detected compounds in all samples with the mean concentrations ranging from 0.76~7.626 ng·L⁻¹. Apart from Maoling River, the concentrations of other three rivers were generally higher than the gulf, implying the important effect of river discharge on the Beibu Gulf. The concentrations of erythromycin-H₂O, sulfadiazine and sulfadimidine were found in the vicinity of aquaculture higher than other sampling sites, suggesting that the high antibiotics consumption in aquaculture activities could contribute to the antibiotics in the environment. According to MEC/NPEC, only ETM may possess environmental risk, nevertheless, attention should be paid to the long-term ecological effects caused by the continuous discharge of antibiotics on the Beibu Gulf.

Keywords: Antibiotics; Beibu Gulf; Aquaculture; Environmental risk assessment; River water; China

Coastal hazards and development setbacks in nigeria: perspectives in niger delta region, Nigeria

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Abstract

The inadequacy of coastal development setbacks for rivers/oceanfront is a problem in Nigeria. This study intends to assess development setbacks in Nigeria with a focus on the nine states (Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo, Rivers) of the Niger Delta. Data will be evaluated over a period of twenty three years (1986-2008) using satellite imagaries, Landsat Thematic and enhanced thematic mapper. The result of the study would identify the number of coastal communities that are vulnerable to natural hazards due to inadequate land use development setbacks. The final development setbacks guides and maps will be prepared in ArcGis 9.1 to determine the extent of change, while aerial photographs will be to validate and evaluate the history of coastal hazards to lives and properties in the region.

Keywords: coast, hazards, development, setbacks, Niger delta, coastal communities



Mechanisms of mangrove tolerance to polycyclic aromatic hydrocarbons: radial oxygen loss and antioxidant enzymes

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Abstract

Elevated concentrations of polycyclic aromatic hydrocarbons (PAHs), one of the serious toxic pollutants causing carcinogenesis, teratogenesis and mutagenesis, due to anthropogenic activities have drawn increasing attention in recent years. Mangrove wetland has been suggested as a low-cost but high efficient phytoremediation technology in removing PAHs. However, the tolerance of mangrove plants to PAHs, a key issue in phytoremediation, is not clear. Two experiments were therefore designed to investigate the tolerance mechanisms in three mangrove species, namely Avicennia marina, Bruguiera gymnorhiza and Kandelia obovata. Three probable mechanisms were elucidated: (1) mangrove plants could promote the removal of PAHs in sediments and reduce the toxicity, (2) radial oxygen loss (ROL) from entire mangrove roots could be regarded as an “external” tolerance mechanism as significant positive correlation ($P < 0.001$) was found between ROL and PAH tolerance and (3) responses of antioxidant enzymes (SOD, CAT and POD) could be considered as an “internal” mechanism of PAHs tolerance. The present study is the first time revealed that direct removal, ROL and antioxidant enzymes played very important roles in the tolerance of mangrove plants to PAH stress.

Keywords: antioxidant enzymes; mangrove; phytoremediation; PAH removal and resistance; radial oxygen loss

Deliberative Democratic Methods for the Conservation of heavily used Vembanad Backwaters of Kerala, (India)

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Abstract

Coastal backwaters and estuaries and inland water bodies of the tropics are economically efficient and biodiversity rich systems, now fast declining due to lack of care, improper management, over exploitation and lack of awareness. One of the hopes of the conservation of these high yielding systems lies in the active involvement of the dependent communities in the management of the natural resources. This can be made possible only by Institutionalizing community rights over protection and harvest of the natural resources. Vembanad Estuary (Kerala, India) is the largest tropical wetland ecosystem on the southwest coast of India and a designated Ramsar site. The estuary is used for fishing, mining sand and lime shell deposits, harvesting live clams, and tourism related activities. All these ‘water based enterprises’ depend upon environmental integrity of the Vembanad estuary and the surroundings. The environmental conditions of the estuary is in a steady decline due to uncontrolled resource use caused by the commercial nature of many of these activities and in turn all these activities to various degrees are in a descend. We are trying to address some of the conservation issues faced by Vembanad by facilitating deliberative democratic conservation. In the process of deliberative democratic conservation the conservation policies and prioritisation are done through consensus evolved through deliberations among various stakeholders and transfer of responsibility over its harvest and management to them. The project aims to increase coordination between stakeholders and strengthen their capacity to address the various issues related to Vembanad Backwaters, develop and implement innovative conservation methods and build multi sectoral and multi stakeholder partnerships at the local level to influence decision making.

Keywords: deliberative democratic conservation; estuary; institutionalizing; resource use; stakeholder partnership; water based enterprises

Coastal Vulnerability Assessment of Semarang City Based on Sea Level Rise and Land Subsidence Scenarios

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Abstract

A study of determining the level of physical and socio-economic vulnerability index assessment of the coastal area of Semarang City, Indonesia was conducted based on the relative sea level rise and land subsidence. The total vulnerability indices were determined from the biophysical and socio-economic parameters. The basic physical data were collected from the geology and hydro-oceanographic data as well as the other secondary data. Study on the socio-economic dimension was also obtained from interviews and filling out the questionnaire from the respondents. Several scenarios on sea level rise including the current condition and the projection condition for the future 50 years were investigated in the research. Whether Semarang is a lowland city and some coastal area always flooded caused by the high tide, so this inundated tide was into account in the study. The prone inundated area was also figured out. The results show that high vulnerability index almost covering northern part of Semarang coastal area especially district of North Semarang. The socio economic aspects give a high contribution for the study. The inundation-prone areas are the District Gayamsari, Genuk, Padurungan, and North Semarang.

Keywords: sea level rise; Semarang; coastal vulnerability index

Arsenic Accumulation in the Deltas of the Tibetan Rivers - A Source to sink continuum from Mountains to Coastal Zones

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Abstract

Alluvial aquifers in the flood plain and delta plain areas of the major rivers originating in Tibetan Plateau have been widely reported to be contaminated with arsenic concentration levels much above guideline limits. Millions inhabiting these floodplain and delta plains are exposed to the risk of arsenicosis and more serious health hazards. The present study is an attempt to make an assessment of arsenic occurrence in all major deltas and floodplains of the Tibetan Rivers viz. Mekong, Irrawaddy, Yangtze, GBM, Red River Delta and the Brahmaputra Floodplains in South East Asia to gain a better understanding of the aquifer characteristics, sediment architecture, sources, sinks and related aspects of arsenic occurrence in these highly socially and economically vulnerable areas. With relatively fewer studies on arsenic occurrence, source and mobilization mechanism in regions like the Brahmaputra floodplains in India, and other unexplored and less intervened coastal regions in the world, the study reviews the possible similarities and contrasts of arsenic occurrence within the contaminated aquifers in similar coastal areas in India and SE Asia. An attempt has been made to report the findings of the recent arsenic screening and surveillance program in some critical areas with respect to existing research initiatives, exposure level, mobilization mechanisms and possible affordable mitigation systems. Overall findings suggest that among the delta regions of different Tibetan Rivers, the Bengal Delta plain exhibits the highest concentration range and spread of arsenic in coastal plains, mainly contained by the deltaic mass. There is ground for believing that, notwithstanding the scale and spatial variability, the Tibetan Plateau is the original source of the arsenic bearing alluvial soils that finally constituted the arsenic bearing aquifer downstream, both in the floodplains and deltaic masses.

Local perspectives on a global phenomenon: Can the fishers of the Naaf River be insured against climate change?

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Abstract

Climate changes in the Naaf River is a prime example of what has been called a “social ecological system” with factors from different domains interacting on different scales. The extent to which local community and fisheries systems are affected by climate change (their vulnerability) was examined by three factors: their exposure to specific change, their sensitivity to that change, and their ability to respond to impacts. By this investigation, it was found that about 1.5% fisheries productivity reduced and the annual yield dropped to 3,230 MT from 6,583 MT in last five years, which lead to BDT113 million (48%) revenue loss. Socioeconomic impacts were felt through changes in capture, production and over all income, and possible increases in risks of damage or loss of fishing gears and crafts. Due to the low adaptive capacity, fishers tend to be poorer, more marginalized and much more likely to be afflicted by natural hazards like storm surge. The estimated economic loss of category IV type cyclone was BDT19.1 million which, posing a threat to the fishermen’s livelihood directly. Employed autonomous adaptations in the investigated areas were not effective to reduce the vulnerability and all the participants in the participatory workshops ask for participatory based planned adaptations to combat the climate change impacts.

Keywords: Adaptation; climate change; fishers; fisheries productivity; Naaf River

Assessment of vulnerabilities to climate change for water and wastewater infrastructure management in Vietnam: a case study of Ho Chi Minh City

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Abstract

Climate change (CC) is likely to have negative impacts over coastal areas in many regions including Vietnam. However, there is shortage of practical CC risk and vulnerability assessment particularly in the context of urbanization and water and wastewater (W&WW) infrastructure management of the Southeast Asia coastal cities. At the same time, the insufficiency and unavailability of information on the potential CC risks at local level brought more difficulties in making good adaptation measures and strategies. This paper provides the current context of CC vulnerabilities and urban development for urban W&WW infrastructure management in Ho Chi Minh City (HCMC) in Vietnam. The paper has come up with meaningful findings that analyses the impacts of CC and growing urbanization for the vulnerable communities in Binh Thanh and Thu Duc district by conducting rapid vulnerability assessment (RVA). The research applied some of the key tools and techniques: participatory rural appraisal, impact matrix and multiple criteria analysis. It aimed to present the case of RVA for urban W&WW infrastructures in HCMC and recommended the next step for CC adaptation measures. The results show the vulnerability and hazard factors, accompanied with experiences and lessons learned in the RVA. The hazard factors influencing vulnerabilities of selected coastal districts are imposed due to flood, saltwater intrusion, and inadequate safe water. In addition, vulnerability factors are related to the community CC adaptation knowledge, as well as economic and institutional aspects. This paper not only focused on the case of CC vulnerability assessment but also correlated with CC adaptation measures at top downscale level.

Keywords: Climate change; Water infrastructure; Coastal water management; Risk assessment; Urbanization

An attempt to find out the effect of Tsunami accompanying with analyze the marine micro-floras and faunas (Diatom and Foraminiferid) in the water and bottom sediments: a geo-environmental study of South Eastern part of Bay of Bengal

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Abstract

Tsunamis are rarer in the Indian Ocean as the seismic activity is less than in the Pacific. There have been 7 records of Tsunamis set off by Earthquakes near Indonesia, Pakistan and one at Bay of Bengal in the last 200 years. Infrequent occurrence of tsunamis in the Bay of Bengal kept the geoscientists of this region almost unconcerned about the potentially of tsunami hazard. There are some evidence of Paleo-Tsunamis and low height tsunamis. Unfortunately the local tsunamis are more destructive than the regional tsunamis. Very recent a modified Seismic Hazard Map and a Tsunami Vulnerability Map of Bangladesh is proposed by geologists. In this map the country is divided into six seismic hazards zones and three tsunami vulnerable coastal belts. The first one is Chittagong–Teknaf-coastline-Most vulnerable. Second one is Sundarbans–Barisal coastal belt-Moderate Vulnerable and third one is Barisal–Sandwip estuarine coastline- Low vulnerability (Karim, M.F. 2005). This paper presents try to find out the tsunami effect (2004) on the north eastern part of the Bay of Bengal" i.e. most vulnerable areas. This research is an attempt to find out the effect of recent tsunami accompanying with a new technique, that is analyze the marine micro-floras and faunas (Diatom and Foraminiferid) in the water and bottom sediments. It is remarkable that vast amount of unknown diatom species (about 18 %) at St. Martin's Island and 9 % at Chittagong coast) have also been found in the both sites of bottom sediments. It is gradually reduce at St. Martin's Island with the reducing of water depth. Beside, it observed that reducing the water depth only 4 m (12m to 8 m), about 45 % diatoms are recorded as unknown sp. in the Chittagong coast. Most probably these unknown species of diatoms are debris of recent catastrophic tsunami (26 December, 2004) as well as they are assigning a signature of tsunami. Lab analysis shows that a remarkable amount of the broken test (shell) of Foraminiferid (23.6 %) in the coastal and marine sediment (St. Martin Coast, Bangladesh) could be a sign of tsunami effect in this region.

Keyword: Seismic activity, Diatom, Foraminiferid and Paleo-Tsunamis

Assessment of Vulnerability and Adaptive Response in the context of climate variability in south-west Bangladesh

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Abstract

The study area is known to be a poverty-stricken and high vulnerability locality to natural climate as well as anthropogenic variability, which is due to its low lying deltaic floodplain topography in combination with a few other factors that include its disadvantageous geographic location, low resource to man ratio, and lack of environmental governance. The existing micro-, meso-, and macro-level climatic changes in the study area has seriously constraint the region's economic development in the community level which focused on the impacts of projected changes in socio-economic condition. The study also focused on some non-climatic factors (i.e., economic, social, wildlife and human threat) or stimuli is either constraining or facilitating the adaptive process in community level. A crucial insight of the indigenous adaptation strategies in community level and that an engagement of climate change vulnerability and adaptation concerned with socio-economic changes in community level has focused on fruitful results in the study area.

Impact of a tropical cyclonic storm ‘Aila’ on water quality characteristics and mesozooplankton community structure of Sundarban mangrove wetland, India

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Abstract

The work attempts to explore the changes in mesozooplankton (0.2 – 2 mm) community structure in the coastal regions of Indian Sundarban mangrove wetland due to severe tropical cyclonic storm ‘Aila’ on 25th May, 2009. A sharp increment in water turbidity, chemical oxygen demand (COD), phytoplankton (chlorophyll b) and micronutrients (nitrate, phosphate and silicate) was noticed during post-aila period with a corresponding decrease of water transparency and chl a and chl c. The dissolved micronutrients showed an identical trend of increment during post-aila period which might be derived from non-point sources like domestic sewage, agricultural fertilizers and aquacultural firms situated along the lower stretch of the Ganges estuary. The mean concentration of nitrate was 22.68 µgm-atom l⁻¹ and 28.52 µgm-atom l⁻¹ during pre and post-Aila period respectively. A three-fold increase of phosphate concentration was also recorded where the mean concentration of 1.18 µgm-atom l⁻¹ of the pre-Aila period reached as high as 3.51 µgm-atom l⁻¹ during post-Aila period. COD also showed enrichment during post-aila period (mean value 94.71 mg l⁻¹). The turbidity of water increased because of sudden impact of the wave-tide climate. By obvious reasons, turbidity and transparency showed an inverse relation in this study. Before the cyclone, transparency and turbidity showed an average value of 26.67 cm and 17 NTU respectively whereas, the values changed to 6.5 cm and 30 NTU respectively during post-Aila period. Mean values of chl a concentration showed more than three times higher value (3.20 mg m⁻³) during pre-aila period in comparison to post-aila period (0.95 mg m⁻³). Comparatively low concentration of DO was noticed during post-aila period due to high rate of degradation of the organic matter, domestic effluents and sewage wastes. Reduction of zooplankton biomass, density and species diversity was also pronounced during post-aila period. There was a sharp distinction of the number of copepod species which was 25 during pre-aila period dominated by calanoids of 22 species of 10 genera and 3 cyclopoid species of a single genus. The number drastically dropped to only 10 species during post-aila period where calanoids were represented by only 7 species of 4 genera, cyclopoids with 2 monogenetic species and harpacticoid by the solitary species, *Euterpinia acutifrons*. The decrease in copepod diversity index value (from 5.4 – 0.18) was largely due to the overwhelming post-cyclone dominance of two species (*Bestiolina similis* and *Oithona brevicornis*) which are organic pollution-tolerant in nature. Their dominance might be further stimulated due to the presence of large amount of organic debris present in the estuarine waters carried by the huge tidal waves as a result of the storm. Mesozooplanktons, other than copepods, were comprised of decapod crustacean Lucifer hansenii, chaetognath (*Sagitta bedoti*) and ctenophore (*Pleurobrachium globosa*) contributed about 15 – 38% of the total mesozooplankton during pre-Aila period. Surprisingly, all of them were totally absent in the post-Aila period, causing imbalance of the marine food chain system. The cyclone has raised new questions regarding the longevity and sustainability of Sundarban wetland and their ability to recover from future cyclonic storms.

Keywords: Copepods; Cyclone; Mesozooplankton; Sundarban wetland

Climate change, adaptive governance, and local coastal areas in Pakistan

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Abstract

In developing countries, such as Pakistan, climate change poses a serious challenge to its social, environmental and economic development. Specifically, the people living in coastal areas of Pakistan are considered ‘vulnerable’ to the impacts of climate change. The purpose of this paper is to review the climate variability and its impacts in coastal Pakistan, and to find out the best possible ways for reducing the vulnerability of its population from the climatic hazards. The methodology was designed by taking the concept of ‘adaptive governance’ (in the context of climate change) and applying this at the ‘local government level’ in coastal Pakistan. This approach helped in finding out the key climate change response mechanism for reducing the vulnerability of Pakistani community living in coastal areas. The research finds out that the implementation of ‘adaptation strategies in conjunction with the sustainable development policy agenda’ (such as; mainstreaming climate change, land use-planning, settlements and infrastructure, emergency planning, good governance, better coordination and capacity building) at the local government level in coastal Pakistan would reduce the vulnerability of its population.

Keywords: Climate change; vulnerability; governance; Pakistan; local coastal areas; Response mechanism

Modelling the Vulnerabilities of the Songor Lagoon and its Catchment Area (Ghana) to Sea-level Rise

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Abstract

Wetland ecosystems are an important and widely distributed feature of tropical landscapes in both coastal and inland regions. Climate change and sea-level rise will affect wetlands because of their fragile nature. These could alter and disrupt wetland hydrology, biogeochemical cycling, and other processes that sustain wetlands. The potential impacts of climate change on coastal systems have not been adequately studied in Ghana, although a general assessment of the vulnerability of the coast of Ghana has been carried out. This study assessed the vulnerabilities of coastal ecosystems, particularly, the geomorphology of the Songor Lagoon and its catchment area to relative sea-level rise. The goal of the study was to determine the response of the shoreline to projected sea level rise and the land area that will be lost from sea-level rise based on best and worst case scenarios of the Intergovernmental Panel on Climate Change Special Report on Emission Scenarios (IPPC SRES). The Songor coastal area is expected to suffer a lowering of its ecological integrity from the destruction of mangrove forests resulting from land losses due to sea-level rise and associated shoreline recession. The potential permanent inundation of major portions of land in the study area is also expected, resulting in the loss of beach area, houses, wildlife habitats, farmlands and many more. The loss of buildings in the study area could particularly be high in two villages, namely Totokpoe and Pute which has a combined population of over 3000 people, most of whom will be at risk of losing their homes. These local communities do not have the adaptive capacity to deal with the impacts of climate change. The study recommended the prevention of developmental activities in high vulnerability areas, re-vegetation to restore degraded mangrove forests and a development of an integrated shoreline management plan for the entire shoreline of the country to enable effective management.

Keywords: Climate Change, Sea-Level Rise, Coastal Wetlands, SimCLIM, Shoreline Recessions, Songor Lagoon (Ghana)

» ABSTRACTS C4 «

Session: C4 Keynote

Challenges for adaptive coastal governance: Scales, Knowledge and Power

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Abstract

This paper summarises the preliminary results from the development of a Coastal Monitoring System (CMS) for the coastal areas of Jeddah, Saudi Arabia. The CMS will be tailored primarily to nowcast and forecast water levels, current velocities and waves to support the coastal authorities in the planning and management of different tasks. The system integrates a user-friendly web interface with the data from several operational monitoring devices and hydrodynamic models for simulation of flow, waves and particle tracking for the fate of oil. In the first phase of the development of the CMS, a network of stationary monitoring devices will be established. Tidal gauges for monitoring water levels and wind were installed at coast guard stations Ohbar, Gahaz and Saroom near Jeddah in April 2011. To provide a better spatial coverage of water levels and wind, two additional stations will be installed at the cities of Duba and Jizan in the northern and southern limits of the Red Sea respectively. In addition, a wave rider and a Met/Ocean buoy will be integrated into the operational monitoring network. Details of the devices, selection of the locations, data transfer and communication will be given. The process based model is based on the Delft-3D modelling system developed by Delft Hydraulics, the Netherlands. The model covers the entire Red Sea in variable grid size with finer resolutions along the Jeddah coastal areas. The models for simulation of flow and waves have been developed following the procedures of set-up, sensitivity studies, calibration and validation. Synoptic data from several sources have been gathered and processed for the development of the models. Also especially designed measuring campaigns have been carried out using measuring devices deployed from moving vessels. Details of the measuring campaigns, operational monitoring devices and development of the process based models leading to the CMS will be provided.

Keywords: Coastal monitoring system; operational devices, Red Sea; Jeddah; 3D hydrodynamic models

Session: C4 Oral

Bridging the Science-Policy-Practice Interface: From Vulnerability Assessment to Action

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Abstract

Today, not only 'reliable knowledge' is needed, but there also exists a need to be sensitive to a much wider range of social implications to produce socially robust and context-sensitive knowledge. On the basis of a meta-analysis of vulnerability assessments, a number of functional, structural and social barriers are illuminated that inhibit the joint production of applicable knowledge by experts and decision makers: divergent objectives, needs, scope and priorities; different institutional settings and standards, as well as differing cultural values, understanding, and mistrust. It is argued that combining understanding from multiple sources and providing mechanisms for linking solutions proposed by research with articulated needs and problems of practitioners would reduce the discrepancies in activities of different actors and result in more timely and context-appropriate solutions. A more locally embedded and socially contingent production of actionable knowledge is recommended and ways to enhance effectiveness of research-based knowledge are suggested.

Keywords: Knowledge systems, vulnerability, science-policy interface,



Fostering a successful social learning process: Reflections on a multi-disciplinary and science-policy orientated research project

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Abstract

This presentation discusses research exploring social learning within a large European Union-funded project on Science and Policy Integration for Coastal Zone Management (SPICOSA Project). The aim of the paper is to identify a series of practical lessons for, and theoretical challenges towards, greater engagement of multi-disciplinary groups of scientists with the ideas and principles of social learning. A key hypothesis of social learning is that the nature of the relationships within and between stakeholders and scientists may be as important for gaining new insights for Integrated Coastal Zone Management, than the actual content of the communications. The analysis presented in this talk seeks to explore such relationships, building on results derived from a series of in-depth interviews and questionnaires with SPICOSA project scientists of different disciplinary backgrounds from 17 study sites across Europe. The paper outlines how working in groups (with other scientists and with stakeholders) changed and shaped ideas, actions and attitudes of both scientists and other stakeholders engaged in the process. It explores scientists' views on outcomes from the project and how changes related to the social learning process have contributed to achieving these successes. The discussion uses evidence from within the SPICOSA project to focus on a series of emergent challenges to fostering a successful learning process, relating for example to: the desire to manage or manipulate learning processes, the barrier of engaging stakeholders within the context of a scientific-led research project and the assumptions of social learning which both scientists and stakeholders bring to a learning process. The reality is that there are often many scientific and policymaking constraints and barriers setting a challenging context for a social learning process. The presentation argues that given this fact, social learning should be fostered, funded and constructed as a key element in all ICZM research initiatives.

Keywords: integration; science-policy; social learning; stakeholders; collaborative

Science-Policy Link for Coastal Management in India

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Abstract

Typically, in the context of coastal management, it is important for researchers to communicate scientific findings in an appropriate and accessible way to policy-makers to guide them make the right choices to draw up policies aiming at sustainable coastal environmental problems. An improved dialogue between the scientific and policy-making communities is necessary to improve linkages between policy needs to enhance accessibility of scientific knowledge to policy makers. India (with a coastline of 7500 km) has promulgated the Coastal Regulation Zone (CRZ) Notification in 1991, where the various coastal activities were managed with a sectoral approach. In 2011, the CRZ 1991 Notification has been revised for regulating development activities on the coastal stretches within 500m of High Tide Line on the landward side (CRZ I, CRZ II and CRZ III), including the aquatic area from low tide line up to territorial limits (CRZ-IV) and the area of the tidally-influenced water body. A separate notification has been issued for the islands- the Island Protection Zone (IPZ). Some of the uses of Science-Policy links for coastal management in India include: identification of CRZ violations identification of erosion hotspots for coastal protection measures and infrastructure development determine landuse/ landcover change risk governance - for cyclones and tsunamis

Integrated Coastal Management (ICM) Plan Preparation

In order to be effective, the policy must be focused and practical, addressing priority and strategic coastal use and change issues. It is necessary to engage meaningfully with the scientific community, public, private sector and the Government. Many key points that are important to consider while identifying lessons learned for linking science and policy formulation are discussed in detail.

Keywords: Coastal Management; science-policy links; CRZ; IPZ; India

International coastal scientists' prioritization of research needs for coastal management and conservation

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Abstract

Over the past 5 years, several “100 questions” exercises have identified lists of important research questions relating to the management and conservation of ecosystems and species. From 6 such lists, I synthesized 20 questions that relate specifically to coastal conservation and management. I conducted an Internet-based survey of coastal scientists to prioritize those questions. The sample was constructed using author contact information from an ISI Web of Science search. A total of 2,081 authors with email contact information were identified; these scientists, from 94 countries, had published at least one article in one of 450 journals with coastal research content between 2005 and 2010. The survey goal was twofold: (1) to prioritize the 20 existing coastal research questions and test for differences in priorities among scientists across disciplines and regions; and (2) to give scientists from outside the biological sciences and from around the world a chance to suggest alternative important coastal research questions. This paper presents summary results of the research question prioritization component of the recent (May 2011) survey. The results of this research may be used to facilitate dialogue between coastal scientists and policy makers, and could help align scientific research with policy needs.

Keywords: research priorities; coastal science; scientists' opinions; science and policy; 100 questions; research impact

The Role of Sustainability Science in Integrated Coastal Zone Management

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Abstract

Sustainability Science is a co-produced approach to sustainable development research, involving a policy centred process between researchers and managers. There is a need to investigate the role of Sustainability Science in Integrated Coastal Zone Management (ICZM), to clarify the linkages between Sustainability Science and ICZM philosophies. ICZM has been comprehensively documented and described in the academic literature since its emergence in the 1970s. By comparison, there is a paucity of literature on Sustainability Science in practice and/or within coastal management. This is partly because Sustainability Science only emerged in the 1990s as a new academic discipline. Organisational capital needs to be built, where a new culture of policy making can be influenced by a continuous reflection on current system changes, and the adaptation of policy responses accordingly. This paper is devoted to an analysis of ICZM activity, in which sustainability science plays an important role. The intention is to present a number of case histories from across North West Europe where the operationalisation of the principles of Sustainability Science in the coastal zone was tested. The approach employed was based upon empirical research on the functioning of Expert Couplet Nodes (ECNs) within the European Interreg IIIB COREPOINT project. Relationships between local authorities and research groups formed the basis of the operation of the ECNs. The results were based on in-depth, semi-structured interviews with both scientists and policy makers. The real life difficulties inherent in implementing Sustainability Science in practice were noted from the ECN case studies. However, a good foundation in ICZM (e.g. Severn Estuary Strategy) can be an accommodating factor. Evidence presented in the paper shows that the ECN model can facilitate the contextualisation of science, and this can lead to better policy making.

Keywords: Sustainability Science; Integrated Coastal Zone Management; Policy making; Expert Couplet Nodes.

Sea-level Rise in Local Planning Policies: The Case of Bacacay, Albay, Philippines

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Abstract

Low-lying coastal areas in the Philippines are among the most vulnerable to sea-level rise. The exposure to tropical cyclones which are anticipated to become stronger as a result of climate change increases the significant threats posed by sea level rise on these communities. This paper examines the socioeconomic impacts of tropical cyclones and sea-level rise to water resources, food supply, human health, and settlement in selected coastal communities of the municipality of Bacacay, Albay in the Philippines. Likewise, storm surge, flood, inundation, and saltwater intrusion are looked into. The 1.3 meter sea-level rise scenario was used to project impacts for 2100. This scenario was generated from an ensemble of various GCMs in the SIMCLIM modeling system with ALFI as the chosen storyline. This APN-funded research recommends the need to mainstream climate change adaptation in the barangay (community) and municipal development planning and enhance the capacity of local stakeholders to effectively implement local adaptation plans. It also highlights the importance of integrating science with local knowledge to promote more robust climate change assessment and hence effectively tackle climate change challenges at the local level.

Keywords: Sea-level rise, coastal communities, local policies.

Developing an integrated coastal zone management framework to better adapting to climate change impacts: the case of Mauritius as a small island developing state

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Abstract

As a Small Island Developing State (SIDS), Mauritius is among the countries that are most affected by the phenomenon of climate change and global warming. The Barbados Programme of Action (1994) and the Mauritius Strategy (2005) recognized that climate change could delay or prevent sustainable development in SIDS and that SIDS face special challenges due to their specific physical and geographical characteristics. To better adapt to these challenges and to sustain its very important tourism industry, an integrated coastal zone management (ICZM) framework coupled with appropriate institutional set up and legislations are presently underway. Financing plans and projects has always been a major issue of SIDS given their limited natural and economic resources. How will the ICZM framework encapsulate itself within the short and long term socio economic scenario of Mauritius needs to be understood among policy makers and the population? This paper focus on the importance of a well designed ICZM framework that moves in the direction of a “Mauritius – Sustainable Island” core philosophy.

Keywords: Climate change, adaptation, ICZM, SIDS, sustainable development.

» ABSTRACTS D1 «

Session: D1 Oral

The antibacteria activities and prebiotic effects of o-sulfated and sulfoniamide derivatives of inulin

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Abstract

Inulin, a kind of polymeric material, is mainly extracted from low-requirement halophytic vegetation like Jerusalem artichoke. In this study, two kinds of inulin derivatives, 6-sulfo-inulin (SII) and 6-(4-acetamido-2-sulfanilamide)-inulin (ASII), were successfully synthesized. Their structural properties were characterized by FT-IR and their antibacteria activities against E. coli and prebiotic effects over Bifidobacterium were explored. The results indicated that, comparing with inulin, ASII exhibits a better antibacterial ability and SII has an improved prebiotic effect. When the two kinds of tested bacterium were combined cultivated, SII could help Bifidobacterium to “outcompete” potentially detrimental E. coli. Because the derivatives are convenient to prepare and exhibits improved potential activities, these materials may benefit the employments of this currently underutilized biodegradable and environmentally benign coastal zone resource—inulin.

Keywords: halophytic vegetation; inulin; 6-sulfo-inulin; 6-(4-acetamido-2-sulfanilamide)-inulin; antibacteria activities; prebiotic effects

Marine Red Algal Diversity and Their Use in Korea

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Abstract

Korea has diverse marine habitats surrounded by Yellow Sea, South China Sea and East Sea, and its southern and southwestern coastlines form a well-developed via coastline, providing safe seaweed farming. The warm and cold current systems bring subarctic, temperate, and subtropical marine organisms to the Korean waters. The marine red algal diversity of Korea is high with approximately 566 species. Of these, *Porphyra*, *Grateoloupa*, *Gloiopeplis* are used as food, and *Gelidium* and *Gracilaria* is used for agar production. They are harvested in the field and/or cultivated in fishery farms. Recent researches in my lab have been focused on the genera *Gelidium*, *Gracilaria* and *Grateoloupa*. The diversity of *Gelidium* and *Grateoloupa* based on morphology is newly evaluated with description of new species and taxonomic revision of species. For example, *Gelidium eucorneum* sp. nov. commonly occurs in the intertidal zone on the southern coast of Korea and is characterized by small thalli with horn-shaped cystocaps. Conservation and management of marine red algae is necessary for selection of superior strains or species for industrial use.

***Gracilaria* cultivation development and bioremediation roles of seaweed in Chinese coastal waters**

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Abstract

Mariculture is one of the most important marine industries in Chinese coastal waters. In 2008, the total mariculture production reached 13,403 million tons from a production area 1,578,909 ha. Within the mariculture sector, the culture of the red agarophyte, *Gracilaria*, has also rapidly expanded in China over the past 10 years. Production of *Gracilaria* reached 99,451 t in 2007 and for seaweeds only ranked only behind the kelps, *Laminaria* and *Undaria*. The principal species being cultured throughout China is *G. lemaneiformis*. This seaweed grows very well in many Chinese coastal waters. The specific growth rates (SPG) are up to 13.9% d⁻¹ in Jiaozhou Bay, Shandong Province. In laboratory experiments, the removal of NH₄-N decreased 85.53 % and 69.45%, and the concentrations of PO₄-P decreased 65.97 % and 26.74% with *Gracilaria* after 23 days and 40 days, respectively. *G. lemaneiformis* is very effective in decreasing N and P loadings. Some allelochemicals from *G. lemaneiformis* are able to inhibit the growth of some microalgae, damage the cell membrane, chloroplast, mitochondria and nucleolus of *Skeletonema costatum*. Large-scale *Gracilaria* cultivation can be an effective means of improving water quality conditions and controlling harmful algae bloom, and promoting a more sustainable mariculture industry in China.

Keywords: mariculture, *Gracilaria* cultivation, bioremediation, China

Effect of sedimentation and erosion disturbances on seagrass waters

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Abstract

We study effects of local erosion and burial on i) isolated rhizome fragments of seagrass which are important for seagrass spreading and ii) edges of a seagrass meadow which affect seagrass patch dynamics and recovery potential. The initial burial depth of isolated rhizome segments was negatively correlated to the survival rate of those rhizome segments. At the edge of meadow, seagrass invaded the experimentally created gaps with more biomass than experimentally created hills. Overall present results demonstrate that seagrass survival is negatively affected by sedimentation but surviving shoots grow back rapidly to the “preferred” depth. Our study provides quantitative knowledge on the seagrass recovery potential of bed edges and of isolated rhizome fragments of seagrass following small scale (but meadow-wide occurring) sediment disturbances which is of vital importance for maintenance and spreading of these worldwide threatened ecosystems.

» ABSTRACTS D1 «

Getting Riparian States to Co-operate in Transboundary Groundwater Management: Challenges and Opportunities to Water and Food Security amid Climate Change

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Abstract

Transboundary riparian ecosystems and transboundary groundwater are as interdependent as flora and fauna found anywhere. Nonetheless, conflicts characterize the management of transboundary riparian ecosystems and transboundary groundwater. Conflicts on the obscured groundwater are envisioned to worsen and magnify in the face of increasing water scarcity and global environmental change. To surmount these management conflicts, water experts worldwide suggest several management approaches which can be broadly categorized under co-operative, non-co-operative and myopic ones. Most promisingly sustainable, practical and popular among them is the co-operative management approach which evolves a single comprehensive plan to manage transboundary watersheds. However, there are issues with the co-operative management approach which arise as a result of cultural, political, economic, legal, geographical, technical, historical, and institutional differences from one stakeholder (user or right owner) to the other within and across boundary. Stakeholders may view these issues as challenges or opportunities. But the best way forward is the evolution of a single co-operative transboundary watershed management approach using stakeholders who have learned from success and failure management practices in component riparian ecosystems and are strongly motivated to bring all their experiences to the development of a comprehensive plan which manages transboundary watersheds as a whole.

Keywords: Watershed, conflict, cooperative, way, forward

Plant biology in maintaining sustainable development of coastal zone: Disciplinary roles and relationship

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Abstract

In the 21st century, the following issues are the concerns for human beings: Health of Human beings; Eco-environment; Sustainable Development; Food and Energy Supply. Although these challenges are linked with each other, the biggest is the last. For China, Agricultural Sustainable Development (including potential resources development such as coastal zone resources-plant resources, soil resources and sea water) and Eco-environmental Sustainable Development are the most important aspects. Along the Chinese coastal zone where more than 70%GDP is produced annually□this situation is quite similar in the their parts of the globe. On the basis of this tendency, we should reconsider coastal zone-related disciplinary system and relationship. We think that Soil Science (soil: the first protecting barrier for survival, not recognized), Ecology (scientific & efficient utilization for natural resources), Agricultural Sciences (safe and reliable food supply and guarantee), and Life Sciences (the core role for natural cycle, especially plant biology, providing the basic principles and measures) are the important disciplines. They are linked with one another, overlapped and inter-cooperated. In the sustainable development context, more attention should be paid to Advances in Life Sciences, in particular Plant Biology in the 21st century, which will provide an eventual platform for resolving the Issues mentioned above (Shao et al 2007-2011). The current presentation will discuss the roles of plant biology in maintaining sustainable development of coastal zone under global climate change on the basis of the recent work from my team group.

Keywords: Coastal zone; Salt gradient; Drought; Plant biology; Stress physiology; Sustainable development; Resources and eco-health; Global climate change

Biodiversity and biogeographical analysis of the genus *sargassum* in the south china sea region

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Abstract

The brown algal genus *Sargassum* is one of the most dominant algal genera found in the Tropical and Subtropical seas. It attains its highest diversity in the Southeast Asian region around the South China Sea, including the Gulf of Thailand, with a total of 191 species recorded. The Philippines recorded the highest number of species (73) and Thailand the lowest (11). Cluster analysis based on species composition of ten pre-designated sub-areas within the region indicates a good separation of subtropical areas like Hong Kong, South China, Vietnam, Hainan and Taiwan from the truly tropical areas like the Philippines, Indonesia, Thailand, Malaysia and Singapore, due mainly to the presence of more typically temperature to subtropical species in those subtropical areas. Many new species have recently (within the last 20 years) been described from the South China Sea region (70 out of 191 or 36.6%). Many of these are likely to be synonymous. The taxonomic validity of many of these is currently being evaluated using molecular techniques and morphological analyses.



» ABSTRACTS D2 «

Long term trends in rainfall and their impacts on phytoplankton ecology in a southwest Australian estuary.

Potential Management Solutions on Ecosystem-based Approach: The Yellow Sea Example from Science to Management

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Abstract

Marine environment degradation in the Yellow Sea faces tremendous challenges from rapid economic development in the coastal areas of the sea. There have been a lot of efforts devoted to the management of the marine environment and sustainable uses of marine and coastal resources in the past decades in the Yellow Sea by the coastal countries. However, the degradation trend has not been effectively reversed. The traditional sector management may be one of the reasons. The UNDP/GEF Yellow Sea project (2004 – present) identified the regional marine environmental problems, the priorities, and root causes of the Yellow Sea, through the Transboundary Diagnostic Analysis (TDA), and prepared and adopted by the governments of the coastal countries of the Yellow Sea, the Strategic Action Programme (SAP), with clear identified management targets, management actions and implementation mechanism.

The Yellow Sea regional SAP takes the ecosystem-based approach, with thorough consideration on the ecosystem carrying capacities. The main objective of the SAP is to recover and/or maintain the Yellow Sea ecosystems through enhancing the ecosystems' Provisioning, Regulating, Supporting and Cultural Services. The design of the SAP has been prepared fully based on the scientific findings, and apply the marine scientific knowledge in the design of the management actions. Two cases (amongst 23 demonstration projects) will be provided in the presentation as the examples of the ecosystem-based approach: (i) food chain-oriented approach; and (ii) habitat-oriented approach. Scientific findings on appropriate level of reducing fishing efforts, sustainable marine culture, reducing negative environmental impacts from mariculture areas, impacts of pollutant to the biological diversity, etc have been considered in the ecosystem-based approach, and be included in the management actions. The ecosystem-based approach applied in the Yellow Sea management requires inter-sector coordination to address marine environmental problems in a coherent, scientifically sound manner. The case studies indicated that while science is appropriately interpreted and presented, it will be understandable and applicable by the decision maker. The approval of the Yellow Sea SAP is a good example.

Long term trends in rainfall and their impacts on phytoplankton ecology in a southwest Australian estuary.

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Abstract

Most of Australia has low erratic rainfall combined with small coastal catchments and high evaporation resulting in annual discharge from rivers that are amongst the lowest and most variable in the world. The southwest of Australia has seen a pronounced decline in rainfall over the last 30 years at ~ 10 mm/y with 2010 dropping to 268 mm less than the 30 year average. This drying trend has resulted in lower river runoff and a range of impacts on southwest estuaries. Evidence from Wilson Inlet, a bar built estuary along the south coast of Australia suggests pronounced impacts on nutrient cycling and phytoplankton dynamics. The estuary is approximately 14 km in length and 4 km wide and has an area of 48 km². The estuary has an average depth of approximately 1.8 m and a volume of approximately 120 x 10⁶m³. Typically the entrance of the estuary is blocked by a sand bar for 7 to 9 months each year. Since the 1930s Wilson Inlet has been artificially opened to control local flooding when it exceeds ~1m above mean sea level. In recent years when the Inlet did not reach this height the bar was not artificially breached. As a consequence of not being opened to the sea, despite a reduction in rainfall and river flow, the average salinity of the Inlet has been reduced significantly. Since 1999 the salinity has fallen ~ 10 ppt. Associated physical and chemical impacts include reduced stratification, a lower frequency of bottom water hypoxia and a reduction in bottom water ammonium concentrations. Biological consequences include a reduction in chlorophyll a and a reduction in diatoms within the Inlet.

Keywords: rainfall, estuaries, phytoplankton, nutrient cycling.

Session: D2 Oral**Human effects on China coastal ecosystems—a case study of Daya Bay**

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Abstract

As a venue of rapid industry, aquaculture development, urban expansion and population growth, Daya Bay is a natural laboratory to study the influences of human activities on coastal ecosystems. Satellite observations suggested that two nuclear power plants operated here have direct impacts on the local environment at the southwest part of Daya Bay, which takes up to ~3% (2002) and ~7% (2003) of the entire bay. Field observations over 1998 to 2007 suggested that human activities here had substantially altered the nutrient balance and driven this bay into a P limiting environment. In the past decade, phytoplankton biodiversity in this bay decreased by ~25% accompanied with significant change in community structure. Ecosystem degrade in Daya Bay was further evidenced by the observed trend of elevating petroleum hydrocarbon level. Principle Component Analysis (PCA) suggested that the long-term variations of water quality and phytoplankton biomass in Daya Bay can be grouped into three distinct clusters: Cluster A (1998 and 2004-2006) characterized by high concentrations of NH4-N and TIN and high TIN/PO₄-P ratios, Cluster B (1999, 2002 and 2003) characterized by high concentrations of NO2-N, NO3-N, SiO₃-Si, and chlorophyll a and high SiO₃-Si/PO4-P ratios, and Cluster C (2000, 2001 and 2007) characterized by high PO4-P and phytoplankton concentrations. Marine reserve within Daya Bay was suggested and discussed based on these findings.

Keywords: South China Sea, Daya Bay (DYB), coastal ecosystems, marine reserve, water quality, phytoplankton, remote sensing, principal component analysis (PCA).

Impact of climate change on the eastern Pacific fisheries

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Abstract

Patterns of variability of time series of catch records of marine organisms in the eastern central Pacific are examined. Climate indices were compared to the variability of fish catch. 18 time series of catch data for major fisheries of the Eastern Central Pacific are analyzed. The study is focused on the low-frequency variability and the catch time series were analyzed by the method of Hamming windows. The variability of the climate of the North Pacific, time series of the Pacific Decadal Oscillation Index, the multivariate index of El Niño, and the Sea Surface Temperature were analyzed also with the Hamming windows. The spectrum of variability of catch indicates that the most frequent component is 29 years detected in at least 8 fisheries. The second component was identified in 7 fisheries with a frequency of 17 to 18 years. Two other components are one with a frequency of 13 to 14 years, and another with 7 to 8 years. The long-term or low frequency climate variability was recognized in environmental series where a dominant cyclical pattern over 50 years, one of approximately 30 years and another one of 17 years was found only in the southern part of the study area.

Keywords: Climate change; fisheries; eastern tropical Pacific; spectrum of variability

» ABSTRACTS D2 «

Biogeochemistry in the Continuum from Watersheds to the Continental Margins: Case Studies from Changjiang (Yangtze River)

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Abstract

Systems of land – sea interaction represents an over-stressed ecosystem under the influences both from land (e.g. runoff with pollutants) and from open ocean (e.g. incursion of boundary current to the coastal region) but with different patterns in terms of time-scale and magnitude. Land-based human activities from watersheds, such as deforestation, agriculture, and hydrological engineering (i.e. dam construction), have altered the fluxes of natural weathering materials and pollutants to the West Pacific Ocean. On the other side, incursion of Kuroshio regulates the biogeochemical processes of adjacent coastal ocean. In this study, the role of biogeochemistry in the land - sea interaction is evaluated using some case studies from China Seas as an example. Data are from various sea-going cruises in and cover a region from upstream of drainage basin to the continental margin, which includes nutrients, trace species, biomarkers, stable and radio isotopes. Climate issues as well as human being activities, such as damming and fresh water regulation in the watersheds and monsoon induced change in water exchange over the shelf. Biogeochemical dynamics in the coastal environment is examined in more detail.

Assessing Distribution Patterns, Extent, and Current Condition of Mangrove in Iranian coast of Persian Gulf

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Abstract

Iranian mangrove forests occur between 25°11'N to 27°52'N. These forests exist in the north part of the Persian Gulf and Oman Sea, along three Maritime Provinces in the south of Iran. These provinces respectively from southwest to southeast of Iran, include Bushehr, Hormozgan and Sistan & BaluchestanThe Mangroves play important roles mainly in aquaculture and finishing. And beside that they are great nursery for aquatic animals like fishes and place of reproduction for birds. As well as protection of shorelines against massive waves and tsunami. Approximately 35% of world mangrove area was lost during the last several decades of the twentieth century (in countries for which sufficient data exist), which encompass about half of the area of mangroves. Likewise, the 2010 update of the World Mangrove Atlas (WMA) indicated a fifth of the world's mangrove ecosystems have been lost since 1980. Now scientists have used satellite images to compile the most comprehensive map of mangroves worldwide, which should help in future efforts in monitoring and conservation. We determined the spatial extent 0 f the mangrove forest in the Persian Gulf using remotely sensed satellite data and estimated changes in the spatial extent of the forest from the 1973 through 2008 using Landsat satellite images from Multispectral Scanner Landsat (MSS) (1976), Thematic Mapper (TM) (1989), Enhanced Thematic Mapper plus (ETM+) (2000, 2006) and IRS LISS III (2008) sensors. In this research we used normalized differential vegetation index (NDVI). Change detection was applied and mangrove in the study area was found to have increased by about 65% from 1974 to 2008.

Keyword: Mangrove Forest, NDVI, Persian Gulf, Change Detection

A long-term time series shows that catchment activity affects marine water quality in the inshore Great Barrier lagoon

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Abstract

Long-term ecosystem studies are becoming more valuable as scientists strive to understand the ecological consequences of a changing environment. Here we present an analysis of the longest available time series of water quality data for the Great Barrier Reef (GBR), the AIMS Cairns Transect, which has been sampled several times a year since 1989. Water quality was defined by the concentrations of chlorophyll a, dissolved inorganic, organic and particulate nutrients (PO_4^{3-} , DOP, NO_x, DON, Si, PN, PP), suspended solids (SS), and by temperature and salinity. Most water quality variables showed significant long-term and seasonal trends. Suspended solids, PN, chlorophyll a and NO_x concentrations peaked around the late 1990s, while concentrations of DOP and PO₄ showed multi-year fluctuations. Seasonal trends were obvious in concentrations of SS (highest during the windier dry season), chlorophyll a and PN (highest during summer with a smaller peak during spring), while DON, DOP and PP concentrations had no significant seasonal trends. Data clearly separated into wet and dry season, predominantly driven by temperature and river discharge. PN, PP, chlorophyll a, NO_x and Si were positively associated with river inflows and vegetation clearing rate on the adjacent catchments, while salinity was negatively correlated with river flow. Very high vegetation clearing rates were reported before or during years when concentrations of several water quality variables were high (1996–2001), and three major river flood events also occurred during this period (1999, 2000 and 2001). This is the first evidence, albeit correlative, that catchment activity (i.e. land clearing) affected marine water quality. Future improvements in GBR catchment management are expected to improve inshore marine water quality. However, these improvements will be difficult to quantify given the highly variable baseline, which is influenced by a variety of factors including the variable climate in tropical Australia with sporadic extreme wet season events.

Climate changes and the role of new exotic/invasive species *Mnemiopsis leidyi* in the Caspian Sea biodiversity

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Abstract

After *Mnemiopsis* invasion into the Caspian Sea via the ballast water from the Black Sea and/or the Sea of Azov in 1999 (Ivanov et al., 2000; Roohi, 2000), caused tremendous damage to this new ecosystem. The results of a monitoring study carried out in the southern Caspian Sea during the years 2001–2006 showed that the explosion dynamic in the *M. leidyi* population coincided with a decline in the abundance and diversity of mesozooplankton. The highest summer–autumn average of *M. leidyi* abundance was observed in 2002 ($760 \pm 1148 \text{ ind. m}^{-3}$), although the biomass during this period ($23.2 \pm 23.3 \text{ g.m}^{-3}$) was lower than in 2001 ($41.5 \pm 44.3 \text{ g.m}^{-3}$). It was shown that the highest biomass of *M. leidyi* was observed in summer-autumn period while the minimum was in winter-spring. Meantime the amount of phytoplankton population increased to a high level with a cyanophyte, *Nudolaria* sp. bloom in 2005. Since *M. leidyi* is a voracious predator of fodder zooplankton, catches of the main zooplanktivorous fish, Kilkka *Clupeonella* spp., decreased significantly in the southern Caspian Sea. The landings of Kilkka dropped initially to 64 thousand tonnes in 2001 and later declined to 15 thousand tonnes in 2006, from catches of 82 and 85 thousand tonnes in 1998 and 1999, respectively. So within only 6 years, about 80% decrease in the Kilkka catches of Iranian fishermen has occurred, resulting in a minimum of 100 million US dollars economic loss. The *Mnemiopsis* invasion also caused increased eutrophication in the Caspian Sea due to decreased herbivory. The outburst of the cyanophyte *Nudolaria* sp. in the southern Caspian Sea in September 2005 with respective abundance and biomass values of $1.2 \times 10^8 \text{ ind. m}^{-3}$ and 99.7 g.m^{-3} could be a consequence of ecosystem instability caused by the *Mnemiopsis* invasion.

Keywords: long-term time series; coastal water quality; tropical; nutrients; suspended solids; land runoff

Climate changes and the role of Wind Vector on Nudolaria algae bloom in the Caspian Sea

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Abstract

Anomaly climate parameters changes follow with global warming are the noticeable outlines in aquatic ecosystems in which are importance in increase or decline of some environmental occurrences. Recently, Nudolaria bloom is one of the unpredictable phenomenon's which happen in the Caspian. In this study, day time period changes and wind vector on algae bloom was investigated in the southern Caspian Sea from 2005 Up till now, there is not any concern with meteorological aspect in Nudolaria bloom investigation.

Key words: Meteorology, Climate changes, Nudolaria, Wind Vector.

Keywords: Caspian Sea, zooplankton, phytoplankton, *Mnemiopsis leidyi*, *Nodularia*

Temporal variation of diatom and silicoflagellate assemblages in coring sediment over the last 130 years in Sishili Bay, China

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Abstract

Diatom and silicoflagellate remains were analyzed for the 94-cm coring sediment which was deposited during 1875 and 2008 in Sishili Bay, China, with the aim to discover the changes of local marine environment and explore the changes of climate and human activity intensity during that period. Totally, 67 sub-samples were studied and 53 species were identified including 52 diatoms and 1 silicoflagellate species. The concentrations of fossil remains were less than 5000 before 1977 but experienced a sharp increase to more than 10000 valves/g DW after that year. The concentration distribution shares a similar trend with the total dissolved nitrogen in the sediment. Our analyzed showed that the fossil abundance increase was closely related with the waste water discharge from the sewage plant, which was situated around the coring sediment site. *Paralia sulcata* dominating in the sediment was regarded as an effective indicative species for eutrophication also had a corresponding increase from the late 1970s. Additionally, the increase of mean annual air temperature in northern Yellow Sea since 1960s was also indicated by the increasing concentrations of warming species *Cyclotella stylorum* from that period.

Keywords: Sediment; diatom; silicoflagellate; human activity; climate change Sishili Bay

Long term change in diatom community as an indicator of environmental change in a heavily impacted coastal bay – Jiaozhou Bay in China

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Abstract

Over the past decades, the coastal environment in China has been greatly modified by the rapid economic development and heavily human activities. Jiaozhou Bay, a semi-enclosed basin in the western Yellow Sea of China, will be presented as a typical case in this talk. For example, the population around Jiaozhou Bay increased from 4.5 million to 7.0 million during 1960s-1990s; the waste discharge increased from 1.46×10^9 t in 1988 to 8.51×10^6 t in 1997; the aquaculture increased from 540 t/y in 1980 to 81,000 t/y in 1995. Phytoplankton as one of ecological indicators was used to reflect these environmental changes in Jiaozhou Bay. The results of phytoplankton data from 1954-2004 in situ combined with the evidence of diatom debris in a 100 year sediment core indicated a shift in the dominant species, cell size change and decrease in abundance. The related chemical and physical parameters (nutrient, temperature etc.) and human activities will be explored for understanding the response of the phytoplankton assemblage to the environmental change.

Keywords: Marine ecosystem, Jiaozhou Bay, Long-term change, diatom

Using the MERIS-derived data to analyze the chlorophyll-a variation in the Bohai Sea

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Abstract

Seasonal variation of Chlorophyll-a (Chl-a) in shallow coastal ecosystems often lacks a complete mechanistic explanation. Here we seek to identify major mechanisms that control the variability of Chl-a in different dynamic regions of the Bohai Sea through the seasons. For this, we analyzed 2003-2009 Chl-a data derived from the Medium Resolution Imaging Spectrometer (MERIS) in the Bohai Sea. In the shallow regions (i.e. the Laizhou Bay and the Bohai Bay), the data interestingly did not reveal any consistent seasonal trend but a considerable inter-annual variability during the summer/autumn period. In deeper offshore waters, low concentrations of Chl-a always occurred in summer. The Principle Component Analysis (PCA) analysis of seven variables, including monthly composite Chl-a in the Laizhou Bay and the Yellow River discharge, suggested that the high inter-annual variability of the river discharge considerably contributed to the high inter-annual variability of Chl-a during summer. We found Chl-a and wind speed contributed similarly to the Chl-a variation by performing PCA in the Liaodong Bay. This similarity implied that the processes caused by wind-induced vertical turbulent mixing, i.e. remineralization of the benthic nutrients and resuspension of the benthic sediment, could explain the relatively low Chl-a concentration during summer in the offshore waters.

Keywords: Bohai; chlorophyll-a; MERIS; river; seasonality; wind

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High-resolution record of black carbon and polycyclic aromatic hydrocarbons in coastal zone of Hangzhou Bay, China – preliminary results Yantai, China

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Abstract

A high-resolution record of black carbon (BC) and polycyclic aromatic hydrocarbons (PAHs) deposition over the past ~150 years was reconstructed using a dated sediment core from Sishili Bay, Yantai, China, which shows plentiful information on energy consumption and structure, following the historical economic development in China. During the period before 1950s which was dominated by biomass-burning dominated, LMW-PAHs increased from ~80 ng/g to the maximum 925.6 ng/g around 1953, while HMW-PAHs kept relatively steady with the average of 51.1 ng/g. BC concentration in this period waved about 10 years with an average of 0.72 mg/g, there is a sharp drop for both BC and PAH concentrations at the end of the World War II and Chinese Civil War. Between 1950s and 1980s, the concentrations of BC and PAHs increased steadily. This trend indicated diminishing biomass burning and increasing coal combustion in China's energy structure. After 1980s, the HMW-PAHs increased rapidly while BC concentration dropped to a low level. This character is consistent with the higher temperature combustion (coal and oil instead of biomass) and increasing energy consumption since China embarked on the “reform and open” policy. BC concentration rose from 0.26 mg/g in 1980-1996 to 0.58 mg/g in 1996-2009, which may reflect the growing number of vehicles.

Keywords: Black carbon; polycyclic aromatic hydrocarbons; sedimentary record; coastal zone; Yantai

Natural and anthropogenic impacts on the community structure and function at Cixi wetland in Hangzhou Bay, China

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Abstract

Cixi is a rapidly growing city in Zhejiang province, situated on the southern bank of the Hangzhou Bay. The wetlands around this bay are important areas for aquaculture and industry but they also provide essential living space for species, which are dependent on such habitats. The zoobenthic community (macrobenthos), an indispensable part of such a system, is recognised as a key element in many marine and estuarine monitoring programmes. A loss or a decline in biodiversity results in a loss of ecosystem services provided by wetlands.

Preliminary results of the investigation in 2010 reveal more than 50 macrobenthic species, mainly comprising organisms from various big groups such as Crustacea, Annelida and Mollusca. Wise coastal zone management can lead to sustainable use of the wetland area and its ecosystem services since wetlands are also rated as the second most valuable ecosystem globally, preceded only by estuaries. Therefore it is necessary to monitor this area with respect to ongoing changes in order to protect the precious wetlands.

Keywords: Wetland; Hangzhou Bay; macrozoobenthos; diversity; abundance



Estimating the deposition rate of the tidal flat from the morphological data of the *Spartina alterniflora* plants

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Abstract

Based on the results obtained from field work and statistical analysis for the tidal flat of the Rudong coast in Jiangsu, we propose that the deposition rate of the tidal flat can be estimated using the morphological data of the *Spartina alterniflora* plants. It is found that the distance from the bed surface to the depth where the root system is located is quite stable for living plants. Furthermore, for any buried, old plants, the distance between the present-day bed surface and the root system can be measured. Hence, the difference between these two distances represents the thickness of newly deposited materials. Since the first time for the introduction of this species to the study area is known, the deposition rate can be deduced. Thus, at the site of the central part of the Weihai tidal flat on the Rudong coast, a deposition rate value of 3.2 cm/yr has been derived, which is consistent with the data obtained from bed elevation monitoring (i.e., 3 cm/yr) and the Pb-210 measurements carried out previously by other researchers.

Keywords: *Spartina alterniflora* Loisel root stem, tidal flats, deposition rates, Jiangsu coast

The three ages of health: natural and Anthropogenic variance of seagrass and micro-algal abundance over the last 83 years

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Abstract

The natural health of upper Little Swanport Estuary was assessed from and to the onset of the lower estuary oyster aquaculture using a multiple proxy paleoreconstruction of seagrass/micro-algal variability and sestonic turbidity in respect to usual flood and nutrient supply. It was found that natural variability could be described as a series of flood mediated supra-decadal seagrass meadow destruction and recovery. The former state describing a micro-algal continuous regime shift, independent of external net supply of inorganic nitrogen but with sufficient light for potential seagrass recruitment. The effect of lower estuary oyster aquaculture appeared to “soak up” the nitrate, as the main supply from the coast, leading to both a temporal and longitudinal gradient of decreasing micro-algal productivity and an increasing proportion of nitrogen fixation within the seagrass muddy sediment biome (86%). This process was described as juvenilisation, a process of re-oligotrophication within a mesotrophic context and may lead to eventual loss of seagrass.

Keywords: Paleoreconstruction, health, nutrients, fixation, aquaculture, juvenilisation, re-oligotrophication

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Decadal variation of water quality in three contrasting coastal systems of Ishikawa coast, Japan: Drivers and trends

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Abstract

This study examined drivers and trends of change over time in some water quality parameters from three contrasting coastal systems (Kanazawa area- KNA, Noto area- NTA and Nanao area- NNA) of Ishikawa coast. Mean annual concentration of COD has decreased by ~20% and 12% at KNA and NNA, respectively, between 1984 and 2009, whereas, NTA which had lowest COD concentration in 1984 had increased by one-fourth (~25%) as at 2009, possibly as a result of human perturbation from tourism, agricultural and fishing activities. Within the last three decades, hydrogen ion concentration (pH) value has dropped between 0.13 – 0.20 along the coast (KNA, NTA and NNA), as a result of possible environmental change impact on coastal waters quality of Ishikawa since increased atmospheric CO₂ concentration tends to increase acidity in the upper ocean. Analysis suggests that human perturbation over the years may be more relative than environmental change impact. Relative to NTA and NNA, KNA coastal compartment have experienced rapid and serious erosion due to the combined effects of natural and anthropogenic factors resulting from dense population with sizeable industrial centers and port developments amongst others. Around NTA coastal compartment, refuse abandonment on the coast by tourist has been identified as one of the drivers of change in the coastal water quality. The main vulnerable areas of the coast, from the water quality point of view, seem to be the KNA coastal compartments, where high COD concentrations and nutrients (T-N and T-P) concentrations are observed. Although, COD concentration has been the lowest at NTA relative to KNA and NNA, increasing trend observed at NTA in recent years suggests some form of organic contamination possibly as a result of anthropogenic influence which may warrant further investigation and local attention.

Keywords: Water quality; decadal variation; natural; anthropogenic; environmental change; Ishikawa coast.

Sedimentation rates and accumulation metals in coastal sediment of Hai Phong Coastal area, Viet Nam

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Abstract

Hai Phong is one of big cities of Viet Nam with big ports and industries, the pollution in coastal area are potentially problems impact coastal ecosystem. The human activities on coastal environment according to times (1894-2008) were recorded seeing through sedimentation rates and accumulation metals in sediment by used ²¹⁰Pb. Sediments deposited in traps and surface sediments in the tidal flat are coarse aleurites, fine aleurites muds, aleuritic - pelitic muds. Accumulation rate of sediments in rainy season were in a range 0.07 – 22.81 g/cm²/year, in the dry season in a range 1.34 – 6.98 g/cm²/year. Sedimentation rates in tidal flat were in a range from 0.13 - 15.00 cm/year in period 1894 – 2008. Concentration of metals in sediment cores were in a range Ca = 0.56 – 0.89 %; Mg = 0.78 – 1.19 %; Na = 0.24 – 1.63 %; Fe = 2.90 – 4.37 %; Mn = 0.10 – 0.18 %; Ag = 0.15 – 0.21 mg/kg dry weigh; Cd = 0.28 – 3.53 mg/kg dry weigh; Co = 10.69 – 19.48 mg/kg dry; Cu = 50.01 – 89.01 mg/kg dry weigh; Ni = 23.16 – 44.80 mg/kg dry weigh; Zn = 94.25 – 137.68 mg/kg dry weigh; Pb = 55.36 – 84.06 mg/kg dry weigh; As = 20.24 – 53.93 mg/kg dry weigh; V = 32.33 – 63.64 mg/kg dry weigh; Li = 45.80 – 74.03 mg/kg dry weigh. In surface sediments, heavy metals were in a range Cu = 20.97 – 115.53 mg/kg dry weigh; Pb = 31.45 – 125.18 mg/kg dry weigh; Zn = 47.47 – 225.29 mg/kg dry weigh; Cd = 0.05 – 0.78 mg/kg dry weigh; Hg = 0.09 – 0.57 mg/kg dry weigh. In the Hai Phong coastal area recorded human activities effect on coastal environment by suddenly sedimentation rates from 1981-1985 very high, some heavy metals in sediments were high concentration over TEL or PEL, these factors are potentially impact and damage to coastal ecosystem.

Keywords: Sedimentation rates, coastal sediment, metals, Hai Phong.



Benthic records indicating increasing nutrient availability and primary production in the Yellow Sea

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Abstract

The Yellow Sea is a semi-enclosed shallow shelf and is vulnerable to eutrophication pressures from the neighboring lands. To date, it is difficult to resolve the history of eutrophication in the Yellow Sea, largely due to lack of long term systematic observation in the region. We present an analysis of sediment records of the key bioactive elements C, N and P at three sites locating in the north, middle and south of the Southern Yellow Sea. The sediment contents of total organic carbon (TOC) and total nitrogen (TN) both presented an overall increasing feature, while total phosphorus (TP) without significant increase, over the last century; the molar ratios C/N and C/P also presented significant increases since six decades ago. The low C/N ratios (<8) in the middle and north of the Southern Yellow Sea also indicated that the sediment organics derived from the sea. The contents of TOC, TN and TP in the surface sediment were mostly positively correlated with contents of these elements except for TP and primary productivity in the overlying water column of Southern Yellow Sea. The trends of historical changes of sediment contents of TN and TP and N/P molar ratio were consistent with the observed increase of nutrients in the water column of 36°N in the Yellow Sea since late 1970s/late 1980s and the trends of TOC and TN contents also paralleled with the decadal increases of chlorophyll a content, zooplankton and macrobenthos biomass. The results indicate that the Yellow Sea has received more nutrient inputs from the neighboring lands, which stimulated the sea's production toward a higher level through bottom-up effects.

The impact of different pollution sources on modern dinoflagellate cysts in the Sishili Bay, Yellow Sea, China

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Abstract

The spatial distribution of dinoflagellate cysts in the surface sediment of Sishili Bay, Yellow Sea, China, was studied, with the purpose of understanding the impact from nutrient enrichment and industrial pollution. Thirty-five dinoflagellate cyst taxa of 15 genera and three unknown cysts were identified and quantified at twenty-two sampling sites. The autotrophic cysts (e.g., *Spiniferites bentori* var. *truncata*) and heterotrophic cysts (*Brigitteinium sp.1* and *Quinquecuspis concreta*) dominated in the sediment samples. The spatial distribution of cyst abundance showed a significant positive relevance with increased nutrient but negative to heavy metal pollution. The highest abundance of cysts with an average of 539 cysts g⁻¹ DW occurred in A zone, corresponding to nutrient enrichment caused by domestic sewage discharge. In contrast, the lowest cyst abundance with an average of 131 cysts g⁻¹ DW was observed in E zone impacted heavily by the industrial pollution. The abundance of autotrophic cysts decreased dramatically in E zone compared with heterotrophic cysts and showed a sensitive characteristic to the industrial pollution. The different physiological mechanisms on how heavy metals affect autotrophic and heterotrophic cysts need in-depth study.

Session: D3 Keynote

The flowcam: a methodology for studying the nano-microplanktonic communities

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Abstract

In the context of coastal zone monitoring, it is essential to study the components of the planktonic food web, from nano-microplankton to mesozooplankton. Standard methodology based on microscopic and/or molecular approaches are currently applied, but the recent instrument, the flowcam, appears to be a very efficient tool to analyze these planktonic communities. The flowcam is an integrated system, combining selective capabilities of a flow cytometry, microscopy, and fluorescence detector in order to analyze quickly particles in a moving fluid. This study reported the efficiency and the limits of the flowcam, through different examples from *in situ* experiments.

In tropical lagoon water (Tuamotu Archipelago, French Polynesia), nano-microplankton was simultaneously studied by two methods, the inverted microscopy and the flowcam. The abundance of these organisms was similar for particles of size range between 1.5 µm and 100 µm. The identification by genus with the flowcam was easy for a lot of particles, but it appeared difficult to determine the round cells, especially small dinoflagellates. In the temperate marsh water (Charente-Maritime, France), the abundances of metazoan microzooplankton counted with the flowcam were significantly similar to binocular loop counts, with the possible determination of the genus for many organisms by the flowcam. In conclusion, the monitoring of these planktonic communities with the flowcam could be useful for different applications: (i) monitoring of nano-microplankton, (ii) identification of a specific genus such as a biomonitor (e.g. toxic algae), (iii) studying the short term variations of a specific organism during grazing experiments. The limits of the flowcam will be discussed and ways of research will be given



Session: D3 Oral

Migratory response of estuarine benthic diatoms to light and temperature

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Abstract

Migration of estuarine benthic diatoms is an important adaptation to living in sediments of intertidal flats. Motility allows cells to migrate up and down in the sediments in response to a wide range of environmental stimuli. Vertical migration of two benthic diatoms was investigated in response to different light intensity and temperature. Using Imaging-PAM (Pulse amplitude modulated) fluorometer, minimal fluorescence (F0) was used to monitor diatom biomass variation in surface sediments, and rapid light curves (RLCs) were applied to assess the photosynthetic activities of the tested diatoms. Both *Cylindrotheca closterium* and *Nitzschia* sp. presented increasing motility under higher temperature conditions. However, *C. closterium* with long valves had more than twice the migratory speed of *Nitzschia* sp. with shorter valves. Two light intensities of 100 and 250 $\mu\text{mol photon m}^{-2} \text{s}^{-1}$ had different effects on *C. closterium*, but not on *Nitzschia* sp. Consequently, there was no light/temperature interaction effect on the vertical migration of *Nitzschia* sp. With lower photosynthetic capacity and smaller cell size, *Nitzschia* sp. responded differently from *C. closterium*. Motile benthic diatoms thus exhibit complex and species-specific response to light and temperature, involving their photosynthetic capability and morphological characteristics, which can contribute to explaining the migratory patterns of benthic diatoms observed in natural estuarine intertidal or subtidal flats, and understanding the influence of climate changes on coastal benthic diatoms communities.

Keywords: benthic diatom; chlorophyll fluorescence; light; temperature; vertical migration

Micro-environmental change in the coastal area of Bangladesh: a case study in the Southern Coast at Shitakunda, Chittagong, Bangladesh

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Abstract

Although Foraminifera are very small members of marine and brackish water fauna they are often present in large numbers and constitute an important element of the meiofauna*. They possess hard parts in the form of tests (or Shells) which on death are preserved in the sediment and are therefore interest to geologists or researchers (Murray,J.W.1979). So, they could be remaining in the sedimentary layer as a proxy data. As because Present is the key to the Past. This research is an attempt to find out the Micro-environmental Change in the coastal Area of Bangladesh accompanying with a new technique, that is population analyze the marine micro faunas (Foraminifera) in the bottom sediments. Laboratory analysis in the Geography and Environmental Studies, reveal that in the local Foraminiferid assemble zone of Chittagong coast (Shitakunda), they have been nonappearance. This is clear indications that present environmental condition for the sustainable micro fauna sp not suitable. On the other hand It is indicating the hazardous coastal pollution which influences the sustainability of faunas tremendously in this region.

Keywords: Meiofauna : The term meiofauna is derived from the Greek meio meaning "smaller". In this context, it refers to the fauna smaller than what has been defined as the lower size limit for macrofauna, those organisms that are retained on a 1 mm size. The size of meiofauna ranges in between 50 μm and 500 μm .

Foraminifera: The Foraminifera, ("hole bearers") or forams for short, are a large group of amoeboid protists with reticulating pseudopods, fine strands of cytoplasm that branch and merge to form a dynamic net

Evidence for bacterial iron (II) oxidation in surface and ground waters of a circumneutral-pH, subtropical coastal ecosystem

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Abstract

Bacterial iron (II) oxidation produces reactive, poorly-crystalline iron(III) oxides at circumneutral pH, imposing a strong influence on the geochemistry of aquatic habitats. Little is known regarding bacterial iron (II) oxidation in circumneutral-pH, subtropical coastal ecosystems where aquatic iron cycling is of environmental significance. Using culture-based and non-culture-based methods, we examined the occurrence and distribution of physiologically diverse iron (II)-oxidizing bacteria (FeOB) in surface and ground waters of a forested subtropical coastal catchment (Poona Creek, southeast Queensland, Australia). Results showed a lack of aerobic, acidophilic and anaerobic, nitrate-dependent FeOB in catchment water samples. Neutrophilic, O₂-dependent FeOB resembling stalked Gallionella and sheathed Leptothrix were present in microbial mats from a circumneutral-pH, iron seep, whereas unicellular, microaerophilic FeOB were widespread in a seep (10^2 – 10^3 cells mL⁻¹), shallow stream (10 – 10^2 cells mL⁻¹) and estuary-adjacent groundwater (10^4 – 10^5 cells mL⁻¹). Light and electron microscopy demonstrated multiple patterns of iron (III) oxide precipitates associated with Gallionella-like stalks, Leptothrix-like sheaths and unicellular FeOB cells in natural samples and/or laboratory enrichment cultures. Direct Gallionella-specific PCR detected dominant bacterial members related to known FeOB *Sideroxydans paludicola* (95% sequence identity) and *Gallionella capsiferriformans* (98% sequence identity) in the seep microbial mat. TGGE analysis indicated the most common FeOB in water enrichment cultures were related to *S. lithotrophicus* (96% sequence identity). This work represents the first bacterial culture-based study of iron (II) oxidation in a circumneutral-pH, subtropical coastal ecosystem in the southern hemisphere. Future work is needed to determine whether bacterial iron (II) oxidation accelerates iron transformations and transport from the catchment into adjacent estuarine and marine systems via surface and/or ground waters, impacting coastal water quality due to the risk of bacterially-mediated biofouling and potentially toxic cyanobacterial blooms.

Keywords: Iron-oxidizing bacteria; *Gallionella*; *Leptothrix*; *Sideroxydans*; iron seep; stream water; ground water

Abundances and Distribution of Nitrogen-Cycling Microbes in Estuarine Sediments of the Laizhou Bay, China

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Abstract

Microbes drive the fixation, transformation, and sink of nitrogen in ecosystems. The Laizhou Bay, Bohai Sea, an inner sea of China, is facing eutrophication problems caused by nitrogen overload, like many other coasts worldwide. We have investigated the nitrogen-cycling populations in estuarine sediments of three rivers that are characterized by different levels of nutrients and heavy metals. The diversity, abundance and distribution of 16S rRNA and functional genes (amoA, nosZ and Hzo) were assessed using clone library analysis, PCR-DGGE and Q-PCR for ammonia-oxidizing bacteria (AOB) and archaea (AOA), denitrifying bacteria (DNB) and anaerobic ammonium oxidization bacteria (AMB). We found that the AOB mainly belonged to *Nitrosomonas* sp. and *Nitrosospira* sp., whereas AOA had a greater diversity than AOB. Among several previously reported AMB species, only “*Candidatus Scalindua* spp.” was recorded; both the diversity and abundance of nosZ genes are much larger than those of other functional genes. Lower abundances of AOA, AOB and DNB were found from the Di River, a drainage river with lower ammonia/nitrite, higher nitrate concentration and larger grain size, and the higher concentrations of heavy metals. As a whole, this study indicates that the denitrification process predominates the nitrogen transformations in these estuarine sediments, and that nutrient concentrations, and sedimental grain size mostly impact the community structures of nitrogen-cycling microbes.

Keywords: eutrophication; 16S rRNA; functional genes; gene copy number; nitrogen removal; diversity; distribution

Resuspension of sediment prokaryotic communities during physical erosion process: an experimental approach

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Abstract

Intertidal mudflats have a central role in the productivity of coastal systems by their capacities to enrich the marine zones through trophic and hydrodynamic pathways. The sediment resuspension into the water column depends also on the properties of the sediment and the biota. Fate and role of sediment prokaryotic communities in the water column are still poorly known and only few studies have addressed the prokaryotic resuspension in coastal ecosystems. The objective of this study was to evaluate the resuspension of the prokaryotic community into the water column with an erosion flume (erodimetre). For the first time, the abundance, physiological states, heterotrophic activities and diversity of the prokaryotic cells were studied during important hydrodynamic events. Only few cells, less than 25% were resuspended mainly under shape free. The resuspension fluxes were different from date to the other one and seemed to depend on the characteristics of the upper biofilm. The resuspension fluxes of attached cells were related to those of chlorophyll a and increased with the rate of sediment erosion. Few prokaryotic cells were active (<33% of the total resuspended cells). Whatever the friction velocity, few sediment bacterial cells enriched the water column, contrary to archaeal ones. Gammaproteobacteria dominated the erosion export. At low velocity frictions, Chromatiales and Cyanobacteria were rapidly resuspended, followed by Actinobacteria. Contrary to bacteria, archaeal cells resuspensions seemed to depend to the characteristics of the upper biofilm, as they were detected for different velocity frictions but always superior to 5 cm.s⁻¹. This first experiment on prokaryotic resuspension, during rising tide, showed that according to velocity friction, a rising tide provoked an enrichment of the water column either by free active or dead cells associated with particles. Whatever their physiological states, prokaryotes play an important role in the trophic network and the mineralization processes.

Degradation of organic pollutants by bacteria and its potential application in bioremediation

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Abstract

Given the immense risk posed by widespread environmental pollution of inorganic and organic chemicals, novel methods of decontamination and clean-up are required. Owing to the relatively high cost and the non-specificity of conventional techniques, bioremediation is a promising alternative technology for pollutants clean-up. Several bacterial strains, including *Enterobacter* sp., *Acinetobacter* sp., *Pseudomonas* sp. and *Proteus* sp., that can degrade sulphonamides, estrogen, furazolidone, carbendazim, crude oil and other organic pollutants, and one *Pseudomonas* sp. strain that can biotransform Hg²⁺ to Hg⁰, were isolated and characterized. The degradation activity of the strains was characterized by CE, HPLC or HPLC/MS. After degradation or biotransformation by the isolated bacterial strains, the concentration of the pollutants in the environment was significantly reduced. Cytotoxic analysis showed that the supernatant containing pollutant and/or its metabolites showed distinctly decreased cytotoxicity to HeLa cells, which confirmed the application of the bacteria in the bioremediation. Bacterial glutathione S-transferases (GST) are part of a superfamily of enzymes that play a key role in cellular detoxification, implicated in a variety of distinct processes such as the biodegradation of xenobiotics, protection against chemical and oxidative stresses, and antimicrobial drug resistance. GST of *Proteus mirabilis* V7 and *Acinetobacter calcoaceticus* T32 was found to be involved in the furazolidone-degradation process. GST of *P. mirabilis* V7 was found to be involved in the varied tolerance of DDT, diazinon, carbendazim, trichlorfon, diethylstilbestrol and bromophos ethyl. Another important regulator in bacterial that controls the expression of genes involved in diverse cellular functions is the ferric uptake regulator (Fur). In our study, real-time PCR demonstrated that Fur of *Pseudomonas aeruginosa* PA1 was a repressor during the degradation of thiophosphate, bromophos ethyl, and to certain extent diethylstilbestrol.

Keywords: bacteria; degradation; environmental pollution; cytotoxicity; GST; Fur

» ABSTRACTS D3 «

Interplay of physicochemical and biological components in Sundarban estuarine ecosystem, India

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Abstract

Sundarban is the single largest chunk of mangrove forest in the world. It is one of the most productive and bio-diverse wetlands in the world and has been identified as World Heritage Site by IUCN (1989). This mangrove contributes numerous nutrients to the coastal water providing a critical habitat for marine ecosystem. Very few studies have been conducted so far in this estuarine ecosystem due to its inaccessibility. This study unfolds water quality, biomass, species composition, diversity, phytoplankton and zooplankton abundance and bacterial population of a tidal creek in Sundarban estuary during the study period of 2008-2011. Our study explored, dynamic correlations and various limiting factors among the physical, chemical and biological domains to designate the status of this unique estuarine ecosystem, which has never been reported earlier. Phytoplankton and zooplankton community were studied and identified minutely. During premonsoon phytoplankton biomass declined at high salinity level (24.25 PSU) and new halotolerant species took over, which were definitely better resilient to the high saline environment. This tidal estuary is moderately productive with an average annual integrated phytoplankton production rate of $151.07 \text{ g C m}^{-2} \text{ y}^{-1}$. Higher microbial abundance during the premonsoon period may be the possible reason for higher community respiration and nitrification rates observed during that time. The bacterial abundance in the estuary was found to be the lowest in postmonsoon and highest in premonsoon showing exponential relation with temperature.

Bacterial species from estuarine water were isolated followed by their biochemical and genetic characterization to divulge the diversified community structure. Although, much has been talked about Indian Sundarban, there is a pressing need to have an authentic and geo-referenced database regarding these parameters. This study will establish a roadmap to guide research in estuarine ecosystem which is a great challenge at this moment.

Keywords: Mangrove ecosystem, Mangrove forest, Phytoplankton-zooplankton-bacterial abundance, Primary productivity, Dynamic correlations.

Study of the Genetic Diversity of Picoeukaryotes in the Adeliea Bay of the Antarctic waters, India

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Abstract

Picoeukaryotes are defined as the smallest eukaryotic plankton the diameter of range from 0.22 to 2-3 μm . They are important portions of plankton and play crucial roles in maintaining stability of ecosystem in the ocean, the carbon flow and energy flow. The diversity of picoeukaryotes in the major waters in the world is relatively high. Picoeukaryotic diversity in the Adeliea Bay of Antarctica was characterized in this investigate. Samples were collected during January of 2009 in Antarctic Great Wall Station. In the present paper, clones of the Adeliea Bay library were analyzed by restriction fragment length polymorphism (RFLP) analysis. 500 positive clones were digested by Hae III and 65 OTUs were obtained, which showed that the picoeukaryotes in this area were diverse. After constructed phylogenetic trees, we found 7 main clusters in the Antarctic waters: Dinoflagellates, Stramenopiles, Chlorophyta, Haptophyta, Chorophyta, Cercozoa, Ciliates and Fungi. The results made a foundation for the further research of genetic diversity of eukaryotic picoplankton in these waters.

Keywords: Picoeukaryotes, Adeliea Bay, Diversity



Session: D4 Keynote**Hyperspectral Sensing for Environmental Monitoring and Marine Management**

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Abstract

The analysis of hyperspectral data aimed at improving our understanding of the Earth environment has come a long way in a relatively short time. What is interesting is the length of time that it has took to move this well established technology, available in terrestrial systems [accessible essentially since the diffraction grating was invented], to on-orbit sensors. The limitation, however, has not been the optics but the communications technology to deliver the datasets to ground. LANDSAT is a case in point where relatively high spatial resolution observations had to trade off against limited spectral sampling and rather poor temporal resolution. In contrast, MODIS, for reasons of environmental monitoring / earth systems science, traded off high spatial resolution for higher temporal resolution and broad spectral coverage. New low Earth orbiting sensors in the design and development phases, such as ESA's Sentinel series and the NASA's HypsIRI sensor will transition across these limitations and deliver both high spatial and high spectral resolution with moderate temporal sampling.

The spectral signatures of many of the biological, geological and atmospheric attributes of environment systems are complex [and may change in time as systems evolve or as they adapt in response to the immediate physical environment]. We require a significant level of spectral information if we are to fully classify these systems and understand their evolution with time as part of process studies. We now find hyperspectral sensors not only on orbit but on aircraft, on ships, on profiling floats and gliders, and installed on AUVs and ROVs with a range of information analysis approaches being applied to extract improved knowledge of these systems. This presentation will overview the contribution that hyperspectral information is contributing to improving our knowledge and understanding of marine, terrestrial and atmospheric systems including information at the molecular level. Examples drawn from coastal marine systems, riverine systems, the land surface and the atmosphere.

Session: D4 Oral**Review on Precision and Quantitative Remote Sensing for Polar Ice Sheet Monitoring and Sea Level Change**

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Abstract

This paper reviews the status and trends of the research in precision and quantitative remote sensing for monitoring polar ice sheets and the contribution toward sealevel change. While global sealevel change is an important part of the global climate change, the polar ice sheets are well known to be very sensitive and are the largest potential future contributor of sea level rising. The international community has been collecting massive polar data through on-site, aerial and satellite observations in polar research. For example, great efforts have been made to carry out experiments in the Southwest Antarctica where the ice sheet change is more active, while less is done for the ice cap as a whole. Particularly the very thick ice sheet in the middle and east part of the cap remains a challenge for thickness and change measurements. There is a need to understand and monitor special activities in the polar region, including snow densification, congelation, melting, ice stream boundary change, subsurface activities, grounding line change, and ice shelf collapse. We will review various techniques and methods employed in polar ice sheet change observations with platforms (ground based, airborne, satellite) and sensor types (optical, laser/radar altimeter, synthetic aperture radar, and multi/hyper spectrum scanner). The measurements are made in terms of topography, ice sheet/shelf thickness, grounding line, ice sheet boundary, coastline, temperature, snow layer thickness, bedrock distribution, ice stream movement, and others. After reviewing the existing techniques and methods used, we will present a strategy to develop a framework and system that will integrate the existing observations and new ground, airborne and satellite observations for an objective estimation of the contribution and potential of the polar ice sheets toward global sealevel change and sealevel change in China.

Keywords: Remote sensing; Antarctic ice cap; global climate change; global sea level; ice sheet; observations

Monitoring coastline change in the Niger Delta of Nigeria: A remote sensing approach

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Abstract

Coastline change due to climate change has become a great matter of public, political and academic concern in the Niger Delta over the last few decades. This is because the region is critical to the economic development of Nigeria. This is evident from wide oil resource exploration in the region. Coastal erosion has become an increasing environmental problem in the Niger Delta. Though natural forces (such as storm surges/high wave tide, sediment supply, erodible nature of sand, climatic change/sea-level rise and low coastal topography) are not only responsible for coastal erosion in the region; but also anthropogenic activities (such as population growth, urban and industrial development pressures, intensified fisheries and other economic activities). Sea level rise resulting from global climate change has been globally renowned cause of coastal erosion in the region. Therefore, this study aim at assess climate change impacts on coastline of the Niger Delta, using satellite remote sensing approach. Three popular remote sensing methods were tested to examine change in coastline resulting from coastal erosion in the delta. The study finds out that, in general, this implies that over 35% and 31% of coastal sands have been eroded in Forcados and Escravos respectively between 1984 and 2002. The outcome of this study will help coastal movement ministry in Nigeria for better planning of Nigeria coast to adapt to the change in climate.

Keywords: coastline change, remote sensing, Niger Delta

A habitat-oriented approach to detect the ecological hotspots and prioritize them for management by ranking the ecological risks levels on Chinese Yellow Sea Coast

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Abstract

Ecological hotspots (EH) detection is a leading approach for biodiversity conservation. In this study two questions are considered: (1), how to detect the EH by a habitat-oriented approach instead of the species-oriented approach, and (2), how to rank the ecological risks of the EH and then make the corresponding management strategy. The ecological naturalness assessment is done in three steps of computation as the first step to detect the EH: the NDVI, the Euclidean Distance to the main human impacts sources, and the land use reclassifying. The naturalness assessment result is lastly mapped with a 0-4 stretched grades approach. Second, we compute and interpolate the heavy metal's potential Hakanson ecological risks index by ARCGIS 9.2 to get the spatial distribution of the ecological risks. Lastly, through raster calculation we do three logic computations to delineate the EH with low, mid, and high ecological risks, taking the median value of 2 as the EH identifying threshold. Only the area with a naturalness value above 2 is considered as the EH to be managed. The results show that: (1), the naturalness assessment results show there are three parts of high naturalness areas: centers of the National Red Crown Crane Natural Reserved lands (YNNR), centers of the Dafeng Milu Natural Reserved lands (DMNR), and the southern parts, around the LiangDuo River Gate ; (2), the Hakanson RI index interpolation result show that the areas with high heavy metal's ecological risks mainly distribute in the northern part of the area; and (3), the EH with low ecological risks mainly include parts of the YNNR, the DMNR, and the bottom southern part. The EH with mid eco-risks mainly distribute in the north of the EH with low eco-risks. The EH with high eco-risks are smaller compared with the other two kinds of EH. This is an effective habitat-oriented approach to detect the EH with ecological risks levels classifying, and then makes the spatial explicit management strategy. The EH with low and mid ecological risks are strongly proposed to be managed first.

Keywords: ecological hotspots detection, NDVI, land use, human impacts, heavy metals, ecological risks, management strategy

Examining the Effects of Increasing Land Price on Urban Sprawl in China Coastal Provinces During 1990-2010

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Abstract

Not long ago, China land was owned by state governments and it wasn't considered as asset for producing economic wealth. In the late 1980s, central governments issued series of policies that caused the ownership separate from land-use rights and the conversion of rural land to urban land was charged. Due to government regulations, land prices were still at low and stable level during 1990-1999. House distribution policies were completely changed in urban areas at the end of 1999 and caused land prices to rapid increase. By analyzing dynamics of urban sprawl, we found that increasing land prices caused urban sprawl accelerate during the period 2000-2005 and get slower during the period 2005-2010. But the most important driving force is different and the trends of urban sprawl are also different at different city levels. To balance urban sprawl and food safety, governments should issue new policy according to these differences.

Keywords: Increasing land price, Urban sprawl, driving forces, government policy

Remote sensing and GIS for ICZM process implementation on Romanian Black Sea Coastal Zone

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Abstract

The marine and coastal spatial data management actions in the Romanian Black Sea institutions, developed towards implementation of Coastal GIS standards/QC-QD procedure/web-services, are supported by complementary systems, among others areas, in order to provide a modern scientific and technical instrument to support the development of the policies, coastal strategies and management. The paper presents the certain national consortium actions that are developing as implementing activities of certain international/European Web-GIS practices in the use of marine/coastal data and metadata. In connection with these, Web-GIS services are at the moment one of the most growing sectors in geographical information system science, and one of the goals of this work/paper is to evaluate its implementation in correlation with a Web-GIS system as a support tool for ICZM implementation process in the Romanian Black Sea area. The results presented on this work are related to the developments of a Marine&Coastal GIS able to accommodate the data exchange and integration, from several sources/teams, which associated in databases, can constitute the engine of a dynamic and efficient decisional system.

Keywords: Web-GIS, Remote sensing, Integrated coastal zone management, Vulnerable areas



Validation of MODIS ocean color and aerosol property retrievals on the northeastern United States coastal ocean

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Abstract

Satellite ocean color remote sensing has been utilized for monitoring surface water phytoplankton feature for decades. Success in retrievals of spectral water-leaving radiance L_w (i.e. “ocean colour”) used for deriving phytoplankton biomass and aerosol optical properties from ocean colour sensors (e.g. MODIS and SeaWiFS) has been well recognized particularly in open oceans, but is challenging in coastal regions. Retrieval performance relies on an accurate removal of the atmospheric contribution to the total spectral radiance measured at the top of atmosphere by a satellite-based sensor. The removal process is collectively called “atmospheric correction”, including the removal of scatterings by air molecules and aerosols, gas absorption and surface effects. Accuracy in atmospheric correction is very sensitive to complexity of atmosphere-water system under consideration. In the northeastern US coastal regions, optical complexity of both waters and atmospheres may lead to significant issues in the quality of satellite-retrieved ocean colour and aerosol property products. Quantifying retrieval uncertainties requires high-quality in-situ measurements. Deployed near the Martha’s Vineyard Coastal Observatory (MVCO) on the US new England inner shelf in the early 2004, an AERONET-Ocean Colour (AERONET-OC) instrument, measuring both ocean colour and aerosol optical properties simultaneously, provides a unique long-term time series of the ground truth for the validation. This paper presents a comprehensive assessment of the MODIS retrievals of ocean colour and aerosol properties (aerosol optical thickness and Angström exponent) in terms of the MVCO AERONET-OC measurements during the period from 2004 to 2010.

Keywords: Ocean colour; aerosol, retrieval; satellite remote sensing; MODIS.

Preliminary remote sensing observation of sea surface temperature increase during *Ulva prolifera* blooms

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Abstract

A massive bloom of green macroalgae *Ulva prolifera* occurred in June of 2008 in the Yellow Sea (YS), resulting in perhaps the largest “green tide” event in history. The large covered area is about 1200 km² and impacted area reached 40,000 km² on 31th May. It also occurred in the followed two years, 2009 and 2010. This research showed that SST increase 1-3°C in *Ulva prolifera* blooms location by using remote sensing data. Three times of large area *Ulva prolifera* bloom events in 2008-2010 were analyzed, all results showed increases of SST in the water where macroalgae blooms occurred. The results maybe attribute to the algal bloom affecting absorption and penetration of the solar radiation in water. The present study represents a preliminary observation, which is an important step for understanding influences of macroalgae on ocean surface condition.

Keywords: Remote sensing; sea surface temperature; macroalgal blooms



Advance in Remotely-sensed Detection of Water quality

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With the rapid industrialization and urbanization in the Pearl River Delta, more and more wastes have been drained into the estuary. The aquatic environmental quality in the estuary has been widely concerned from the governments and the public. It is very important to investigate the water quality in the estuary. In this presentation, the advances in applications of remote sensing technique for retrieval of aquatic environmental parameters will be demonstrated. Firstly, the progress on chlorophyll-a retrieval will be introduced. A new ly developed algorithm, the enclosed fluorescence line area (EFLA) algorithm, which employs the enclosed area of the fluorescence peak of chlorophyll-a, for retrieval of chlorophyll-a concentration in turbid coastal waters, will be presented. Secondly, the progress on remotely-sensed detection of total concentration of several heavy metals (Cu, Zn, Pb) in the coastal water will be exhibited. The principle, method on retrieval of heavy metals will be detailed, and the distribution of heavy metals retrieved from satellite images will be shown. Finally, the developmental tendency on remote sensing applications for coastal waters will be discussed.

Keywords: remote sensing, water quality, chlorophyll-a, heavy metal concentration, Pearl River

A model of High Speed Retrieval by Cross-Polarized ENVISAT-ASAR

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Abstract

We present a new empirical C-band cross-polarization ocean backscatter model for high wind retrievals, from ENVISAT-ASAR. The model relates normalized radar cross section (NRCS) in cross-polarization (VH) to the wind speed at 10-m height. This wind retrieval model has the remarkable characteristic that it is independent of SAR radar incidence angles or wind directions but is extremely linear with respect to wind speeds, especially high winds. To evaluate the accuracy of the proposed model, winds with resolution on the scale of 1 km were retrieved from a dual-polarization SAR image of storm surge, using the new model and compared with CMOD5.N. A root mean square error of retrieval wind speed is about 3.5m/s in new empirical C-band model.

Keywords: ENVISAT-ASAR, cross-polarization (VH), high winds, storm surge

Spatial-temporal dynamics of land use and land cover change from 1996 to 2006 in the coastal zone, USA

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Abstract

Human activities have impacted on the coastal zone of America profoundly; one of the most important aspects was the land use and land cover change that happening on multi spatial-temporal scales. In this paper, based on the land cover data in 1996-2001 and 2006 derived from NOAA Coastal Services Center, the spatial-temporal characters of land use and land cover change in USA's coastal zone were studied. It's divided into five sub-regions which are: Great Lakes Coast (LC), West Coast (WC), Gulf Coast (GC), Northeast Coast (NC) and Southeast Coast (SC). Statistical methods and GIS techniques were used to analyze the spatial-temporal characters of LUCC. We found that, from 1996 to 2006, there're increased land-use activities accompanied with substantial shrinkage of forest area in all the five sub-regions as well as significant decreasing of wetland in SC sub-region. Forest land, wetland and cultivated land were the dominant land use types in most area of coastal zone in USA, however, the grassland spread much wide in WC sub-region. Overall, the changing speed was mitigate and therefore the land cover structure was relatively stable in most non-urban coastal areas, however, high-intensive development zone, grassland and medium-intensive development zone changed rapidly. Interchanges between forest and grassland were much common process in coastal zone; moreover, interchanges between wetland and forest were significant in SC sub-region. The land use degree index had been improved greatly in coastal zone in USA and, from the perspective of land use degree index, LC sub-region has the most intensive human activities while WC sub-region, the least.

Keywords: Coastal zone; LUCC; Spatial-temporal dynamics; USA

Annual variation of the Changjiang River plume by the satellite observations zone, USA

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Abstract

Changjiang River is the third largest river around the world, and its plume delivery huge terrestrial materials and nutrients to the coastal ecosystems. It is difficult to monitor the spatial-temporal variation of the Changjiang River plume using the in-situ measurements for its large dynamic, and the satellite remote sensing is the only way which can detect the variations. In this study, the annual variation of the Changjiang River plume was analyzed by the satellite derived salinity. First, the satellite remote sensing algorithm for salinity was established in the ECS. The salinity was found to be good relative with the absorption coefficient of color dissolved organic matter (CDOM) in many estuaries and plume systems, and consequently, the satellite-derived absorption coefficient of CDOM (aCDOM) can be used as a proxy to get the synthetic salinity field of the plume area in many researches. In the East China Sea (ECS) where is influenced by the Changjiang River Plume, a nearly stable relationships between aCDOM and Sea Surface Salinity (SSS) was found through nine investigations covering four seasons. Since the CDOM mainly came from the terrestrial input carried by the river, its value of fresh water end-member was various and affected by the change of river discharge, photobleaching and other complicated processing in the estuary systems, and also depended on the sampling time in the strong tidal system, so samples at the salinity less than 10psu were excluded when building the relationship with aCDOM and salinity. Meanwhile, CDOM was accumulated during the phytoplankton growth and the conservative relationships were influenced, especially in the blooms and the open ocean where there were less terrestrial CDOM. Stable relationship was found in the range of 10-30psu with small seasonal change, and there were somewhat dispersed in spring and autumn bloom, and the relationship in winter was most stable. The absolute error of the modeled salinity by aCDOM (400nm) was less than 2.5psu. Based on the developed algorithm, the monthly averaged distribution of the salinity in the ECS was estimated in august from 1997 to 2010, and large annual variations of the Changjiang River plume were found.

Keywords: CDOM, absorption coefficient, salinity, Changjiang River, plume

Session: D5 Keynote**Use of nitrogen isotopic signatures of nutrients and macroalgae as indicators of anthropogenic inputs in coastal areas**

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Abstract

Anthropogenic nitrogen inputs to estuarine and nearshore waters can significantly alter the local environmental status, even leading to eutrophication. Nitrogen stable isotope analysis of nutrients and biota components is one the tools currently used to characterize the various inputs and to track the extent of their impact. This approach has been used here to determine the isotope signatures of the various nitrogen sources coming from the watershed of the Charente river (France) and to examine the interest in using macroalgae as bioindicators of such inputs. The main different sources of inorganic nitrogen (nitrates and ammonium) exhibit clearly distinct $\delta^{15}\text{N}$ values. Agricultural runoff coming from cultivated zones receiving fertilizers shows a $\delta^{15}\text{N}$ nitrate and ammonium value close to +6.5 ‰ and +9 ‰, respectively, much lighter than animal manure (+9.2 ‰ and +12.4 ‰). Sewage nitrates are very $\delta^{15}\text{N}$ -enriched (+16.9 ‰ and +25.4 ‰). The overall mixing of these sources leads to a nitrate $\delta^{15}\text{N}$ in the range +7.7 to +8.4 ‰ at the mouth of the estuary, that is not significantly different from the pristine continental site (+7.3 ‰) and the nitrate oceanic inputs (+7.4 ‰). The variations in $\delta^{15}\text{N}$ values of *Ulva* sp. and *Fucus serratus* observed at the mouth of the estuary during the studied period cannot be due to the $\delta^{15}\text{N}$ variations of inorganic N inputs, which were very weak during the studied period. Since the water nitrate $\delta^{15}\text{N}$ was there very close to the oceanic site values, while macroalgae exhibit distinct values, it can be hypothesized that this discrepancy is due to a different fractionation factor during organic matter synthesis, linked to the effect of environmental parameters like nutrient concentration and light.

Keywords: Nitrogen; stable isotope; nutrients; macroalgae; anthropogenic inputs**Climate-driven isotopic speciation of sedimentary C/N in seas receiving sediments from turbid rivers**

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A trough-wide upward decreasing in sedimentary C/N ratio had been observed previously in the Okinawa Trough receiving sediments from various sources due to sea level rise and circulation pattern changes during the last deglaciation. Decreasing input of terrestrial organics was attributable to this marine-ward C/N tendency. However, reported $^{13}\text{C}\text{org}$ values reveal an inconsistent story. Here we revisited the isotopic speciation of carbon and nitrogen in MD012404 to explore their origin and the mechanism controlling their relative contribution to sedimentary C/N ratio. After removing amino acid by using KOBr we found inorganic N play an important role in regulating the oft-used bulk TOC/TN ratio. On the other hand, the content of residual carbon remains unchanged throughout the last glacial-deglacial time period. Contents of carbon and nitrogen associated with amino acid follows a positive correlation; yet, residual carbon and inorganic nitrogen exhibit their own patterns. Compared with previously reported $\delta^{15}\text{N}$ pattern for total nitrogen, $\delta^{15}\text{N}$ of organic nitrogen is higher by 1 to 2 per mil. Although the overall patterns resemble with each other, the Holocene intensification of N-fixation signal, in fact, is proved to be altered by inorganic nitrogen sourced from Taiwan Cyclone-driven deep erosion, which provides tremendous amount of sediments with clay-associated mineral nitrogen, apparently compromises the usage of C/N indicator and 15N in seas surround high-standing Oceania islands. Previous reports of $\delta^{15}\text{N}$ and $^{13}\text{C}\text{org}$ and C/N ratios in surface sediments in the East China Sea need to be re-evaluated for the usefulness of isotope proxies as well as obtaining in-depth understanding of carbon and nitrogen cycling.

Keywords: C/N ratio, nitrogen isotope, fixed nitrogen, organic carbon, sediment

» ABSTRACTS D5 «

Session: D5 Oral

Eutrophication in marine environments as seen from an N-Isotope perspective

Study on the historical variations of terrestrial organic matter sources with carbon and nitrogen stable isotope and C/N ratios as indicators in column sediments of Sishili Bay, Yantai

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Abstract

Stable isotope ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) and C/N ratios in three sediment cores of Core A1 (close to sewage outfall), Core C3 (in aquaculture area) and Core A5 (outside of the bay) were used to investigate the natural and different terrestrial sources of organic matters (OM) in Sishili Bay, Yantai. The variations of $\delta^{13}\text{C}$, $\delta^{15}\text{N}$ and C/N ratios all indicated the common function of natural and terrestrial sources and natural OM input play dominant roles before 1960s and terrestrial OM inputs increased after 1960s. The good negative relationship between C/N and $\delta^{13}\text{C}$ ($r=0.7843$) in all the sediment samples in Core A5 indicated the two main OM sources natural and one terrestrial source, however more than one terrestrial sources were found in Core A1 and Core C3. Also the variation of $\delta^{13}\text{C}$, $\delta^{15}\text{N}$ and C/N ratios were more violence in Core A1 and Core C3, especially after 1960s, indicated the obvious human impacts to these two cores. The wider variation of stable isotope and C/N ratios in Core A1 showed richer terrestrial sources from sewage discharge. However the higher $\delta^{13}\text{C}$ and C/N ratios and lower $\delta^{15}\text{N}$ in Core C3 indicated the contribution of terrestrial sources OM input were more than Core A1 and Core A5. The impacts of environmental events were obvious to the sediment samples in Core A1 and C3; however for Core A5 which is outside of the bay, the impact was not obvious. The heavy rainfall in 1964 caused the increase of terrestrial OM inputs in Core A1 and Core C3 with the low $\delta^{13}\text{C}$ peak and high $\delta^{15}\text{N}$ and C/N ratio peaks. The red tide in Sishili Bay in 2004 brought more natural OM sources and resulted in the high $\delta^{13}\text{C}$ peak and low C/N ratio peaks in Core A1 and Core C3.

Keywords: eutrophication, nitrogen, stable isotopes, modeling;

Abstract
The nitrogen cycle is spinning much more rapidly since industrial N-fixation has surpassed natural rates of N-fixation in the last decades. The benefits for agricultural production are beyond question, but fundamental perturbations of nitrogen cycles and deteriorating environmental conditions in soils and aquatic environments illustrate the downside of this increase in the worldwide nitrogen budget. A suitable tool to identify, quantify and attribute present-day and historical inputs of reactive nitrogen to either natural or human sources are nitrogen isotope ratios that have, for example, been used as indicators for nitrogen input sources, to trace natural processes that lead to isotope fractionation, and to reconcile diverging mass flux estimates. The presentation will review the state of knowledge on N-cycles (based on N-isotope investigations) in two contrasting marine environments, both of which are heavily impacted by reactive N from industrial sources: The eutrophied coastal North Sea and the ultra-oligotrophic eastern Mediterranean Sea.

Keywords: eutrophication, nitrogen, stable isotopes, modeling;

Keywords: $\delta^{13}\text{C}$; $\delta^{15}\text{N}$; C/N ratios; terrestrial sources, organic matter, Sishili Bay

Using radium isotopes to determine horizontal mixing of coastal water in the eastern coast of Hainan Island, China

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Abstract

The mixing rate of terrestrially derived contaminants with the ocean water is one of the most important parameters influencing the health of coastal ecosystems. We have used the horizontal distribution of the four naturally occurring radium isotopes to determine the mixing time scale of near-shore waters in the eastern coast of Hainan Island in China. In the surface water, the exponential-like decrease of ^{228}Ra away from the east coast of Hainan Island can be interpreted by horizontal water mixing with eddy diffusion coefficients of $0.12 \times 10^6 \text{ cm}^2/\text{s}$ in the Bamen Bay transect for scale length of 80 km and $1.2 \times 10^6 \text{ cm}^2/\text{s}$ in the Boao Bay transect for scale length of 120 km respectively. However, within the distances of 10 km and 2 km away from the Bamen Bay and the Boao Bay, the apparent ages of water obtained by the method of $^{228}\text{Ra}/^{223}\text{Ra}$ AR are estimated to be only several days. By combining the horizontal eddy diffusion with the offshore gradient of ^{226}Ra activity between coastal waters and open sea, we estimate the offshore flux of groundwater discharge to be $0.5 \text{ Bq/m}^2\text{d}$.

Keywords: Mixing rates; Eddy diffusion; Radium isotopes; Hainan Island; Groundwater

The use of $\delta^{15}\text{NNH}_4$ in precipitation for identifying nitrogen sources and fractionation mechanisms

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Abstract

Nitrogen is an important nutrient in the marine and nitrogen isotope has been widely adopted in environment researches concerning nitrogen cycle and source identification. Ammonia as a kind of inorganic nitrogen, its concentration in atmospheric is increased due to the intensification of human activities. Ammonium concentrations and $\delta^{15}\text{N}$ in precipitation from Oct. 2008 to Sep. 2009 at Guiyang, southwest China, have been analyzed to identify the sources and isotopic fractionation processes of atmospheric ammonium nitrogen. The volume-weighted average concentration of ammonium is $112.2 \mu\text{eq/L}$ which is 1/3 higher than 1980s, and $\delta^{15}\text{N}$ of ammonium is $-15.9\text{\textperthousand}$ which is lower than other areas and the source of ammonium should be mainly derived from the release of animal waste. The $\delta^{15}\text{N}$ values are more positive in little precipitation and weaker precipitation intensity, because the little precipitation and weaker precipitation intensity can remove more coarse particles. And the $\delta^{15}\text{N}$ values are closely related with natural logarithm of monthly volume-weighted average ammonium concentrations ($R=0.73$). The $\delta^{15}\text{N}$ values are not affected by wind directions, suggesting that the ammonium sources are local. The residence time of ammonium is less than 2 days at Guiyang by counted the difference in the $\delta^{15}\text{N}$ values ($\delta^{15}\text{N}$) of ammonium between two rain events.

Keywords: $\delta^{15}\text{N}$, isotope fractionation, ammonium, residence time, source, wind direction

Radionuclide concentrations in shallow water sediments off the Nile Delta, Egypt

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Abstract

Most of the world's deltas are focal points for the trade, agriculture and fisheries of coastal peoples, and this is especially true for the Nile Delta. The continental shelf off the Nile Delta is boarding while on the both sides it is a little bit shorter.

Four radionuclide elements (^{238}U , ^{232}Th , ^{40}K and ^{137}Cs) were measured in the near shore sediments collected from different localities off the Nile Delta during 2008 to determine the concentration levels of natural and artificial radionuclides. The radionuclides distribution in marine sediments provides essential information about sediment movement and accumulation that provide a strong signal about the sediment origin. The collected samples were air-dried in the sunlight, bottled in 40 ml vials, stored for about 4 weeks to reach the equilibrium state and measured using low-level gamma-ray spectrometer with high purity germanium detector. The measured data showed that, the activity concentrations of the natural radionuclide ^{238}U , ^{232}Th and ^{40}K are found within the World average permissible values. Rosetta area recorded the highest ^{238}U and ^{232}Th concentration levels (76.8 and 28.0 Bq.kg⁻¹ dry weight), followed by Sahl El-Tine area (48.7 and 17.6 Bq.kg⁻¹ dry weight). The highest value of ^{137}Cs was recorded at Abu Qir Bay area. Bullurus area recorded the highest ^{40}K 113.0 Bq.kg⁻¹ dry weight, indicating that this radionuclide may accumulate in the particulate forms from the agriculture drainage systems of the fertilizers and petrochemical industries. The lowest values of ^{238}U , ^{232}Th and ^{40}K and were recorded at Abu Qir and Gamassa areas.

Keywords: radionuclide concentration; shallow water sediments; Nile Delta

Studies on carbon accumulation and food cycle system in the rehabilitated mangrove forest of the southern Thailand

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Abstract

Mangrove forests are considered as the one of the bio indicators in the marine-river estuaries ecosystem. It is being as a unique habitat for several fresh and salt water species. The present research is aimed to study the carbon accumulation and food cycle system in the rehabilitated mangrove site of the southern Thailand. The rehabilitation of the mangroves at the abandoned shrimp ponds in Nakhon Si Thammarat, southern Thailand has been taking place since 1998. Almost five million mangrove trees have been planted in 1000 ha area of the abandoned shrimp ponds. It is observed that the mangrove plantation increases the population of the species like crab, shell, shrimp and fish at the rehabilitated mangrove site. The food cycle system of the rehabilitated mangrove site and its surrounding mangrove forests is studied. The stable isotopes such as $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ are monitored as a primary parameter to study the food cycle system in the mangrove forests and the coast around the mangrove forests. It is found that the $\delta^{15}\text{N}$ content in the living organism is gradually increased from small phytoplankton to large fishes in the food cycle system. Conversely, it is observed that there is no significant change in the $\delta^{13}\text{C}$ value during the food cycle system. The $\delta^{15}\text{N}$ values in the classified types of three carnivore fishes are found to be higher than its feed sources of the herbivore and omnivore. The analysis data reveals that the fishes of carnivore involve in 4 to 5th step of the food cycle system which triggers from the falls of mangrove leaves at the rehabilitated mangrove forest. The rehabilitated mangrove forest would be as a sink source for atmospheric carbon and rich biodiversity of the marine-river estuaries ecosystem.

Keywords: mangrove planting, abandoned shrimp pond, stable isotopes, food chain, carbon sink.

Sources and exchange of particulate organic matter in an estuarine mangrove ecosystem of Xuan Thuy National Park, Vietnam as traced by stable isotopes

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Abstract

Mangrove ecosystem of Xuan Thuy National Park, Vietnam (XTP) is of great important for many species of fish and invertebrates, and a major stopover for migratory birds between northern and southern Asia. However, the sources and exchange of particulate organic matter (POM) between mangrove forests and adjacent environments is virtually unknown. Consequently, there is considerable ambiguity concerning the roles of mangroves in the carbon cycle, as well as their function to sustain biodiversity. To address this, we measured the changes in stable isotope ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) values, and C/N ratios of POM and mangrove leaves, and physicochemical parameters (salinity, DO, pH, water temperature, water level, flow velocity, total suspended matter) with spatial, tidal and seasonal changes to determine the sources and exchange of POM between mangrove forests and adjacent environments. The present results showed that leaf $\delta^{13}\text{C}$ values of the three dominant mangrove species ranged from $-29.87 \pm 0.48\text{\textperthousand}$ to $-27.19 \pm 0.93\text{\textperthousand}$ which indicated that mangroves characterize the C3 photosynthetic pathway. In addition, low $\delta^{15}\text{N}$ values of the mangrove leaves may indicate low anthropogenic nitrogen load to the mangrove forests. Spatial differences in POM- $\delta^{13}\text{C}$ and C/N ratios indicated that during flood tide the major creeks imported marine phytoplankton, whereas narrow creeks tended to accrue mangrove detritus. During the diurnal tidal cycles, co-variation in salinity, DO, pH, and water temperature indicated that the creek water chemistry was influenced by the seasonal factors (precipitation, evaporation), porewater seepage from mangrove sediments, and aquatic respiration. Co-variation in POM- $\delta^{13}\text{C}$ and C/N ratios demonstrated that mangrove detritus was exported to creeks during ebb tide and was enhanced during the rainy season, whereas marine phytoplankton was imported to creeks during flood tide.

Keywords: Mangrove ecosystem; particulate organic matter; stable isotopes; Xuan Thuy Park.



» ABSTRACTS D6 «

Session: D6 Keynote

Influx and export of dissolved organic carbon in the marginal seas - implications for global ocean carbon cycling

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Abstract

Coastal and marginal seas play a key role in the global carbon cycle by linking the terrestrial, oceanic, and atmospheric carbon reservoirs. The marginal seas receive $\sim 0.20 \text{ Pg C yr}^{-1}$ riverine input of dissolved organic carbon (DOC). Moreover, the high biological activity in marginal seas is stimulated by both the riverine and the upwelled nutrients. The net production of DOC in the ocean margins is estimated for $\sim 0.38 \text{ Pg C yr}^{-1}$, which accounts for 20% of the new production therein. As a result of a short water residence time, the ocean margin may serve as a net CO_2 sink by exporting a significant fraction of locally produced or river-discharged organic carbon to the open ocean interior. The export of such organic carbon, thereby less likely to return to the atmosphere may therefore contribute significantly to the carbon sequestration in the ocean. At the same time, this relatively freshly produced organic carbon, when exported into the adjacent open ocean interior might also contribute to the dark ocean respiration. This presentation sought to use the South China Sea and East China Sea as two unique and contrasting marginal systems to examine the influxes, production and export of DOC therein. In addition, we will attempt to compile these DOC influxes and export in the world ocean margins in order to assess its implications for global ocean carbon cycles.

Keywords: marginal sea, carbon cycling, dissolved organic carbon (DOC), net production.

Session: D6 Oral

The Changing Behavior of Inorganic Carbon in Yellow River Estuary between Spring and Fall

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Abstract

Difference of changing behaviors of inorganic carbon and the influence of Water and Sand Regulate Scheme on the estuarine mixing process between spring and fall were discussed based on the data obtained from May and September, 2009, combined with the data we discussed before (September, 2004 and April, 2006). Furthermore, in-situ incubation of the different salinity water in the Yellow river estuary through the method of black-white bottles was carried out in spring 2009, which aims to identify the DIC consumption of plankton activities. The Results showed that: The mass and the form of the inorganic carbon had notably changed both in spring and fall during the estuarine mixing process, during which partial pressure of carbon dioxide (pCO_2) decreased rapidly and deficit of dissolved inorganic carbon (DIC) occurred in the low-salinity area. The higher concentration of DIC would lead to a larger deficit area. A group of sandbars which was caused by a large amount of sediments depositing in the mouth of the estuary due to WSRS in summer made the estuarine mixing process accomplish in a short distance, so the deficit area of DIC in fall is smaller than spring. Phytoplankton activity which consumed CO_2 was the main reason which made deficit of DIC occur in the low-salinity area of Yellow River Estuary, however there still existed a scavenging process of DIC by calcium carbonate precipitation.

Keywords: changing behaviors; estuarine mixing process; inorganic carbon; phytoplankton activity; Water and Sand Regulate Scheme; Yellow River estuarine

Changing Biogeochemistry in Changjiang and Mississippi/Atchafalaya Delta-Front Estuaries

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Abstract

In this presentation, emphasis will be placed on some of the most anthropogenically altered LDE systems in the world to posit that these systems are both “drivers” and “recorders” of natural and anthropogenic environmental change. Specifically, the processes in the LDE can influence (“drive”) the flux of particulate and dissolved materials from the continents to the global ocean that can have profound impact on issues such as coastal eutrophication and the development of hypoxic zones. LDE record changes such as continental-scale trends in climate and land-use in watersheds, frequency and magnitude of cyclonic storms, and sea-level change. Processes that control the transport and transformation of carbon in the active LDE sediment deposit are also essential to our understanding of carbon sequestration and exchange with the world ocean.

Keywords: deltas; Mississippi; Atchafalaya; Changjiang; biogeochemistry; carbon cycling; hypoxia

Response of photosynthesis and photosystem in sorghum to short-term high temperature

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Abstract

Global warming can aggravate food crisis of feeding the world's human population, particularly in the developing countries. Improving plant heat tolerance is a feasible way to solve the food crisis induced by global warming. Sorghum, as the common human food and livestock feed, feeds more than 500 million people in 98 countries. In this study, gas exchange analysis and JIP test were carried out to dissect heat tolerance mechanism in sorghum, which may provide important information for its cultivation and management under global warming. Gas exchange and chlorophyll a fluorescence transient were examined in leaves of sorghum at high temperatures. No changes were found in photosynthetic rate (Pn) and photosystem (PSII) performance index on absorption base (PI(abs)) at 40°C for 1 h. But transpiration rate was enhanced significantly, which served as a self-protection response for dissipating heat. Pn decreased significantly at 40°C for 3 h, and the decrease became greater at 45°C. Decrease in Pn mainly resulted from stomatal limitation at 40°C for 3 h, whereas it was due to non-stomatal limitation at 45°C. Decline in PS function indicated by the significant decrease in PI(abs), trapped energy flux and electron transport flux was responsible for the decrease in Pn at 45°C. PSII reaction center and oxygen-evolving complex in the donor side were not affected at high temperatures, but electron transport in the acceptor side was sensitive to high temperature. PSII function recovered completely one day after high temperature stress even as high as 45°C, which is favorable for sorghum to meet the challenge of global warming. However, Pn did not completely recovered possibly due to heat-induced irreversible damage to CO₂ fixation process. The result will provide some directions for coastal crop cultivation and management under global climate change.

Keywords: gas exchange; JIP test; photosynthetic recovery; climate change

How significant is submarine groundwater discharge and its associated dissolved inorganic carbon in a river dominant shelf system -the northern South China Sea?

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Abstract

In order to examine the magnitude of submarine groundwater discharge (SGD) rate and associated dissolved inorganic carbon on the shelf of the northern South China Sea (NSCS), we measured the concentrations of four radium isotopes, ^{222}Ra , ^{226}Ra along with carbon dioxide parameters in the shelf seawater based on a cruise in June-July, 2008. To better define the groundwater end-members, we also sampled the coastal groundwater in Dec. 2008 and Oct. 2010 for radium isotopes and other ancillaries. During this cruise, northern SCS is characterized by a complex mixing scheme influenced by both strong river plume and coastal upwelling nearshore in the summer time, which bring us difficulty to evaluate SGD rate because of the high river-derived radium fluxes. Two independent mathematical approaches were used to derive SGD to get convincing estimate. Based on a three end-member mixing model with Ra isotopes and total alkalinity (TALK), we derived SGD flux into the NSCS shelf, ranging $(2.3\text{-}3.7) \times 10^8 \text{ m}^3 \text{ day}^{-1}$. At the same time, applied a simple mass balance approach using ^{228}Ra and ^{226}Ra in the NSCS shelf, we derived a first order estimation of SGD of $(2.8\text{-}4.5) \times 10^8 \text{ m}^3 \text{ day}^{-1}$ for direct discharge along the shoreline of NSCS. These fluxes are equivalent to 13–26% of the Pearl River discharge and most of them are recirculated seawater. In spite of fewer water flow relative to the river flux, in the groundwater, both the average total dissolved inorganic carbon (DIC) (4540 mol L^{-1}) and the average total alkalinity (TALK) (409 mol L^{-1}) are significantly higher than those in the surface seawaters (DIC:~ 1909 mol L^{-1} , TALK:~ 2202 mol L^{-1}), and the overlying river waters (DIC:~ 1060 mol L^{-1} , TALK:~ 1007 mol L^{-1}). The estimated SGD contributes $(381\text{-}746) \times 10^9 \text{ mol yr}^{-1}$ of DIC to the NSCS shelf, which accounted for 55–108% of the riverine DIC flux. Due that the net community productivity from SGD is insignificant in this summer, high CO₂ delivered by SGD to the NSCS shelf should be appreciated.

Keywords: Submarine groundwater discharge, ^{226}Ra , ^{228}Ra , ^{224}Ra , DIC, TALK, South China Sea, Pearl River plume

Annual variation of the aquatic pCO₂ of the East China Sea using satellite remote sensing during summer time

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Abstract

The partial pressure of aquatic CO₂ (pCO₂) can be well estimated in some ocean basins by the empirical algorithm using the satellite derived sea surface temperature and chlorophyll concentration, etc. However, this method is hard to apply to the marginal sea with highly spatial –temporal dynamic and complex water mass interaction. In this study, we have put forward a semi-analytic algorithm using controlling-factors analysis method to estimate the pCO₂ by satellite remote sensing in the East China Sea (ECS). Major factors and processes which control the variation of pCO₂ were identified in the ECS during the summer time, and then the quantified models were built up to estimate the specific pCO₂ variation under each factor. By adding up each contribution of water pCO₂ variation with the major controlling factors, we can retrieval the total pCO₂ variation by the satellite-derived variables. In the Changjiang River-dominated ECS, the horizontal mixing of organic matter-rich Changjiang water with high pCO₂ and the Kunoshio surface water with low pCO₂ is one of the dominated process in this marginal sea, which can be quantify by two end-members mixing method. Biological effect on the pCO₂ by the primary production is another significant control of pCO₂, which can be determined by the specific pCO₂ drawdown of unit chlorophyll concentration. Thermodynamic control of pCO₂ is significant in the outer shelf of ECS where far from the terrestrial input. Vertical mixing can be ignored in the ECS during summer time for the strong stratification, except the upwelling regions. Adding up these controlling-factor specific pCO₂, we can get a good satellite-derived pCO₂ variation by comparing with the underway pCO₂. Some deviations come from the un-accounted pCO₂ change with exceptive processing, such as additional mixing by another high pCO₂ water mass, the unmatched time scale of pCO₂ chemical buffering and fade away of phytoplankton bloom, etc. Based on the developed semi-analytic algorithm, the monthly averaged pCO₂ in the ECS were estimated in August from 1997 to 2010, and large annual variations were found for the different regions in ECS.

Keywords: Aquatic pCO₂, control factor, ECS, remote sensing

Nutrient Transport by Coupled Shelf-Bay Circulation in Mirs Bay (Hong Kong)

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Abstract

The Mirs Bay is located to the east of Hong Kong Island and occupies about 50 % of total sea area of Hong Kong. Since nutrient rich Pearl River water is potentially limited by light and phosphate, most of red tides or algal blooms are originated in the eastern part of Hong Kong waters. Study of Mirs Bay circulation is crucial to scientifically understand the interactive dynamics of the coupled bay-shelf system as well as the associated biogeochemical response in Hong Kong waters. A coupled three-dimensional physical model and nitrogen-phosphate (NP)-based dissolved inorganic nitrogen, phosphate, phytoplankton, zooplankton, and detritus (NPPZD) ecosystem model was used to study the ecosystem responses to the circulation in the Mirs Bay. The circulation in the Mirs Bay is not isolated from the adjacent shelf processes. With a deep central channel in the bay and unique shelf/coastline topography in the adjacent shelf waters, Mirs Bay is closely influenced by the intrusion of dense and nutrient rich deep shelf waters, induced by the frictional bottom Ekman layer and by the amplified cross-isobath shoreward transport at the lee of the coastal promontory due to Hong Kong Island. The intrusive nutrient rich deep waters surface in the bay and subsequently transport to the rest part of Hong Kong waters by the shelf circulation. Both shelf and bay circulations are highly time- and space-dependent governed by variable wind and tidal forcing as well as by the local intrinsic hydrodynamics.

Keywords: Coastal circulation, ecosystem, nutrients, modeling



» ABSTRACTS D7 «

Session: D7 Oral

A model study of processes of tidal mixing and stratification in the Pearl River Estuary

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Abstract

A high-resolution three-dimensional numerical simulation using Regional Ocean Modelling System (ROMS) is performed to explore the spatial and temporal dynamics of tidal mixing and stratification in the Pearl River Estuary (PRE). The model is forced with realistic river discharge, tides, wind stress, and ocean boundary conditions during the winter of 2009. Simulated water elevations, currents and salinity are compared with measurements conducted in February of 2009. The observed temporal variation of both current and salinity is well reproduced by the model, which has good model skill ranging from 0.82 to 0.95. The potential energy anomaly is used as a measurement of stratification. A central subject of this study is to investigate the contributing terms to the modulation of stratification using a dynamic equation for the potential energy anomaly budget. Temporal and spatial variations of the simulated stratification turn out to be a complex interaction of differential advection, depth-mean straining, vertical advection, and vertical mixing in the PRE.

Keywords: Stratification; ROMS; potential energy anomaly; tidal straining

Age of freshwater discharged from the Yellow River in the Bohai Sea: a model study

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Abstract

A three dimensional nested hydrodynamics model was applied to estimate the age of the Yellow River freshwater in the Bohai Sea, in order to quantitatively understand the transport timescale for dissolved material discharged from large rivers into a semi-enclosed sea. The modelled freshwater age has significant spatiotemporal variability and its annual mean over the sea surface is ~2.7 years. Generally, the more freshwater was occupied in the sea water, the lower water age was obtained. A front of water age was found offshore of the Yellow River estuary in summer and fall, being consistent with salinity distribution. The surface younger water was distributed northeastward from the river mouth in August when the Yellow River discharge reached the maximum, and it turned southeastward in the following months, showing the same behavior as the low salinity water. To understand the spatial and temporal variations in the water age, water parcels were released from the Yellow River mouth and its trajectory was calculated. The horizontal mixing of the water parcels with different age not only in a control volume but also at each grid point leads to complex structure of age frequency distribution.

Keywords: advection-diffusion; Bohai Sea; constituent-oriented age and residence-time theory; water age; Yellow River

Diagnostic Simulation of Thermohaline Circulation in Jiaozhou Bay with synchronous in-situ observation data

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Abstract

With the synchronous observation data of temperature and salinity, a 3-D diagnostic baroclinic model is established to simulate the summertime thermohaline circulation in Jiaozhou Bay. The result shows that the thermohaline circulation is stronger than the tidal-induced residual current off the Dagu River mouth, in the area between Xuejiao and Huangdao, and in the vicinity of the east coast, with a maximum value of $\sim 0.1 \text{ m/s}$. The thermohaline circulation features with the gravitational circulation pattern, with intrusion of high-density water in deep area and outflow in shallow area. Vertically, the velocity and direction of thermohaline circulation change with depth. In the bay channel, the thermohaline circulation shows inflow in north and outflow in south, and divergence in surface and convergence in bottom over the scour pit. Numerical experiments show that the climatological temperature and salinity field helps to reveal the basic pattern of thermohaline circulation in Jiaozhou Bay. However, owing to the lack of the information about intra-tidal variation of temperature and salinity, it is difficult to calculate the thermohaline circulation in the vicinity of river mouth accurately and there is an overestimate of surface circulation. Using non-synchronous data will introduce more errors and may change the characteristic of thermohaline circulation.

Keywords: coastal thermohaline circulation; diagnostic baroclinic model; Jiaozhou Bay; synchronous observation data

Saline intrusion in the Pearl River Estuary

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Abstract

Saline intrusion in the Pearl River Estuary poses great threat to the freshwater supply for the surrounding population and the health of habitats for many species. It is affected by many factors, such as river discharge in the upstream, tidal action from the downstream, local and remote wind, large-scale circulation in the Northern South China Sea, among which river discharge and tides play the most important roles. Due to different combinations of river discharge and tidal strength in several sub-estuaries in the Pearl River Estuary, the behaviors of saline intrusion manifest different patterns in different sub-estuaries. In this study, the dynamics of saline intrusion in three selected sub-estuaries are investigated with a well calibrated and verified 3D baroclinic model (EFDC). The underlying mechanisms for the different behaviors are elucidated. This study is hoped to serve as a scientific basis for the proper management of water contamination in the region.

Keywords: Saline intrusion; Pearl River Estuary; EFDC model



Modern sedimentation rate, source and transport of sediments in the Changjiang Estuary and the East China Sea using radionuclides

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Abstract

Radionuclides can be used to determine the sources, fluxes and rates of internal processes in sedimentary compartments such as rivers, estuaries and oceans. A large number of sediment cores and surface sediments collected in the Changjiang estuary and the East China Sea in June and October of 2010 were analyzed for radionuclides (^7Be , ^{210}Pb and ^{234}Th) to elucidate the routes, budgets and sediment dynamics. Apparent sediment accumulation rates derived from ^{210}Pb profiles vary from <0.1 to 3 cm/yr , averaging -0.5 cm/yr and showing a spatial pattern closely related to hydro dynamics and sediment source-to-sink pathways. Spatial and temporal variation of Be activity in surface sediments and the ^7Be profiles of the Changjiang Estuary and East China Sea indicates episodic deposition of flood layer sand their mobility from Changjiang Estuary toward the south. Based on the distribution of ^{210}Pb -based sediment accumulation rates, temporal and spatial variation of Be and ^{234}Th activity in surface sediments, the sedimentation in the Changjiang Estuary and the East China Sea is controlled by riverine loading (flood) and current. The material balance of inputs (riverine loading, atmospheric deposition) and outputs (decay, burial into sea bed) of ^7Be , ^{210}Pb and ^{234}Th were also calculated in the Changjiang Estuary and the East China Sea.

Keywords: sedimentation rate, transport, ^7Be , ^{210}Pb , ^{234}Th , Changjiang estuary, East China Sea

Climate and environmental change during Holocene and their present interaction - example from the Beibu Gulf, South China Sea

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Abstract

The Beibu Gulf and its sedimentary records play an important role for the understanding of monsoon climate variability, environmental evolution and anthropogenic impact of the northern continental margin of the South China Sea. The Beibu Gulf is an object of trilateral investigation by the Leibniz Institute for Baltic Sea Research Warnemünde, the Guangzhou Marine Geological Survey and the University of Szczecin. During an expedition on board of the Chinese R/V "Fendou-5" in September/October 2009 sediment samples from 25 stations were taken for geological, geochemical and micropaleontological investigations. Furthermore, depth profiles of hydrographical characteristics were recorded and water samples taken for biological and chemical studies. The sediments cover the upper Holocene and reflect by proxy-data the post glacial global warming with eustatic sea level rise, including recent changes. Moreover, the surface sediments and water column show spatial differences in the distribution of environmental parameters (e.g. grain size, salinity, diatom composition) and indicate the inhomogeneity of Beibu Gulf's environment. Following the result from sampled stations, the area can be subdivided from north to south. Changes in properties within these zones are caused by several factors from which the most important ones are: the influx of the large rivers (e.g. Red River) with a high load of suspended matter (e.g. silt and nutrients), the seasonal variability of monsoons (prevailing SW monsoon during summer and NE monsoon during winter), the influence of the currents, the water depth and the distance from the shore. Eutrophication of coastal waters, caused mainly by the discharge of the fresh waters, highly loaded by nutrients and phosphorus, can be traced by analysis of pigment concentrations.

Hydrographic system can be displayed by numerical models, which describe not only present state, but also the geological past and can help to improve the future projections.

Keywords: Beibu Gulf, Holocene, environment reconstruction, multiproxy approach.

Climate extreme and flood occurrence in coastal environment of Nigeria

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Abstract

This paper aims at examining the occurrence of flooding in relation to climate extremes in Nigeria. There are indications that climate change has impact on human activities on earth. Several evidence abound which show that adverse events such as flooding can result from global climate change. Other examples of such adversities include; increase in temperature; increase in sea level; low yield of agricultural products among others. Several studies have been done on climate change adverse effects, especially its impact on socio-economic activities of man. Thus, this study used geospatial technique to assess the climate change-related flooding occurrence in the coastal environment of Nigeria. Lagos is used as a case study for this research work. Periodic data on flooding occurrence was collected from National Emergency Agency, Abuja (NEMA) in Nigeria. This data was correlated with climate parameters using geo-statistical and geospatial interpolation methods. The results showed that climate change or extreme climate events influence the occurrence of flood in the area. It is evident from the results that there were significant relationship between the rainfall and the occurrence of flood in the area. Aside from the fact that the area is a coastal environment, the area is also known to be prone to regular flooding incidence. Thousands of lives and properties have been lost as a result of this extreme climate event. There is no doubt that government, environmental agencies and non-governmental organizations will find the outcome of the research useful for proper planning and adequate decision-making

Keywords: coastal erosion and flooding, Niger Delta of Nigeria





ABSTRACTS
POSTERS



photo: Marcus Lange, City of Yantai

Session: A1 Poster

Evaluation of material circulation system between land and sea using exergy flows

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Abstract

Enclosed sea areas nearby big cities have suffered strong environmental problems such as red tide due to discharge of municipal and industrial wastewater. This is because discharged materials do not properly circulated from sea to land. This paper focuses on establishment of a suitable material circulation system in an enclosed sea and land, which is composed of three sub-systems: seaweed cultivation, methane fermentation, and the utilization of biogas and residue. A comprehensive evaluation method is required to promote our understanding about suitability and sustainability of the material circulation system. Many researchers have proposed evaluation methods using material and energy flow based on the conservation principles to analyze the material circulation system. It is, however, inadequate because quality of materials varies depending on the environment. To overcome these problems, the authors focus on exergy, which represents energy quality and is based on first and second law of thermodynamics. There have been few papers proposing an evaluation method which discuss the sustainability of material circulation system between land and sea with exergy as an evaluation indicator, though exergy analysis has been widely attempted for energy-efficient design in chemical and mechanical engineering. The purpose of this study is to propose an evaluation approach for marine biomass utilization system from the aspect of material circulation using exergy concept. The authors describe material, energy, and exergy flows in the material circulation system at Sakaihama, a typical enclosed area located in Osaka bay in Japan. It is found that exergy flows provide which sub-system is most exergy-consumed and what kind of exergy is supplied to the system. And hence exergy helps a better understanding of the phenomena and indicates what a key role is in energy-efficient material circulation system. These results show that proposed evaluation approach can be useful as an evaluation indicator.

Keywords: Marine biomass; material circulation; energy; exergy; evaluation

Transdisciplinary Evaluation of Different Coastal Adaptation Strategies: Integrating Regional Perceptions of Scientists, Practitioners and the Public

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Abstract

Coastal protection strategies increasingly have to take into account the effects of climate change. At present, engineering and natural science models that assess the impact of global climatic transformations on *regional coastal zones* and their protection structures remain rather detached from the knowledge and insights of practitioners. The paper argues, that innovative coastal protection requires not only interdisciplinary but transdisciplinary research that takes into consideration the whole array of actors involved in *regional coastal protection strategies*. The findings presented in this paper result from the five year research project A-KÜST – “Changes in the Coastal Climate: Evaluation of Alternative Strategies in Coastal Protection” – that was launched in 2009 in the context of the Climate Impact Research Programme (KLIEF) of the German federal state of Lower Saxony. Qualitative interviews have been conducted with all decision-makers participating in coastal protection of the project region of the Ems-Dollard estuary (Southern North Sea) as well as natural and engineering scientists involved in the *regional climate modeling* process, focusing on perceptions and orientations towards coastal protection strategies and climate change. In addition, a quantitative public survey was conducted in order to collect public perceptions on climate change and coastal protection. The analysis reveals that, in contrast to an overwhelming consensus on fundamental issues and principles of coastal protection today, perceptions and orientations towards the significance of climate change and the evaluation of different strategies in the future vary considerably among scientists, practitioners and the public. For the group of scientists, not the scientific discipline they pertain to shapes their perception, but the institutions they work for. The differences in scientific, practitioner's and public perceptive cultures become especially apparent with relation to the evaluation of different *future time horizons*. Integrating local coastal knowledge completes the study and enables anchor points for the societal acceptance of future adaptation strategies. Against this backdrop, transdisciplinarity results to be an important step towards fruitful strategy development.

Keywords: adaptation strategies, coastal zones, transdisciplinarity, incremental time horizons, climate change

Session: A2 Poster**Wave action as a forcing factor of coastal erosion in the western and eastern Russian Arctic**

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Climate changes must affect coastal dynamics. Rising temperatures alter arctic coastline by reducing sea ice and permafrost thawing. The mean annual retreat rate of Russian Arctic coast, composed of ice-rich permafrost deposits, is 1.5 m per year, but at single sites can exceed 25 m. Thermal energy is transmitted to frozen coast via radiative and sensible heat fluxes from air and water. Higher air and water temperatures, together with longer durations of ice-free seas and positive air temperatures, affect the stability of frozen coasts. Besides thermal factor coastal retreat is determined by wave-energy factor. The wave-energy factor is direct mechanical impact of sea waves on the shore. In arctic seas the wind-induced waves are predominate. Surge intensity depends on the fetch, which is linked to sea-ice extent, and wind velocity. Less extensive sea ice creates more open water and longer fetches, allowing stronger wave generation by winds and increasing wave-induced erosion. Therefore, acceleration of erosion and thermo-abrasion of the coast can be caused by the increase of air and water temperatures and by wind-wave activity increase. Coastal dynamics was observed at key sites in western and eastern sectors of Russian Arctic. Annual wave energy variations for the last 30 years were calculated. Analysis has revealed that warming events do not always lead to increase in wave energy and to acceleration of coastal erosion. In half of the cases warm periods were characterized on one hand by reduced ice cover and growth of open water area and, on the other hand, by decreased wind-wave activity. As a result no acceleration in coastal retreat was observed. In western sector of the Russian Arctic wave fetch was limited by presence of islands, while in eastern one by wave acceleration limit. Thus, expectations of catastrophic acceleration of coastal erosion in Arctic are probably exaggerated.

Keywords: abrasion; climate change; coastal dynamics; fetch; load flow; variations; wave energy**Trends in satellite-derived chlorophyll concentrations at High-latitude Coastal Zone: a Case at the Hudson Bay**

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(E-mail: gxing@yic.ac.cn; szliang@yic.ac.cn)**Abstract**

The Hudson Bay is one of high latitude coastal seas and it is also considered part of the Arctic Ocean. Using the monthly satellite-derived parameters of algal chlorophyll-*a* concentration, sea surface temperature, land vegetation index (NDVI) and land surface temperature, we tend to investigate the ecological responses of the Hudson Bay to climate changes, especially under the background of global warming. The chlorophyll-*a* concentration of phytoplankton shows an increasing trend over the time period 1997-2008, especially at the eastern part of the bay while there is no significant change in sea surface temperature. On the coastal land, as shown by NDVI, there is no significant change in land vegetation; from 2000 to present, there is an increasing trend in land surface temperature in winter seasons (winter warming). We suppose that the “winter warming” in land surface around the Hudson Bay may cause land soil to release more nutrients to coastal waters and consequently lead to the increase in algal chlorophyll-*a* concentration.

Keywords: Chlorophyll-*a* concentration, NDVI; sea surface temperature; land surface temperature; high-latitude coastal seas; the Hudson Bay

» POSTERS A3 «

Session: A3 Poster

Types and processes of coastal zones around the island of Taiwan

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Abstract

The coastal zone around the island of Taiwan has a length of about 1250 km and can be divided into four types: (1) the western foreland-setting coast about 430 km in length, (2) the eastern collisional coast with 300 km in length, (3) a relatively narrow northern cape-bay coast and (4) a southern reef coast. The western coastal zone is characterized by coastal plains and a wide shelf along the eastern Taiwan Strait. Many coastal sand dunes and near shore modern marine sand deposits form a nearly continuous belt along the coast in the western Taiwan. Very high erosion rates (3–6 mm/year) of the Taiwan origin produce much sediment, dominated by sands, delivered by small mountainous rivers to the Taiwan Strait, resulting in a relatively flat sandy coast. Foreland sedimentation with westward progressive deposition is the main process operating in the western coastal zone. The eastern coastal zone extends parallel to the leading edge of collision zone between the Luzon Arc and the Chinese passive margin. The eastern coastal zone is flanked landward by the coastal ranges with high-relief cliffs and noticeable uplifted marine terraces. The beaches below the cliffs are characterized by coarse-grained sediments such as gravels.

Volcanic rocks and alternating sandstone and shale in the northern coast are undergone differential erosion, resulting in prominent coastal capes and bays. Marine erosion accompanied by winter northeasterly wind is the primary process for shaping the present-day northern coast. The southern coastal zone is characterized by fringe coral reefs. Biological process is prevalent over other processes and attributes.

Keywords: coastal zone; types; processes; Taiwan

Desalinization effect of sea ice mulching on coated saline soils in Bohai Bay of China: an artificial platform study

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Abstract

The saline soil is a very important reserve agricultural soil in Bohai Bay of China and elsewhere in the world. In order to relatively reduce the ground water level in coastal saline soil, artificial platform field was built in autumn. Sea ice was collected from large pool which the seawater flow into when high tide, and then were covered on the platform field in winter. The aim of this study was to investigate the effect of sea ice melting processes on soil water and salt content at all depths in the platform field. Air temperature and sea ice thickness were recorded in the melting process of sea ice. Meanwhile, soil water and salt content were investigated at different sampling time in the platform field. Sea ice began to melt on Jan. 31, 2009 and had melted completely on Feb. 10, 2009. With melting of sea ice, soil water content increased at all depths. Soil water content of 0-20cm, 20-40cm and 40-60cm layer were higher with 31.65%, 13.41% and 6.50% at the end of the experiment than that at the primary stage, whereas soil water content of other layers slightly decreased. Soil salt content of 0-40cm layer decreased with time (from 8.2 to 3.0g/kg). Salt was accumulated at 40-60cm layer before sea ice melted completely, and then it was leached into below 60cm layer. At the end of the experiment, salt content of all soil layers was obviously lower than the initial level. Meanwhile, the desalting rate of soil reached 63.41% and 32.10% in 0-20cm and 20-40cm layer, respectively. The results of the present study indicated that the melting process of sea ice on platform field could decrease salinity of coastal saline soil in winter. Thus future experiment should study the effects of different sea ice volume on soil desalination in coastal area of Bohai Bay, China.

Keywords: Coastal Saline soil; Sea ice; Soil salt content; Platform field

Simulating the impacts of protection and utilization policies of coastal resources on urban growth and its ecological effects in Yantai, China

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Abstract Urbanization and its effects on coastal zone have been gaining more and more attention in the society. Urban expansion and sea reclamation in coastal city have tremendous pressures on coastal ecological system. Based on remote sensing, geographic information system (GIS) and spatial modeling methods, historical and future urban growth in Yantai were simulated and ecological risks was evaluated based on a landscape risk evaluation index. Future urban growth and landscape changes were projected out to 2030 assuming three different policy scenarios: (1) historical development trends (HT), (2) urban development based on urban land suitability evaluation (LS), and (3) permitting moderate reclamation and urban land expansion in coastal areas (RC). The results indicated that urban growth and its potential ecological risks had significant difference under different scenarios. In 2030, urban area was up to 40940 ha under the scenario HT, 1.8 times more than in 2009. Urban growth speed was limited under the LS scenario, but urban spatial pattern was more compact than the HT scenario. Under the RC scenario, urban land would expand along coastline with sea area loss of 1280 ha resulting from sea reclamation, and urban land was heavily concentrated in coastal zone within 15km from shoreline. The scenario HT and RC had the higher potential ecological risk values, the scenario LS with the lowest value of risk. This study suggested that ecological protection policies and utilization of coastal resource had a profound impact on urban growth and its ecological effects in coastal city. And it was crucial to take stringent urban planning and environmental management measures to control future urban expansion and protect shoreline resource and supporting system of urban ecology in Yantai. Also, more attentions should be paid to ecological effects of urban construction activities by means of sea reclamation.

Keywords: coastal city; urban growth; scenario; ecological risk; simulation

Sustainable Utilization of the Tidal Flat Resources Based on the Integration Agriculture in China

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Abstract It is of great significance for sustainable utilization of tidal flat in China to solve conflict between people and land, maintain the dynamic balance of arable land and protect the wetland eco-environment. Based on the analysis of tidal flat evolution and development stages, the six issues in the courses of tidal flat development, such as increased pollution and wetland degradation, were discussed profoundly. According to the natural and geographical conditions and characteristics of resources for tidal flat in coastal zone and the issues mentioned above, the sustainable principles for tidal flat development and some utilization modes are proposed. Increasing investment in science and technology, tapping the tidal flat's unique characteristics and varieties of agricultural resources and fostering high value-added products are believed to be indispensable for tidal flat resources development and eco-environment protection.

Session: A5 Poster

New progress in marine spatial planning and coastal management in China

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Abstract

The large-scaled development and utilization of marine resources have been a proportional increase in pressures on marine ecology and environment in China in decades. So the Marine Spatial Planning (MSP) and Integrated Coastal Zone Management (ICZM) strategy have become much more important for a local government in China. There has been some further progress in MSP and coastal managements in China in recent years. The major progress are as follows:(1) establishing the new technical requirements for the formulation of Provincial Marine Functional Zoning in which the classification system was revised and management measures for functional zone were required to be more specific; (2)perfecting the MSP system with introduction of planning on the protection of the coastline and island resources, marine environment regulation, regional sea areas utilization for construction, and sea use planning for the spatio-temporal arrangement of the development and use of marine resources; (3) establishing the multi-department joint meeting mechanism in some provincial marine functional zoning system, and giving more attention to the public participation and effectiveness evaluation of Marine Functional Zoning system; (4)implementing total amount control and annual plan management of reclamation land from sea, and paid utilization system of islands with no residents for improving sea use management ability in coastal zone. These progress or measures have promoted the protection of coastal and marine resources, but it is urgent to develop an accurate prediction for sea use demands and to strengthen the supervision of implementation process and effectiveness evaluation of coastal and marine planning.

Keywords: Marine Spatial Planning; Integrated Coastal Zone Management; Provincial Marine Functional Zoning; China



Session: A6 Poster
New approaches towards an overall ecosystem assessment of impacts associated with Offshore Wind Farming

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Abstract

Renewable energies have gained increasing prominence as a means of reducing CO₂ emissions and thereby mitigating the impacts of climate change. In addition to that they can generate extra employment on the national and regional level. National governments have therefore developed Action Plans to increase the share of renewable energies in the upcoming years and decades. Offshore wind farming, as a relatively new technology in the sea, is supposed to be a main pillar of future renewable energy supply. Whilst there are risks associated with not pursuing the offshore wind option, the large-scale expansion of offshore wind farming itself carries a different set of risks. This contribution points at a case study from the German North Sea, where climate change is one of the drivers that have resulted in a large proportion of North Sea space to be set aside for offshore wind farming. In the year 2002 the government proclaimed the goal to establish a capacity of 25,000 MW by the year 2030 which is likely to translate into a sea requirement up to 4,000 square kilometers (depending on size of the wind mills). As the current assessment of impacts just includes a valuation of a single wind farm, new methods are needed that assesses the impacts for the entire sea space designated for offshore wind farming. Based on different connectional approaches (such as the Ecosystem Services approach) and a range of tools the assessment points at various ecological and socio-economic impacts of offshore wind power generation in the North Sea from an holistic perspective. Since only one complete wind farm has installed so far these results are based on assumptions using Germany's offshore wind energy targets for 2030 as a basis.

Keywords: Marine ecosystems; offshore wind farming; renewable energies, risks; impact assessment



Compensate the Marine Ecosystem Damage of Sea Area Use

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Abstract

Abuse use of the oceans has resulted in the diminishing of productive capacity of marine ecosystems. Implementation of Marine Ecological Damage Compensation (MEDC), making the responsible party pay for their damage to the marine ecosystem, is thought to be an effective solution to internalize the externality of human activities.

There are many researches about the assessment and compensation of accidental damage (e.g. oil spill) while there has little attempt in the research and management communities to develop an empirical ecological damage assessment and the related compensation standard of “normal” sea areas use. However, ecological damage produced from “normal” use may continue for many years, and the cumulative effect can not be ignored. Typically the normal sea areas use gets the approval of government and pays the sea use charge though necessary processes and procedure, which complicate the problem. The reality that the different sea areas have different ecosystems and then the different ecosystem services, and the damage degree of different sea areas use patterns to different ecosystem services is different makes conventional case by case damage assessment approach inapplicable. This study develops a set of methods and models to build the MEDC standard of sea area use. The compensation standards of different sea areas use pattern in different sea area in Xiamen are established employing the built model. Moreover, this simplified and low cost method can be applied by other places to establish their own MEDC standard.

Keywords: ecological damage, evaluation, compensation, sea area use

Purification, cloning, structure, function and antimicrobial mechanism analysis of cathelicidin-BF from *Bungarus fasciatus*

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Cathelicidins are a family of multi-functional antimicrobial peptides found in mammals, birds, reptiles and fish by far. They possess broad spectrum antimicrobial activity, not only against Gram-positive bacteria, Gram-negative bacteria, fungi and viruses, but also many antibiotic-resistant clinical bacteria. In addition, they possess many other biological activities, such as immune cell chemotaxis, mast cell degranulation and histamine release, transcriptional regulation of macrophage, wound repair, angiogenesis, cytolytic activity, etc. *Bungarus fasciatus* is a kind of venomous snake belonging to *Bungarus, Elapinae*. It is widely distributed in Guangdong, Gangxi, Fujian, Jiangxi, Hainan and south of Yunnan. In this thesis, a series of experiments were carried out to study cathelicidin-BF of cathelicidins antimicrobial peptide family from *Bungarus fasciatus*. A novel cathelicidins, named as cathelicidin-BF, was purified from *Bungarus fasciatus* venom by a three-step purification protocol including one step of gel filtration, one step of cation exchange chromatography and one step of RP-HPLC. Edman degradation method was used for the determination of its amino acid sequence. The determined sequence was composed of 30 amino acid residues. By electrospray ionization mass spectrometry (ESI-MS), the molecular mass of cathelicidin-BF was determined to be 3637.5 Da. A 750 bp cDNA sequence encoding the precursor of cathelicidin-BF was cloned from a cDNA library of *Bungarus fasciatus* venom gland. The deduced amino acid sequence of cathelicidin-BF precursor is composed of 191 amino acid residues, including a N-terminal signal peptide, a highly conserved cathelin prosequence and a C-terminal mature peptide. Reverse transcription polymerase chain reaction (RT-PCR) was carried out to analyze the gene expression of cathelicidin-BF in *Bungarus fasciatus*. Cathelicidin-BF expresses in all the selected tissues, including stomach, trachea, skin, muscle, heart, kidney, lung, brain, intestine, spleen, liver, ovary and venom gland. However, the expression level in various tissues is different. Evolution analysis revealed that cathelicidin-BF clustered with platypus CATH-3 in phylogenetic tree, implying a close evolution relationship between *Bungarus fasciatus* and platypus. The close evolution relationship of cathelicidin-BF with platypus CATH-3 provides further proof for the taxonomic status determination of platypus in animal evolution. The possible biological activities of cathelicidin-BF were studied. Cathelicidin-BF has a diverse range of antimicrobial activity. It is microbicidal against Gram-positive bacteria, Gram-negative bacteria and fungi, including many antibiotic-resistant clinical bacteria. The antimicrobial activity of cathelicidin-BF against Gram-negative bacteria is stronger than Gram-positive bacteria. In addition, it is active against some fungi, such as *Candida albicans*, *Pichia pastoris* and several saprophytic fungi. Cathelicidin-BF exhibits no antioxidant activity, hemolytic activity, lectin activity, serine protease and serine protease inhibitor activity, cytotoxicity and antitumor activity. However,

it can effectively stimulate rat mast cell degranulation. These results suggest that cathelicidin-BF may play an important role in *Bungarus fasciatus* innate immune response to invasion of external pathogenic microorganisms. A variety of experiments were carried out to study the structure and antimicrobial mechanism of cathelicidin-BF. The secondary structure of cathelicidin-BF in different solvent environments was detected by CD and NMR spectroscopy. In hydrophilic environment, cathelicidin-BF adopts a random-coil conformation. While in hydrophobic or membrane-mimetic environments, the N-terminal region of cathelicidin-BF adopts a typical amphiphatic α -helical conformation. The result of bacteria killing kinetics experiment shows that cathelicidin-BF could rapidly exert its antimicrobial activity. It just takes less than 1 min to kill all the bacteria at the concentration of $1 \times \text{MIC}$ and the antimicrobial activity is proved to be lethal. The result of Scanning Electron Microscopy (SEM) shows that the cell shapes of cathelicidin-BF treated bacteria are significantly changed, cells expanded and deformed and a large number of bleb-like structures formed and protruded from the surface of bacteria cells. Majority of bacterial cells dissolved and the contents of the cells leaked out. According to the results above, we deduce that cathelicidin-BF adopts a random-coil conformation in hydrophilic environment. After attaching to bacterial membrane through electrostatic interaction, the N-terminal region of cathelicidin-BF transforms to a typical amphiphatic α -helical conformation. The hydrophobic side of cathelicidin-BF inserts into the bacterial membrane and the hydrophilic side exposes to the membrane surface. As the number of cathelicidin-BF molecular increases, transmembrane pores form and the cell contents leak out, leading to the death of bacteria cells ultimately. *In vitro* and *in vivo* experiments were carried out for pharmacological and pharmacodynamic study of cathelicidin-BF. Cathelicidin-BF exhibits poor stability in human normal serum and it could be easily digested by proteases of human serum. A certain concentration of salt could increase cathelicidin-BF's antimicrobial activity. Animal model experiments show that cathelicidin-BF possesses effective therapeutic activity against mice skin infections induced by several kinds of bacteria. The characteristics of cathelicidin-BF and its excellent therapeutic efficacy demonstrated by animal model experiments make it an excellent template for the development of topical antibiotics.

Keywords: *Bungarus fasciatus*, cathelicidin-BF, function, structure, antimicrobial mechanism, animal model

The Tideland Classification of Jiangsu Province Based on the Ecosystem Service Function, China

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Abstract:

Land classification is a prerequisite to successful resource management. Traditionally, in China, land classification emphasizes land use productivity or is developed for single component of ecosystem (e.g., soil, vegetation). However, perspective and social values of the public regarding land resource management have changed the emphasis from production to multi-value, especially, ecological land practices. So the traditional land classification is not suited to comprehensively reflect the multiscale ecosystem function (e.g., gas regulation, climate regulation, disturbance regulation, water regulation, water supply, erosion control, soil formation, nutrient cycling, and food production). Ecological land classification (ELC) approach provides a taxonomic separation of sites within a hierarchical framework based on ecosystem service theory which stratifies the landscape into ecologically meaningful units. This paper applies ELC approach to undertake a land classification of tideflat ecosystem of Jiangsu in China. The diagnostic environmental variables were climate/water supply, landform, coastal line type with land and ocean interaction and vegetation. In Jiangsu tideflat, four levels to uniform areas are identified, for example, ecoregion, ecodistrict, ecosite and ecosite. The highest level-ecoregion is composed of warm temperate zone tideflat and semi tropics zone tideland. Ecodistrict is comprised of Huanghe delta plain tideland, Coastal plain tideland and Yangtze delta plain tideland. Ecosite consists of accretion-type tideflat, erosion-type tideflat, spartina tideland, salt grass tideland and grass muddy deposit tideflat. ELC of tideflat in Jiangsu is not a substitute to the Chinese nation-level land classification but a useful complement, and can be used testing and establishing the environmental monitoring networks. Meanwhile, based on the landtypes, coupling with vegetation age information, ecosystem modelling will commence.

Keywords: land classification; ecological land classification; tideflat ecosystem; ecosystem function; ecosystem service; Jiangsu



Valuation of Sanggou Bay Ecosystem Services under Different Mariculture Modes

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As one of the major human activities, mariculture provides not only material products but also many other services. Based on the 17 major valuating parameters and methods by Costanza et al. (1997), the core services of mariculture ecosystem under different mariculture modes in Sanggou Bay were selected and quantified respectively. Seven main mariculture modes have been studied in SGB, including monoculture Kelp (M1), monoculture Scallop (M2), monoculture Oyster (M3), Scallop & Kelp polyculture (M4), Oyster & Kelp polyculture (M5), Abalone & Kelp polyculture (M6) and Kelp+Abalone+ Sea cucumber intergrated multi-tropic aquaculture (M7). The major findings are as follows: (i) The total value of the mariculture ecosystem services of different modes in SGB in 2007 provided by the core function are as follows: M1 is 5.94×10^4 CNY·ha⁻¹·a⁻¹, M2 is 3.21×10^4 CNY·ha⁻¹·a⁻¹, M3 is 2.79×10^4 CNY·ha⁻¹·a⁻¹, M4 is 6.82×10^4 CNY·ha⁻¹·a⁻¹, M5 is 6.29×10^4 CNY·ha⁻¹·a⁻¹, M6 is 3.44×10^4 CNY·ha⁻¹·a⁻¹, M7 is 5.02×10^5 CNY·ha⁻¹·a⁻¹; (ii) NPV (Net present value) of different mariculture mode in SGB are greater than 0, and the BCR (Benefit to cost ratio) are greater than 1, that the above-mentioned culture mode are valid and feasible. With the addition of economic species (such as abalone, sea cucumber), the NPV shows a marked increase. RC results of the seven modes show, M7 can be regarded as the best mode of mariculture; (iii) The total value, economic benefits and environmental benefits provided by IMTA (intergrated multi-tropic aquaculture) mode, are much higher than the polyculture and monoculture mode, and the large-scale algae as primary producers, in water purification, climate regulation, air quality regulation are an important contributor. Therefore, in the choice of mariculture mode, the large-scale algae should be used as an important mariculture species taken into account.

Keywords: mariculture mode; Ecosystem service; Service value; Sanggou bay**Valuation of ecosystem services in Shandong coastal waters, Western Yellow Sea**

G.Y. Du*, Sh. Chen**, T. Xia**, M.Wang*, D-C. Ren***, Zh-Y Zhao***, L. Wang***

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*** College of Economics, Ocean University of China, Qingdao 266003, China**Abstract**

Based on the Guidelines for Marine Ecological Capital Assessment of China, the ecosystem services were evaluated in the coastal area of Shandong province, China. It holds over 1.02 million ton main economical bio-resources in its more than 31,584km² of coastal waters. In 2008, the bio-resources of this area were valued by ¥19.41 billion. And its ecological resources supplied total ecosystem service values of ¥ 160.79 billion, including the values of provisioning, regulating, cultural and supporting services: ¥62.60, ¥3.62, ¥90.47 and ¥4.10 billion per year, respectively. The unit value of total ecosystem services was ¥ 5.09 million/km². The provisioning and cultural services contribute mostly of the whole ecosystem service by 38.9% and 56.3%. The variation existed in individual administrative regions, revealing the function of diverse ecosystem and anthropogenic utilization. The results of our research could be applied to improve utilization and loss evaluation of marine ecosystem. And it will contribute to optimize the exploitation mode of coastal ecosystems, and facilitate the ecosystem-based marine management and the sustainable services of marine ecosystems (1USD = 6.68CNY).

Keywords: ecosystem services; coastal water; evaluation; western yellow sea

Coastal ecological capital assessment: a case study from Shandong province of China

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Abstract

Marine ecological capital is one of important factors of social and economic activities in coastal areas. Marine ecological capital is defined as marine ecological resources which have direct or indirect contribution to social and economic production and provide benefits for human. Marine ecological capital value consists of the stock value of marine ecological capital and marine ecosystem service value. Provisioning service is defined as production provided from marine ecosystem in mass form. The value of provisioning service is one of the key constituents of marine ecological capital value. Following the Technical Directives for Marine Ecological Capital Assessment of China, we selected three indicators e.g. mariculture production, fishing production and oxygen production and conducted valuating the monetary value of provisioning services provided by Shandong provincial coastal waters in the western parts of Yellow Sea ecosystem. The total value of provisioning service of Shandong coastal waters was 54.71 billion RMB in 2008, in which mariculture production value was 45.29 billion RMB, fishing production value was 6.60 billion RMB, and oxygen production value was 5.52 billion RMB. Mariculture production makes major contribution to provisioning services in coastal waters. The distribution pattern of provisioning service of Shandong coastal waters is mainly decided by the mariculture production zone.

valuation and Change Analysis of Ecological Capital in the Yangtze River Delta Coastal Zones

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Abstract

Along with socio-economic development, people were increasingly concerned with the value of natural resources and environmental benefits, with an emphasis on the assessment of ecosystem value. Based on the reference of the 17 major valuating parameters and method proposed by Costanza et al.(1997) and Millennium Ecosystem Assessment, used the evaluation system in the book named An Introduction to China's Ecological Assets, adapted from existing models ALOS satellite data along with some auxiliary data, the market value approach, reforestation cost approach, shadow project method, surrogate market method, and contingent valuation method were used to evaluate the value of the ecological capital of the Yangtze River Delta Coastal Zones for 2005 and 2008. The evaluation area in the land was 31404km², and in the sea was 30485km². The further analysis covered three aspects: the distribution of ecological capital, the composition and changing patterns of ecological capital, and the driving forces. The results show that the ecological capital of the Yangtze River Delta Coastal Zones was increased from 5610.54 × 10⁸ yuan RMB in 2005 to 5807.73 × 10⁸ yuan RMB in 2008, which was an increasing of 3.51%. Among them, the ecological capital of the land was reduced from 2524.04 × 10⁸ yuan RMB in 2005 to 2179.41 × 10⁸ yuan RMB in 2008, and the sea was increased from 3086.5 × 10⁸ to 3628.32 × 10⁸. The main consist of the ecological capital included the values of elements of the nutrients recycling, agriculture production, gas regulation, land into land, wastewater treatment, cleaning the air, beach travel and culture service, ect. And the value of directly using increased 28.79%, the value of potential using increased 44.09%, the value of nature background existence decreased 8.40%, and the value of indirectly using reduced 8.42%. The driving reasons for the change in ecological capital of the land include natural factors as well as anthropogenic factors, such as national planning and economic policies, economic development, and population growth. The principle of sustainable development should be followed in the application of ecological capital.

Key Words: the Yangtze River Delta Coastal Zones Ecological Capital Evaluation

» POSTERS A7 «

Session: A7 Poster

Marine Protected Areas in Vietnam: Can Integrated Coastal Management improve MPA management effectiveness?

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Abstract

Vietnam's marine and coastal zone currently contributes 48% of GDP. Thirty-one percent of the population is located in coastal areas and their livelihoods depend on coastal and marine resources. However, the increasing trend of economic development poses great threats to the marine and coastal ecosystems. Overfishing, pollution and habitat degradation also compromise the quality of the coastal and marine environment. Therefore, maintaining a healthy state of marine and coastal resources and environment is a prerequisite for Vietnam to achieve the goals of both conservation and socio-economic. The significance of sustainable management of coastal and marine resources has been fully recognized by the Vietnam Government through the approval and effective implementation of the Biodiversity Action Plan, Vietnam Agenda 21, international commitments as well as national laws and regulations on marine conservation. In 2001, the first Marine Protected Area (MPA) was established in Nha Trang Bay followed by the formulation of a master plan for establishing a network of 15 MPAs. In the last decade, the Vietnam Government paid increasing attention to integrated coastal management (ICM) and considered this as a main management tool for sustainable development of its coasts and oceans. This paper reviews the current effectiveness of MPA management in Vietnam. Four officially established MPAs including Nha Trang Bay, Cu Lao Cham, Phu Quoc, Con Co are analyzed using an MPA scorecard developed by Staub and Hartziolos (2004). The results are correlated to the current status of ICM implementation at each site to evaluate how ICM can facilitate MPA management.

Keywords: Marine protected area, integrated coastal management, coastal and marine resource management

Appearance and evolution of “citizens” as actors in the legal system governing Japan’s coasts

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Abstract

Japan’s post-war coastal environment policy up to 1955 was designed to focus on post-war recovery, disaster prevention and economic growth. Amendments were made to the River Law (1997) and the Coasts Law (1999) to include environmental protection and participation of citizens and local communities. The amendments to the River Law augmented the former river environment policy that had been focused on water quality, and were supported by the international consensus reached at the 1993 Rio de Janeiro Earth Summit that countries committed to protection of the global environment would revise their domestic policies to promote the participation of NGOs and citizens. Particular priority was given to these kinds of amendments to the Coast Law and other legal provisions having to do with the sea. Four national ministries exercise jurisdiction over marine coasts which at that time included the Ministry of Agriculture, Forestry and Fisheries, the then-Ministry of Construction and the Ministry of Transportation, and the relevant departments in each were in all in fact civil engineering departments. These amendments target rivers and seacoasts that are all “natural public property,” and thus in a public context assume the participation of the public, not just of parties that stand to gain or lose financially. In the case of coastal management, though coasts are national public property, because management is delegated to local governments, this context is reflected in the language used in the law, which refers not to “citizens of Japan” or “consumers” but to “local citizens” or “residents.” However, the concept of “citizens” has not yet fully permeated the law; we must take care to understand that this trend is still in its “pilot” phase. In future, with the buildup of actual cases of implementation, it will be necessary to clearly identify this concept in a way that will be reflected in the legal system governing fisheries.

Keywords: Citizen participation, Seacoast Law, modernization, social sector

A study about the coordination mechanism of marine area legislation

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Abstract

Regional ocean management is one of the important parts of ocean management. However, the sea-related sectors of our country and the coastal provinces and cities prepare and implement their marine development planning according to their own needing. But these are lack of effective coordination mechanisms in legislation and enforcement. Management of marine areas is necessary to strengthen the legislative coordination mechanism. The coordination mechanism of marine area legislation consists of two levels : the central level and local one. On the one hand, the central Legislation requires to form a basic law about marine area management and a unified marine area environmental protection law, and at the same time, setting up a national lead agency to coordinate the work of the local maritime legislation. On the other hand, Coordination of local level requires the administrative areas surrounding marine area to form council consensus, and establish a good communication system of legislative information, and establish some agencies to collaborate regional maritime legislation.

Keywords: Regional ocean management; Legislation; Coordination mechanism



» POSTERS B1 «

Session: B1 Poster

The southwest monsoon intervenes the nutrients supply pattern of Zhemin spawning ground at the East China Sea

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Abstract

Three spring cruises were conducted at the Zhemin Spawning Ground (ZSG) of the East China Sea (ECS) and the 8 rivers (Changjiang and 7 rivers in Zhejiang Province: Qiantangjiang, Caoejiang, Yongjiang, Jiaojiang, Oujiang, Feiyunjiang, Aojiang) injecting into it, respectively at May, 2007, May, 2008 and June, 2008. The dissolved nutrients samples and hydrographic data were collected so as to understand the supply and distribution features of nutrients at the ZSG. The results showed that although the riverine nutrient level presented a certain fluctuation among three cruises, the nutrient concentration of 7 rivers of Zhejiang Province were obviously higher than one of the Changjiang. At the Subsurface Water of Kuroshio (SWK) underlying the offshore stations, the nutrient level was far lower than Changjiang. The south-north march of the southwest monsoon (SWM) during spring obviously intervened the nutrient supply pattern of the ZSG, mainly by the monsoon rains and the persistent southwest wind. At the land, the drainage area of 7 rivers of Zhejiang Province earlier enters into the rainy season (Meiyu rainfall) than the vast drainage area of Changjiang, resulting that the contribution of 7 rivers of Zhejiang Province to the total flux of riverine nutrient into the ZSG kept on increasing with the increase of the monsoon precipitation, from the 10% of silicon, 9% of DIN and 6% of DIP during the low precipitation of May, 2007 to the 22% of silicon, 14% of DIN and 12% of DIP during the high precipitation of June, 2008. In 2008, accompanying with the gradual strengthen of southwest wind from the formative stage of May to the mature stage of June, the coverage area of the SWK kept on enlarging (remarked by 34.4 isohaline) at the bottom water of the ZSG, so as to supply more nutrients to the ZSG.

The distribution and budget of nutrients in the intertidal area of the Yellow River Delta

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Abstract

In order to address the variations and transportation flux of nutrients in the intertidal area of the Yellow River Delta, dissolved inorganic nitrogen (DIN) and phosphate (DIP), and dissolved nitrogen (DTN) and phosphate (DTP) in the seawaters were investigated in September 2007, April 2008 and July 2008 by anchor monitoring, respectively. The results show that DTN ranged from 27.55–88.53 $\mu\text{mol/L}$, 96.00–249.75 $\mu\text{mol/L}$ and 92.97–265.33 $\mu\text{mol/L}$ in autumn, spring and summer, so did DTP from 0.22–3.14 $\mu\text{mol/L}$, 1.04–5.27 $\mu\text{mol/L}$ and 1.40–8.03 $\mu\text{mol/L}$, correspondingly. DIN and phosphate concentrations decreased from the south to the north, as well as from near shore to off shore areas. It was suggested that DIN and DTN in this intertidal area primarily originated from terrigenous input all the seasons, while DIP and DTP originated from terrigenous input in autumn but contributed by the releasing from sediment in spring and summer. DON contents were comparable to DIN contents, while DOP were prior to phosphate in seawaters, which suggesting a high DOM contribution in intertidal waters. N/P and Si/N varied greatly. And phosphorus is the first potential limiting factor to primary production. It was estimated that the average annual flux of nutrients from intertidal area to open waters were much higher than those from sediment to overlying-waters and the absorption by the phytoplankton.

Keywords: Intertidal area; Yellow River Delta; nutrients; distribution; budget

Keywords: Changjiang; riverine nutrients; Zhemin Spawning Ground; Kuroshio; southwest monsoon

Nutrient supply by contrasting two types of groundwater to tidal flat in Ise bay, central Japan

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Abstract

Submarine groundwater discharge (SGD) plays significant role for supplying nutrient to the coastal zone. In this research, we observed movements of water around seawater-groundwater interface during the tidal fluctuation at the Ise bay, using resistivity tomography, piezometers, seepage meters and stable isotopic ratios of water. In addition, pore waters, deep groundwater and shallow groundwater were collected for chemical analysis. The groundwater table showed that shallow groundwater, which has high concentration of phosphorus originated from residences, comes from sandbanks along the coastal lines. On the other hand, deep groundwater, which has nitrate originated from mainly rice fields in mid and down stream areas, was suggested to be recharged in mountains with high elevation according to stable isotopic ratios with very low values. Stable isotopic ratios of SGD indicated mixing of fresh groundwater and circulated seawater except for a older water with a lower oxygen isotopic ratio. The molar ratios of dissolved total nitrogen (DTN) and dissolved total phosphorus (DTP) in deep groundwater and that in shallow groundwater were about 330-1813 and about 4-127, respectively. The ratios of seawater and SGD were between both values. These results indicate that DTP was mainly supplied by shallow groundwater flow from sandbank, while DTN was supplied by deep groundwater. Deep groundwater flux is much higher than shallow groundwater because of so wide recharge area. Consequently, DTN flux of SGD at the tidal flat was extremely more than DTP flux.

Keywords: submarine groundwater discharge, nutrient, stable isotope ratios of water, seawater-groundwater interface, tidal fluctuation, shallow and deep groundwater

The Biogeochemistry of Nitrogen and Phosphorus in the Shuangtaizhe Estuary in Autumn, 2010

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Abstract

In order to issue the distribution, transportation and transformation of nutrients in the Estuary of Shuangtaizhe River, they were analyzed in October 2010. The contents of dissolved inorganic nitrogen (DIN), dissolved organic nitrogen (DON) and particulate nitrogen (PN) ranged at 1.604-3.774, 0.042-0.754 and 0.235-0.612 mg/L, with averages at 3.104, 0.339 and 0.387mg/L, respectively. DIN accounted for 82.2-98.8 % in total nitrogen, followed by PN and DON. The DIN decreased gradually from the river to the sea, while DON varied significantly and PN waved slightly at the same time. The contents of phosphate (DIP), dissolved organic phosphorus (DOP) and particulate phosphorus (PP) ranged at 0.027-0.054, 0.005-0.024 and 0.019-0.065 mg/L, with averages at 0.038, 0.015 and 0.044 mg/L, correspondingly. Different from that of DIN, DIP accounted for less than 50 % of total phosphorus, and varied without obvious tendency from river to the sea. Co-relationships with salinity, pH, suspended particle and other species of nutrients indicated that, the dilution by seawater and suspended particle content were primary factors impacting on the distribution and transportation of nitrogen and phosphorus in the estuarine waters. Very high DIN/DIP ratios (ranging at 104.5- 299.8) suggested an eutrophication state with potential limitation by phosphate in the Shuangtaizhe Estuary.

Keywords: Shuangtaizhe Estuary, nutrients, composition, distribution, transportation

Stable nuclear transformation of *Platymonas (Tetraselmis) subcordiformis* (Prasinophyceae, Chlorophyta)

Cui Yulin

Abstract

Platymonas (Tetraselmis) subcordiformis is a unicellular marine green alga. It was found to be very sensitive to the herbicide Basta through a sensitivity test. Therefore, the herbicide Basta could be employed as a selective agent, and the *bar* gene is a practicable and selectable marker gene. The vector containing the expression cassette of the *bar* gene was transferred to *P. subcordiformis* by both particle bombardment and glass-bead agitation. The transformed cells were then selected using Basta. Finally, Southern blotting analysis indicated that the *bar* gene had been successfully integrated into nuclear genome of *P. subcordiformis* using both of the transgenic techniques, with the transformation efficiency of the glass-bead method being slightly higher than that of particle bombardment. This is the first report on stable transformation of *P. subcordiformis*, and will improve fundamental research on and enlarge applications of this alga.

Keywords: *bar*, glass-bead agitation, nuclear transformation, particle bombardment, *Platymonas subcordiformis*

Characteristics of nitrogen budgets and riverine nitrogen load in two comparing areas in eastern China

C. P. Ti, X. Y. Yan

Abstract

To assess the impact of human activity on nitrogen (N) cycle and to evaluate the sources of N in surface water, N-budgets for Changshu, a representative county in the Taihu Lake region and Jurong Reservoir Watershed (JRW) were established by using N-related human activities data from an intensive household survey, measurement and literature data. The results showed that total N inputs were 239 kg N ha⁻¹ year⁻¹ in Changshu and 280 kg N ha⁻¹ year⁻¹ in JRW. Chemical fertilizer was the dominant N source in both location, accounting for 56.6% in Changshu and 78.7% in JRW. About 30% of the N ended up in surface water in Changshu, resulting in surface water N concentration of 6 mg N L⁻¹. Untreated human and animal waste was the major source of N transported to water in this area. On the contrary, although chemical N application rate was high in JRW, riverine discharge was only 4.2 kg N ha⁻¹ year⁻¹, accounting for 1.5% of the total N input, and was further reduced to 2.0 kg N ha⁻¹ year⁻¹ after reservoir storage and/or denitrification removal. The low N load to surface water in JRW was likely because the human and animal excreta were not flushed and connected to waterway.

Keywords: Eastern China; human activity; nitrogen budgets; riverine nitrogen load

Nutrient budgets and nutrient accounting in coastal waters and their watersheds

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Abstract

Simple budget and accounting procedures were among the earliest quantitative methods applied to coastal waters and their watersheds for assessing the magnitudes of material fluxes. More recently, the Land Ocean Interactions in the Coastal Zone (LOICZ) program first attempted to outline a methodology to assess biogeochemical budgets of coastal water bodies and their implications for coastal ecosystem metabolism in the early 1990s. An original goal of LOICZ was to evaluate its global significance and regional variation, especially along the coastlines of developing countries. Beginning around the same time, and working independently, researchers in the SCOPE Nitrogen project began to construct simple accounting approaches for relating nutrient inputs to coastal watersheds to nutrient export to the coast. A primary aim was to demonstrate the relative importance of anthropogenic nutrient inputs to watersheds on the load to coastal waters. While the aims and development of the approaches were different, they exhibit some basic similarities. Here, we discuss some of the methodological similarities of the approaches and give some recent examples of analyses which provide a simple framework for assessing the linkages between human activities in coastal watersheds and the effects of nutrient loads on coastal ecosystems.

Keywords: nutrient budgets; nutrient accounting; NAN; NAPI; material fluxes; watersheds



» POSTERS B2 «

Session: B2 Poster

Behaviour of dissolved organic matter in a subtropical river-estuary-coastal interface, China: insights from fluorescence spectroscopy and parallel factor analysis

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Abstract

The behaviour of dissolved organic matter along the Jiulong river-estuary-coastal interface was studied using excitation emission matrix fluorescence spectroscopy and parallel factor analysis during August 2008 to June 2009. Two humic-like (C1 and C3), one tryptophan-like (C4) and one possible protein-like (C2) fluorescent component were identified. All the fluorescent components showed a remarkable loss in the river- upper estuary interface, and then were followed by significant additions in the low salinity turbidity maximum zone. C1, C2 and C3 showed conservative behaviour in the middle and lower estuary, while the tryptophan-like C4 received widespread additions (likely from autochthonous production) in the estuary. Compared to C1 and C3, C2 and C4 decreased more rapidly beyond the estuary-coastal interface, indicating the significant influence of coastal current. The seasonal variation of tryptophan-like C4 was characterized by higher level in the upper to middle estuary in the dry season, which is in contrast to that of the humic-like C3. This is likely owing to the different temporal variation of the source intensity for different fluorescent components. Furthermore, the fluorescence intensity of C1 (or C2 and C3) was correlated with DOC and might be used for tracing DOC dynamics in the estuary.

Seasonal variation of suspended sediment transport through the southern Bohai Strait

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Abstract

Based on field observations made in winter 2006 and summer 2007 and on multiscene MODerate resolution Imaging Spectrometer (MODIS) imagery, the seasonal variation of suspended-sediment transport in the southern Bohai Strait and its possible mechanisms are examined. Both the field-survey data and the MODIS-derived SSC show that the sediment transport in the southern Bohai Strait has a significant seasonal variation. The SSC in winter is approximately 3–10 times higher than in summer. Considering the seasonal variation of water flux (WF) and SSC, the annual sediment flux (SSF) through the southern Bohai Strait is estimated to be approximately 40.0 Mt yr⁻¹, about 4–8 times previous estimates, which did not take into account seasonal variation. Although the Huanghe discharge a large amount of sediment in the summer, the SSF through the southern Bohai Strait in the winter is about 4 times greater than it is in the summer. The strong seasonal variability of SSF through the southern Bohai Strait indicates that strong resuspension along the coast of the Huanghe delta in winter and enhanced long shore transport by coastal currents due to winter monsoon activity might be the major mechanisms of cross-strait transport of sediment in winter.

Keywords: Huanghe Delta; remote sensing; seasonal variations; sediments transport; southern Bohai Strait.

Keywords: Dissolved organic matter; Excitation emission matrix fluorescence spectroscopy; Parallel factor analysis; Jiulong Estuary

Significance of river sediments on brackish organisms in coastal lagoon

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Abstract

Severe environmental changes in and around the costal lagoons have occurred in association with both human activities and global warming. Environmental restoration project becomes active in Japan and would be the major subject in future environmental conservation. Before going to promote the nature restoration, detailed scientific information must be requested in order to understand the nature system. We introduce the meiobenthic foraminiferal proxy to evaluate the influence of river in Lake Fuuren, Japan. Lake Fuuren is located in eastern Hokkaido, and its area is 57.5km², with an average water depth of 1.0m. This brackish lake is of oligohaline to mesohaline and is originally rich in fisheries resources. However, northwest part of the lake and near the mouth of the Fuhren River became deteriorated in fisheries. The development of farmland and dairy farming has increased in a catchment area in the 1970s. We examined short sediment cores of 18-45 cm length to investigate the cause and its process, and obtained a couple of significant evidence such as diminishing foraminiferal assemblage, decrease of carbon-nitrogen ratios, increase of sulfide and distinct decrease of radioactive ²²⁶Ra. The core sediments were calibrated by ²¹⁰Pb, using a CRS model, along with ¹³⁷Cs measuring.

These results clearly indicate the environmental change occurred coeval in the late 1970s and earliest 1980s. Diminishing foraminiferal assemblage in conjunction with sulfide increase in argillaceous sediments suggests the stagnant water circulation of bottom water. The decrease of ²²⁶Ra that is common in the hinterland volcanoclastics suggests the potential change of riverine sediment transport. All of these results indicate the change of supplying system of the Fuhren River. It is concluded that the significance of river on the coastal environment must not be underestimated to conserve the growing environment for brackish organisms.

Keywords: coastal lagoon; foraminifera; radium-226; environmental change; river sediment

Simulation of Non-Point Source Pollution in the Past Thirty Years in Jiadong Peninsula, China

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Abstract

Non-Point Source (NPS) pollution, as one of the most important factors that induce coastal water quality deterioration, are of increasing concern among water environment managers and planners worldwide. In this paper, taking Jiadong Peninsula as the case study area, annual load of non-point source pollution from 1979 to 2008 was simulated based on multi-resource database and the N-SPECT (Non-point Source Pollution and Erosion Comparison Tool) model, and, the spatio-temporal dynamics of non-point source N and P was studied and the relationship between non-point source pollution and land use was analyzed. The results suggest that the temporal variation trend of NPS pollution loads of TN and TP from 1979 to 2008 exhibit sharp annual fluctuations and distinct decadal increasing trend. And the spatial patterns of NPS pollutant load are closely related to land use patterns, in detail, agricultural land, the residential area and industrial area are main source areas of nutrients. Among the three typical watersheds, Dagu River watershed is the uppermost contributor of NPS pollution in Jiadong peninsula, Five Dragon River watershed is the second, and Dagui River watershed is the third. The information derived from this study can provide good supports for coastal land use planning and water environment managements.

Keywords: non-point source pollution, nitrogen & phosphorus, land use, coastal zone, Jiadong Peninsula

Session: B3 Poster**Distribution of heavy metal core sediments in a tropical mangrove wetland and their environmental risk to biota**

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Abstract

The study documents the comprehensive account on distribution and possible sources of heavy metals in core sediments ($<63 \mu\text{m}$ particle size) from intertidal zone of the Sunderban mangrove wetland, India, a UNESCO World Heritage Site, to evaluate geochemical processes influencing their distribution and possible environmental consequences. Inductively coupled Plasma Atomic Emission Spectrometer (ICP-AES) was employed to determine concentration of seven metals (Cd, As, Cr, Mn, Zn, Al and Pb) whereas total mercury was analyzed by cold vapor atomic absorption spectrometry (CVAAAS). An erratic behavior of the heavy metal distribution in sediment core was pronounced which might be ascribed to the metal deposition in coastal sediments through natural processes (erosion and atmospheric deposition) and anthropogenic activities (fishing, boating and tourist activities). Values of organic carbon showed very strong positive correlations with most of the metals as revealed by correlation matrix (r) values. The intermetal relationship revealed the identical behavior of metal during its transport in the estuarine environment. Arsenic provides overall high values at those sites infested with mangrove vegetation which can be attributed to arsenic solubilization, especially through diagenetic processes in organic-rich mangrove sediment. High As values in sediments are coherent with the occurrence of high arsenic poisoning (arsenosis) in human being recorded in Gangetic plain of West Bengal. Mercury concentration showed lack of any spatial variability with an almost uniform decreasing trend from surface to deep cores. Concentration of Hg in surface sediments, therefore, may be the result of post-depositional diagenetic processes that remobilize the metal from deeper sediments and cause upward migration in the sediment column. The resulting compositional data set was tested by principal component analyses and cluster analyses. Pollution load index (PLI) and index of Geaccumulation (I_{geo}) revealed overall low values but the enrichment factors (EFs) for Pb were typically high for all the stations. The mean concentrations of As, Zn and to some extent Cu exceeded the Effects-Range Low (ER-L) values indicating that there may be some ecotoxicological risk to biota living in the sediments. Present information on the contaminant levels of these metals is potentially useful in toxicological and public health implications.

Keywords: Ecotoxicity; Heavy metals; Pollution Load Index; Sediments; Sunderban

Evolution of heavy metals and its ecological risk on the sediment in Bohai Sea in the past 20 years

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Abstract

Based on a 20-year monitoring in the surface sediment of the Bohai Sea, the distributions and variations of heavy metals were demonstrated, as well as the impact factors in coastal regions. The higher concentrations of Pb (5.32×10^{-6} - 32.19×10^{-6}), Hg (136×10^{-6} - 223×10^{-6}), Cd (0.02×10^{-6} - 12.77×10^{-6}) and As (4.20×10^{-6} - 29.80×10^{-6}) were located in 1998, while the lower concentrations of Cu (19.7×10^{-6} - 35.5×10^{-6}), Pb (13.7×10^{-6} - 22.4×10^{-6}), Hg (27.4×10^{-6} - 43.1×10^{-6}), Cd (0.161×10^{-6} - 0.221×10^{-6}) and As (5.03×10^{-6} - 9.84×10^{-6}) were in 2009..Cu and Pb distributions were controlled by fine particle content, while Hg and Cd correlated with coarse sediment and As had no correlation with grain components. Variation of metal concentrations was possibly affected by Riverine input hysteretically impacted on the variations of heavy metals, but the economic development impacted little. Three representative evaluation methods, which were complex pollution index, geo-accumulation index and ecological risk index, were applied to assess the pollution statements and potential ecological risks in the Bohai Sea. It was indicated that sedimentary metal pollutions were more serious in the Liaodong Bay, Bohai Bay and Laizhou Bay, in which Hg and Cd were revealed as primary risk factors. The benthic ecosystem had to face a higher ecological risk in 2009 than that in 2004 in Laizhou Bay as a result of innovated higher-level metal risk assessment system.

Keywords: Bohai Sea; heavy metals; ecological risk

Application of growth inhibition rate as ecological effect assessment indicator in ecology

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Abstract

A modified form of growth inhibition rate is introduced to be an ecological indicator. The biomasses representing energy held in each trophic level are used to derive the growth inhibition rate of an aquatic ecosystem which measures the biomass decrease of entire ecosystem owing to environmental heavy metal contamination. The ultimate limiting biomass based upon the definition of carrying capacity (B_p) – a parameter of logistic growth model, is used to determine the highest possible biomass. It is stressed that what we determine by this method of growth inhibition rate calculation is a relative modelling index. It is not possible to find the precise inhibition rate of entire ecosystems, because they are far too complex to allow us to know all the details of an ecosystem. The growth inhibition rate indices have been estimated in the East China Sea's ecosystem to demonstrate the usefulness of the method. The comparison between EC50 obtained by means of statistics and that computed by the model proposed in this paper is made to validate the reliability of growth inhibition rate calculation.

Keywords: Energy; Biomass; Growth inhibition rate; Ecosystem assessment

The chemical characteristics and related factors in the waters of the Shuangtaizi estuary and its adjacent areas

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Abstract

In order to demonstrate the chemical characteristics of waters in the Shuangtaizi River Estuary and its adjacent areas, parameters, such as dissolved inorganic nitrogen (DIN), phosphate, dissolved oxygen (DO), chemical oxygen demand (COD) and Chl a were investigated in August, 2008, 2009 and 2010. The higher concentrations of DO (4.74-8.74 mg/L), phosphate (0.049-56.500 mg/L) and petroleum (0.012-0.064 mg/L) were located in the western Shuangtaizi estuary, while higher DIN (0.187-0.944 mg/L), COD (1.65-5.36 mg/L) and Chl a (0.001-4.150 μ g/L) were in the east. The lower concentrations of DO (4.39-7.86 mg/L), phosphate (0.027-0.101 mg/L) and petroleum (0.012-0.057 mg/L) were located in the east, while COD (1.20-3.82 mg/L) in the west, and DIN (0.113-0.823 mg/L) and Chl a (0.002-2.650 μ g/L) in the middle. The concentrations of DIN decreased gradually, but the COD and Chl a changed by an opposed trend from the west to the east in each cruise from 2008 to 2010. High NP ratios and low phosphate concentrations suggested a potential limitation by phosphorus, except some abnormal sites in study area. A good relationship between Chl a and COD suggested a higher contribution of primary productivity *in situ* to the organic pool.

Keywords: Shuangtaizi estuary; chemical characteristics; nutrients; COD; Chl a

The Design and Implementation of Ocean Data Visualization Sharing and Application System

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Abstract

Ocean data plays the important role through marine scientific activities. But the characteristics of distribution and heterogeneous make it difficult to integrate, so the data sharing and applications were limited. Using the OPeNDAP software framework and the data management and the sharing platform VisualDB, we tried to build the Ocean Data Visualization Sharing and Application System. It realizes to simply and effectively integrate ocean data with the help of OPeNDAP protocol. It provides a visualization data management interface for the data managers and providers. And it provides various types of data services and applications combining C/S and B/S mode. It also allows data users to access data using the client software they are familiar with. It also allows data users to access interactive visualization application interface via a web browser. The ocean data types and formats, system design and implementation, system architecture and functionality are briefly discussed in this paper. The service results of the South China Sea ocean data show that the system facilitates web visualization sharing and seamless access to ocean data in a distribution and heterogeneous environment.

Keywords: Ocean Data; data integration; data management; data sharing

Environmental Capacity of Petroleum Hydrocarbon Pollutants in Jiaozhou Bay, China, Modeling and Calculation

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Abstract

Based on field surveys, mesocosm and parallel laboratory experiments, an environmental capacity model of petroleum hydrocarbons (PHs) is constructed, coupling petroleum hydrocarbons transfer and transport, nutrients biogeochemical cycles with the water exchange model of Jiaozhou Bay. Simulated results of PHs seasonal successions in 2003 match the field surveys of Jiaozhou Bay reasonably well. And the good correlation between the seasonal average cycle (1991~2003) simulation results and field surveys illustrates the rationality of the model's logic structure, dynamic equations and parameters. Monte Carlo Analysis confirms that the variation of PHs concentration greatly correlates with river input, and is also reasonably subjected to self-purification processes such as volatilization to the atmosphere, biodegradation by microorganism and transport to the Yellow Sea by water exchange. The model's simulation results show that the highest value of PHs concentration is in July, then February and March, while the values of other months are lower, which correlates with river input and environment capacity of PHs seasonal variety. According to the model, the environmental capacity of PHs in Jiaozhou Bay is $1500 \text{ L} \cdot \text{y}^{-1}$ when the target of seawater quality criterion (Grade I/II, 0.05 $\text{mg} \cdot \text{l}^{-1}$) in the region is to be satisfied, and the relative self-purification capacity of volatilization, biodegradation and transport to the Yellow Sea are 48%, 28% and 23% respectively, which means these three processes are the main ways of PHs purification in Jiaozhou Bay.

Keywords: Environment capacity; Modeling; Petroleum Hydrocarbon Pollutants; Jiaozhou Bay

Long-term variation in nutrient discharge from watersheds to central Seto Inland Sea, Japan

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Abstract

The objective of this study is to clarify the mechanism of long-term variation in nutrient discharge from watersheds to central Seto Inland Sea. Firstly, we evaluated effect of Submarine Groundwater Discharge (SGD) on nutrient discharge in the Bisan-Seto watershed using newly developed model. Secondly we confirmed effect of climate change and human activity on nutrient discharge for a 30-year period (1978–2007) in Asahi-River watershed in Okayama prefecture. SGD was estimated from topographic gradient with 50m grid DEM using a newly developed model which could consider groundwater flow with Darcy's law. Annual SGD estimated by the model were 66.2 mm in Okayama Prefecture and 48.1 mm in Kagawa Prefecture. These results accounted for about 5% of the total precipitation in both prefectures and correspond with that based on water balance method. Magnitude of SGD was estimated that exceed $0.2 \times 10^5 \text{ m}^3 \text{ year}^{-1}$ in most grids on the coast line while reclaimed land was estimated to be almost 0. The application demonstrates that the model is capable of estimating SGD spatially and quantitatively. Nutrient fluxes were estimated using the Soil and Water Assessment Tool (SWAT) model. The estimated phosphorus flux was more highly correlated with precipitation than the nitrogen flux. Statistical analysis demonstrates a decrease in the annual precipitation as well as in the loads of nitrogen and phosphorus, over the study period. The results suggest a high correlation between phosphorus and discharge but during the high precipitation years, phosphorus loads have decreased. Amount of fresh water and nitrogen discharge via SGD based on the newly developed model was estimated to be about 10% of that from rivers. On the other hands, phosphorus discharge by SGD was 3.6 times larger than river discharges. Consequently, it was confirmed that SGD is important phosphorus source to the

Keywords: nutrient flux; SGD; SWAT; seto inland sea

Study on modeling for secchi disk depth in the Yellow Sea and the East China Sea based on in situ and satellite data

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Abstract

In this paper a single band model and bands ration model for detecting secchi disk depth (SSD) are provided using in-situ data, which were collected from two cruises carried out in the Yellow Sea and the East China Sea in May and June 2009, and Moderate Resolution Imaging Spectroradiometer (MODIS) data. The results showed the accuracy of SSD estimation using bands ration model is much higher than the single band model, and the logarithm ratio model is better than the simple ratio model. These estimation models are helpful to determine SSD in these sea areas using MODIS data. This study could be considered as an exploration in SSD products of satellite MODIS.

Keywords: model; secchi disk depth; modis; the Yellow Sea; the East China Sea

An optical sensor for dissolved oxygen based on phase detection

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Abstract

The dissolved oxygen (DO) is vital important for water factory, sewage treatment plant, fish culture and for biological research. The traditional method of DO detection is electrochemical method which is called Clark electrode. The electrochemical method has been used widely as they are simple and inexpensive; however, the fatal drawback for this kind of sensor is that it is easy to be affected by the pH, H₂S, SO₄²⁻ and so on. The optical sensor for DO detection is a new developed technology, which can avoid most of the drawback of the electrochemical sensors. A dissolved oxygen sensor using fluorescence detection is described in this paper. The principle of measuring the oxygen concentration is based on phase detection which is more precise than the traditional intensity detection method. The emitting part is a low-cost designed LED as the stimulating source. To avoid an unwanted phase shift, two LEDs are used to improve the degree of accuracy. The sensible material for fluorescence is a ruthenium complex. A Discrete Fourier Transform (DFT) algorithm is used for the calculation of the phase. The system is designed into a probe with stainless steel, and the application to measure the dissolved oxygen concentration is presented in this paper.

Keywords: Optical sensor; luminescence quenching time; phase detection; dissolved oxygen

Heavy metal concentration and fractionation in sediments of intertidal Bohai Bay, China

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Abstract

Contamination of heavy metals in the environment is of major concern because of their potential toxicity and threat to ecosystems. The coastal region surrounding Bohai Bay is one of the most densely populated and industrialized zones in China. Surface sediments from the intertidal zone of Bohai Bay were sampled for the geochemical behavior and environmental assessment of six heavy metals (i.e. Cd, Cr, Cu, Ni, Pb and Zn) to provide data that would strengthen future monitoring on the environment of coastal Bohai Bay. A four-step sequential extraction technique was used to gain their chemical fractionations. Except for Cd, the studied metals took on low mobility and on average more than 50% of their total concentrations were associated with the residual fraction, respectively. Although Cd exhibited very high mobility, it could hardly generate a bad effect on the environment owing to its low total concentrations. The results indicate that sediment grain size and organic matter play important roles in controlling the distribution of heavy metals in surface sediments of intertidal Bohai Bay. The study also shows that clayey silt sediments of intertidal Bohai Bay have been contaminated by heavy metals to various degrees, among which Cr prominently contributes the most to the contamination. Taking as a whole, surface sediments of intertidal Bohai Bay have a 21% probability of toxicity based on the mean probable effects level quotient.

Keywords: Heavy metals; Chemical fractionation; Sediment analysis; Environmental assessment; Intertidal zone; Bohai Bay

Determination of trace copper by anodic stripping voltammetry at nano-TiO₂ modified gold electrode

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Abstract

A simple and effective chemically modified electrode for the determination of copper ions (Cu^{2+}) was developed. The chemically modified electrode was prepared by modifying nano-TiO₂/Nafion composite film onto a gold electrode. The analysis of Cu^{2+} using anodic stripping voltammetry (ASV) includes two steps. Cu^{2+} ions are firstly reduced and accumulated on the modified gold electrode surface in a Cu^{2+} solution during an accumulation step, followed by a measurement step by differential pulse voltammetry. For an accumulation step of 240 s at -0.5 V, the stripping peak currents were linear with concentrations of Cu^{2+} over the range from 1.0×10^{-8} to 9.0×10^{-7} mol/L. The detection limit was 3.2×10^{-9} mol/L. The proposed method was applied to the determination of trace level of Cu^{2+} in tap water samples with satisfactory results.

Keywords: Copper; differential pulse stripping voltammetry; nano-TiO₂

Electrochemical sensor based on novel tin-bismuth alloy electrode for determination of cadmium in waters

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Abstract

An electrochemical sensor based on the novel tin-bismuth alloy electrode is used here for the determination of cadmium in waters. Compared with the traditional electrodes, the proposed tin-bismuth alloy electrode had lower detection limit smaller background current and better anti-interference for dissolved oxygen due to the simultaneously existence of tin and bismuth. At the optimal conditions, the response current was proportional to the concentration of cadmium over the range of 5 – 500 nM with a correlation coefficient of 0.999 and a detection limit of 1.1 nM at 150s deposition time. The practical application of this proposed tin-bismuth alloy electrode had been carried out for the determination of cadmium in waters and the results were in close agreement with that obtained by inductively coupled plasma mass spectrometry (ICP-MS). The tin-bismuth alloy electrode was found can be used for at least 40 times with the height of peak current kept in 5% of the initial height and without any reactivated or cleaning steps. Due to its cheap cost, easy fabrication and excellent electrochemical properties, sensors based on this electrode have great potential in rapid, on-site detection of cadmium or other heavy metals in environmental monitoring.

Keywords: Electrochemical sensor; tin-bismuth alloy electrode; cadmium; water; environmental monitoring



Chemosensors based on gold nanomaterials for sensitive detection of heavy metal ions

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Abstract

Gold nanomaterials used for the development of ultrasensitive sensing strategies are becoming increasingly important in environmental sciences. In our laboratory, we have designed some related works based on gold nanomaterials. i) A ‘blue-to-red’ colorimetric sensing strategy has been proposed via redox regulated surface chemistry of AuNPs for the detection of Hg^{2+} and Ag^+ . ii) A colorimetric, label-free and nonaggregation-based silver coated AuNPs (Ag/AuNPs) probe has also been developed for the detection of Cu^{2+} , based on the fact that Cu^{2+} could accelerate the leaching rate of Ag/AuNPs by thiosulfate. In addition, these methods have been validated the practicality through the analyses of real samples, which possess great potential applications in environmental and biological fields.

Acknowledgements: National Natural Science Foundation of China (No. 20975089) and the 100 Talents Program of the Chinese Academy of Sciences.

Keywords: gold nanomaterials; heavy metal ions; environmental field

Bayesian analysis for Marine/Coastal ecosystem model—Theory and Methods

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Abstract

Marine/coastal ecosystem models typically take the form of nonlinear differential equations, and have been used to describe the biogeochemical and planktonic dynamics. Unlike atmospheric and oceanographic models, which are based on sound physical laws, ecosystem models usually suffer from many uncertain factors, such as inconstant model parameters and lack of high quality observation data. Therefore, a quantitative estimate of model or parameter uncertainty is essential to fully understanding the marine and coastal ecosystem dynamics. In this study, a deterministic model is firstly reformulated within statistical framework where both the model and parameter uncertainties are incorporated. Next, the theory of Bayesian statistics and its application in parameter estimation and model prediction are introduced. Then the method to implement parameter estimation and model prediction with the help of a statistical software-BUGS is also illustrated. It is concluded that Bayesian approach has many advantages over many classical deterministic methods since it can combine data and model well and the prior knowledge about model and parameter can also be used.

Keywords: Differential equations; statistical inference; parameter estimation; Markov Chain Monte Carlo; Gibbs sampling

Session: B4 Poster**History trends of heavy metals in sediment cores from tidal flat in Haizhou Bay, China**

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Abstract Sedimentation of metals preserves historical records of contaminant input from local and regional sources, and measurement of metals in sediment cores can provide information for reconstruction of historical changes in regional water and sediment quality. Four intertidal sites at south Haizhou Bay, China were examined for concentrations of heavy metals including Cd, Cr, Cu, Mn, Pb and Zn in core sediments to investigate the historical input of trace metals. Based on ^{210}Pb , sedimentation rates of core LH3 was 0.85 cm/yr, and one of core LH4 is 1.5 cm/yr. Depth profiles correspond to scenario of GDP increase of Lianyun Gang, where is near the Haizhou Bay. Furthermore, depth profiles and enrichment factors of heavy metals Cd, Mn, Pb and Zn indicate that inputs from anthropogenic sources were predominant over natural input, and increase since 1960s. However, heavy metal Cr and Cu show no significant enrichment and pollution in the core sediments. The comparison of the sediment metal content with former work in the Haizhou Bay indicated that southern tidal flats of Haizhou Bay will become a “sink” of heavy metals as further fine sediments are deposited there.

Keywords: Sediment rates; Metals; Enrichment factors; Anthropogenic input; Tidal flat

Anthropogenic environmental changes due to partial dike removal in the Honjo Area of Nakaumi Lagoon, Southwest Japan

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Nakaumi Lagoon is a coastal brackish water lake in San'in District, Southwest Japan. In 1981 the Honjo Area, approximately the northern quarter of Nakaumi Lagoon, was almost completely isolated by the Moriyama Dike constructed by the Nakaumi Reclamation and Desalination Project. However, the reclamation project was cancelled in 2002. In May 2009, the 60 meters partial removal of Moriyama Dike was carried out and the water chemistry of the Honjo Area changed drastically. In this study, we document changes in the water environment resulting from the opening of the Honjo Area. The monitoring program is made up of 60 water quality measurement sites and 12 detailed sampling localities in a traverse line through the lake system and observations were made at monthly intervals from May 2006 to May 2011. Before the Moriyama Dike was removed, the salinity difference between surface and bottom water remained between 2 and 4 psu. For most of the year the water was stratified and bottom water in the Honjo Area showed oxygen depletion. The dissolved oxygen of bottom water decreased early in the year on the Moriyama Dike side of the Honjo Area. This oxygen-poor water was easily up-welled by winds because the vertical salinity difference was small. At times the observed dissolved oxygen value of surface water was less than 1 mg/l, indicating that the shallow ecosystem was significantly affected. After the opening of the Honjo Area, Sakai Channel bottom water with high salinity and high dissolved oxygen moved into the Honjo Area. The large density difference set up a strongly stratified structure in the Honjo Area. After stratification, the bottom water of the Honjo Area became oxygen depleted, becoming an anoxic environment except for a small area near the Moriyama Dike. The strong stratification, however, prevents bottom water from up-welling into shallow areas.

Keywords: anthropogenic change; reclamation; Nakaumi Lagoon; Honjo area

Impacts of Freshwater Input on Vegetation Cover in Yellow River Delta Wetland

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Abstract

Vegetation coverage can deliver important information of wetland landscape and its ecological regimes. In Yellow River Delta wetland, vegetation cover is greatly sensitive to local climate conditions (precipitation and temperature) and freshwater input of Yellow river. Particularly, freshwater inflow has a significant restrictive effect on wetland vegetation. Therefore, the study on impacts of freshwater input on vegetation cover in Yellow River Delta Wetland has theoretical and practical significance. First, based on the data of MODIS images and under the support of GIS technique, the normalized difference vegetation index (NDVI) was calculated. Then, using NDVI as a key quantitative index, the spatial and temporal characteristics of vegetation cover were detected by the spatial autocorrelation analysis method. Finally, using the linear regression method, the relationship between freshwater inflow and NDVI was established and further, the effects of freshwater input on vegetation cover were evaluated. The results of this study would be helpful for the assessment of wetland ecological conditions and to develop appropriate adaptation and mitigation strategies for vegetation protection and restoration in the estuary wetland of Yellow River Delta.

Keywords: Freshwater input; vegetation cover; NDVI; Yellow River Delta Wetland



Session: B5 Poster**Study on a novel marine algicidal actinomycete against the harmful algal bloom species *Phaeocystis globosa***

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Abstract

Harmful algal blooms (HABs) have become a worldwide environmental problem. Recently, algicidal bacteria have attracted wide attention as possible agents for inhibiting HABs. In this study, one strain of O4-6 with algicidal activity against the toxic algae *Phaeocystis globosa* was isolated from mangrove sediments in Yunxiao mangrove National Nature Reserve. Analysis of its nucleotide sequence of the 16S rRNA gene and morphological characteristics strongly suggested that the strain O4-6 belonged to the genus *Streptomyces*. Characterization tests (heat stability, pH tolerance) of its algicidal compound showed that the algicidal compound is instability over 80 °C and not affected by pH changes. Application to the algicidal compound by various separation steps led to isolation of one active molecule having a molecular weight ranging from 500 Da to 1 kDa by dialysis tests, which possessed antibacterial activity against *Bacillus subtilis*. The MALDI-TOF-MS assay showed the algicidal fraction has a molecular weight of 746 (m/z724). And nuclear magnetic resonance spectrum of the peak was also analysed in this study, demonstrated that the algicidal compound was sisonycin. This work provides a probability for HABs' biological control.

Keywords: actinomycete; algicidal compound; *Phaeocystis globosa*;**Effects of marine algicidal bacterial isolated from a sub-tropical bay on *Skeletanema coatum***

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Abstract

Forty-four algicidal bacterial strains were isolated from the seawater and sediment of red tides blooming waters in Nanao, a subtropical bay, in south China. Four algicidal bacteria (referred to P1, P5, N5 and N21, respectively) were selected from the forty-four bacterial strains against the *Skeletanema coatum* by using the 48 well microplate method. The *S. coatum* was used as a susceptible host organism to examine the algicidal activity of the four algicidal bacteria. The results showed that the best algicidal activity appeared when the volume ratio of cultures of algicidal bacteria and *S. coatum* cultures was 0:1:1, followed by 0:05:1, and there almost had no algicidal activities when the volume ratio was 0:01:1. In addition, when the 0.1ml cultures of algicidal bacteria were applied to 1ml *S.coatum* cultures, N5 had the best algicidal activity. nearly all of *S. coatum* cells were separated, inflated and then decomposed within 48h. Followed by P5, over 98% of *S. coatum* cells were directly decomposed until 48h. and the thirdly is N21, many of algal cells became separate and inflate in 48h, the mortality rate of algal cells achieved 99% within 72h. Last one is the P1, *S. coatum* cells became separated and inflated after 48h, then over 99% of algal cells were killed.

Keywords: *Skeletanema coatum*; Marine bacteria; Algicidal activity

Uptake Kinetics and Regulation Mechanisms of *Procentrum donghaiense* for Urea

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Abstract

As worldwide use of urea has increased more than 100-fold in the past 4 decades, urea is an important source of nitrogen for primary producers in aquatic ecosystems. In this paper growth rates and uptake kinetics of *Procentrum donghaiense* with urea as the sole N source were examined in laboratory cultures, and urease activity and its regulation mechanisms were also investigated. The results showed that, the maximum specific growth rate was 0.685 d^{-1} , half-saturation concentration was $20.508 \mu\text{mol N L}^{-1}$ as urea was the sole N source, while 0.663 d^{-1} , $11.940 \mu\text{mol N L}^{-1}$ for nitrate. The maximum uptake rate and half-saturation concentration for urea were $3.184 \mu\text{mol N h}^{-1}$, $39.043 \mu\text{mol N L}^{-1}$ respectively, while $2.800 \mu\text{mol N h}^{-1}$ and $18.032 \mu\text{mol N L}^{-1}$ for ammonium. It suggested that *P. donghaiense* had higher affinities for nitrate and ammonia than urea, but if urea was sufficient, *P. donghaiense* showed higher uptake rate and growth rate. Light intensity, temperature, salinity, nitrogen sources could influence urease activity of *P. donghaiense*. N source composition was a key factor regulating urease activity: inorganic nitrogen, especially ammonium, significantly inhibited it, while urea could stimulate it on contrast. Temperature could significantly affect the urease activity. Salinity had the smallest effect on urease activity. As *P. donghaiense* possesses an effective capability in exploitation for urea, the supply of urea from anthropogenic sources would be beneficial to the proliferation of some phytoplankton species and linked to increased occurrences of HABs.

Keywords: *Procentrum donghaiense*; urea; uptake kinetics; urease; regulation; HABs

Harmful algal blooms mitigation using clay/soil/sand modified with xanthan and calcium hydroxide

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Abstract

One of the challenging and controversial aspects of harmful algal blooms (HABs) research relates to methods that directly control or suppress blooms. Removal of HABs cells using clay or modified clay as the flocculating agent has been studied extensively, and is used in some countries for HABs management. One concern that is frequently raised relates to the environmental impacts of large amounts of exotic minerals or refractory biodegradable modifiers. Here we describe a method for HABs mitigation using clay, soil, or sand modified with xanthan and calcium hydroxide. Xanthan is a natural biodegradable polysaccharide produced by fermentation of the bacterium *Xanthomonas campestris*. Results showed that xanthan could trap and wrap *Amphidinium carterae* cells via bridging and netting interaction due to its superior salt compatibility in seawater. The maximum cell removal efficiency was 55% when xanthan was used alone. The removal effect of xanthan was enhanced by the addition of appropriate calcium hydroxide that decreased the repulsive interaction between anionic xanthan and negatively charged algal cells. Three kinds of minerals (clays, soils and sands) were ineffective in removing algal cells before treatment. When xanthan and calcium hydroxide were used together as modifiers, the removal efficiency increased to 83%-89% within 30 min. After several hours, 95% - 98% cell removal was achieved and there was no significant difference in the removal efficiencies among modified clays, soils and sands. This would make it possible to use local mineral particles (i.e. soil, sand or sediment) intended for treatments, which would reduce transportation costs and environmental concerns in the use of exotic materials. As new modifiers, xanthan is environment friendly and calcium could bind with phosphate in waters and the bottom sediments. The method would provide an alternative modification approach to suppress and mitigate HABs using local soils/sands and polymers in marine systems, but further research is needed before large scale applications due to the ecological effects of pH increase by the addition of calcium hydroxide.

Keywords: harmful algal blooms; mitigation; xanthan; sand; soil; clay

Session: B6 Poster**Sulfate reduction in sediments of Pearl River Estuary (PRE)**

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Abstract

Microbial sulfate reduction rates (SRR) were determined along the entire length of the sulfate reduction zone and methanogenic zone with $^{35}\text{SO}_4^{2-}$ radiotracer method in three sediment cores (QA, HQ and GS) from the Pearl River Estuary (PRE). The sediment cores were collected from the estuarine coast and seaward boundary along the estuarine salinity gradient, representing the freshwater, brackish and marine water environment. The sulfate reduction zone at QA and HQ were at depths of 30cm and 39cm, and the highest values of SRR occurred at 22cm and 4cm depth, with 133.7 and 158.2 nmol cm $^{-3}$ d $^{-1}$ respectively. At station GS, two peaks in SRR profiles appeared on the top 9 cm and at 21.5cm depth in sulfate methane transition (SMT), with significantly low value of 8.7 and 6.5 nmol cm $^{-3}$ d $^{-1}$ respectively. The depth-integrated SRR were 22.7, 35.3 and 3.9 nmol m $^{-2}$ d $^{-1}$ within sulfate reduction zone at three stations (QA, HQ and GS). The correlation between environmental parameters variables (TOC, SO_4^{2-} , Temperature and Eh) and SRR, indicated that SRR was mainly regulated by the availability of active organic matter and temperature. SRR increased at the end of sulfate reduction zone, demonstrating that the anaerobic methane oxidation (AOM) stimulated sulfate reduction within SMT. Through the steep methane concentration gradients within SMT zone, flux rates of methane from methanogenesis zone were calculated, with values of 0.82, 0.58 and 0.21 nmol m $^{-2}$ d $^{-1}$ at three stations (QA, HQ and GS), which account for 7.0%, 5.5% and 42.0%, respectively, of the sulfate reduction in SMT zone. The maximum concentration of AVS in sediment coincides with high SRR in three sediment cores.

Keywords: Sulfate reduction rate, Anaerobic methane oxidation, Pearl River Estuary

Nitrogen cycling of plant-soil system in *Suaeda salsa* wetland in the intertidal zone of the Yellow River estuary

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Abstract

The nitrogen (N) cycle of plant-soil system in *Suaeda salsa* wetland in the intertidal zone of the Yellow River estuary was studied from April 2008 to November 2009. Results showed that soil N had significant seasonal fluctuations and vertical distribution, and the net N mineralization rates in topsoil were significantly different in growing season ($p < 0.01$). The N/P ratio (9.87 ± 1.23) of *S. salsa* was less than 14, indicating that plant growth was limited by N. The N accumulated in *S. salsa* litter at all times during decomposition, which was ascribed to the N immobilization by microbes from the environment. Soil organic N was the main N stock of plant-soil system, accounting for 97.35% of the total N stock. The N absorption and utilization coefficients of *S. salsa* were very low (0.0145 and 0.3844, respectively), while the N cycle coefficient was high (0.7108). The N turnovers among compartments of *S. salsa* wetland showed that the N uptake amount of aboveground part and root were 7.764 g/m 2 and 4.332 g/m 2 , respectively. The N translocation amounts from aboveground part to root and from root to soil were 3.881 g/m 2 and 0.626 g/m 2 , respectively. The N translocation amount from aboveground living body to litter was 3.883 g/m 2 , the annual N return amount from litter to soil was more than 0.125(-) g/m 2 (minus represented immobilization), and the net N mineralization amount in topsoil (0-15 cm) in growing season was 1.190 g/m 2 . The assessment of N biological cycle status of *S. salsa* wetland indicated that N was a very important limiting factor and the ecosystem was situated in unstable and vulnerable status. The *S. salsa* was seemingly well adapted to the low-nutrient status and vulnerable habitat, and the N quantitative relationships determined in the compartment model might provide some scientific bases for us to reveal the special adaptive strategy of *S. salsa* to the vulnerable habitat in the following studies.

Keywords: nitrogen cycle, plant-soil system; *Suaeda salsa* wetland; Yellow River estuary

Impacts of plantation clear-felling and replanting on iron mobilization and greenhouse gas evolution in soils of a subtropical coastal catchment

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Abstract

Exotic *Pinus* plantation forestry is a major land use on coastal lowlands of subtropical Southeast Queensland (SEQ, Australia). Large-scale mature *Pinus* clear-felling followed by replanting are of concern due to disturbance of soil organic carbon and iron pools, and associated biogeochemical processes upon flooding. We selected the Poona Creek catchment to study the potential for iron mobilization and greenhouse gas (CO_2 and CH_4) emissions in a range of SEQ *Pinus* soils under different forestry practices. Intact, 30 cm-deep soil core microcosms from mature pine plantation, first-rotation clear-felled and second-rotation replanted soils were saturated and incubated for 35 day in the laboratory. Leachate chemical analysis showed substantial pH increases and redox potential decreases in all soils over 5–11 day incubation. Despite variable dissolved organic carbon in leachate, mature *Pinus* soils showed minimal iron and aluminum dissolution, combined with continuous manganese mobilization over 35 day. In contrast, clear-felled and replanted soils displayed concurrent iron and aluminum dissolution 3 day post-saturation, without dissolved manganese accumulation over 35 day incubation. Despite low organic carbon mineralization rates, mature *Pinus* soils showed significantly higher CO_2 and CH_4 effluxes 11 day post-saturation ($p < 0.05$), whereas clear-felled and replanted soils primarily functioned as weak CO_2 sources and CH_4 sinks throughout 35 day incubation. Results indicated elevation of iron mobilization in subtropical coastal *Pinus* soils due to plantation clear-felling and replanting, although associated CO_2 and CH_4 emissions were less than those from mature *Pinus* soils. Further study is needed to determine whether dissolved iron is transported through coastal catchment surface and/or ground waters, providing the limiting nutrient for potentially toxic cyanobacterial blooms in estuarine-marine systems.

Keywords: *Pinus* plantation forestry; seasonal flood; iron dissolution; greenhouse gas; CO_2 flux; CH_4 flux

Spatial-temporal rainfall distribution based on TRMM satellite data over the Taiwan Strait and its adjacent area

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Abstract

The present study is focused on the spatial-temporal characteristic of rainfall intensity in the Taiwan Strait and Fujian Province over the 13-year period from 1998 to 2010. We retrieved data from TRMM (tropical Rain Measuring Mission) rain rate available in daily and monthly temporal and 25km spatial resolutions. The rainfall data from Xiamen meteorological station was used to validate the TRMM satellite rain rate and found significant correlation between them. The climatological analysis had showed that the maximum rainfall occurred in June and in the northern Fujian Province. At inter-annual scale, the declined trend of rainfall intensity was found in spring and increased in summer from 1998 to 2010. It suggests that ENSO event could have delayed effect on the rainfall patterns over the Taiwan Strait and its adjacent area. Furthermore, the average yearly frequency of heavy rain event ($>50\text{mm/d}$) was $\sim 7\text{days}$. Major heavy rain events occurred during typhoon period in summer/autumn. The study also indicated that there existed a good relationship between the rainfall rate and runoff rate of Jiulong River at inter-annual scale.

Keywords: rainfall; TRMM; runoff; Taiwan Strait; Fujian



Seasonal and interannual variations of nutrients in the Bungo Channel, Japan

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Abstract

The seasonal and interannual variations of nutrient concentrations (DIN, PO₄ and Si) and the relation between nutrients and water temperature and that between nutrients and salinity in Bungo Channel, Japan were examined using monthly observation data during the period from 1991 to 2008. Our analysis showed that the concentrations of nutrients in the northern area close to the inland sea varied little in the vertical direction from October to April, but largely from May to September; the concentrations of nutrients in the southern area close to the Pacific were high in the bottom layer but low in the surface layer throughout the year. The highest concentrations of nutrients were always found in the deep water in the southern area. Meanwhile, the concentrations of nutrients in the northern area were also noticeably high during the period from October to April, especially in winter. For the concentrations of DIN and PO₄, seasonal variations were significant in the upper layer of northern area and in the deep layer of southern area, which was likely caused by different mechanisms, and were small in the middle layer of southern area. For the concentration of Si, the smallest seasonal variations were found in the upper and middle layers of northern area. Interannual variations depend strongly on seasons. The most apparent interannual variations were found in the deep layer of southern area. For DIN and PO₄, interannual variations were larger than seasonal variations in the southern area, while the magnitude of interannual variations and that of seasonal variations were at the same order in other areas. For Si, the ratio of interannual to seasonal variations was large at northern and southern areas but small in the central area of the channel. During the period from October to June, the temperature and salinity in the northern area were almost vertically homogenous, but were stratified from July to September. The largest interannual variations in water temperature were found in the middle layer of the southern area in autumn, while those in salinity were found in the surface layer of the southern area in autumn. However, the interannual variations of temperature and salinity were generally smaller than their seasonal variations. The correlation coefficients between three nutrient elements and water temperature are generally larger than those between three nutrient elements and salinity. The largest correlation coefficient (~0.7) between water temperature and nutrients were found in the upper layer of the southern area.

Keywords: Bungo Channel; nutrients; seasonal variations; interannual variations

Geochemical characteristics of nitrogen in core sediments from Sishili Bay, China

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Abstract

It is generally recognized that, besides their total concentration, information about the physicochemical forms of elements in sediments is required for understanding their environmental behavior such as mobility and bioavailability. A sequential extraction technique was applied to gain the information about the fractionation of nitrogen in four core sediments from Sishili Bay, China. Based on the binding strength of different nitrogen compounds to sediment matrix, ranging from easier to more difficult, four forms of labile nitrogen, i.e. nitrogen in ion exchangeable form (IEF-N), nitrogen in weak acid extractable form (WAEF-N), nitrogen in strong alkali extractable form (SAEF-N) and nitrogen in strong oxidant extractable form (SOEF-N), were extracted. The results showed that the content of labile nitrogen averagely accounted for about 26.14% of total nitrogen in surface 0-10 cm of core sediments and decreased gradually with depth. The SOEF-N was the predominant one. The average percentages of the four labile nitrogen forms were 89.7% for SOEF-N, 7.97% for IEF-N, 1.19% for WAEF-N, and 1.14% for SAEF-N, respectively, which implied that under natural geochemical conditions only a small part of sedimentary nitrogen could participate in recycling in short time scale. The contents of nitrogen in different labile forms at different sampling sites are influenced by the combination of terrigenous inputs, aquaculture pollution and environmental factors such as sediment pH, redox potential and particle size.

Keywords: Sequential extraction, Nitrogen forms, Geochemical characteristics, Sishili Bay

Seasonal variations in fluxes of dissolved inorganic carbon from Taiwanese rivers

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Abstract

Estuaries and rivers link the land and ocean, playing a significant role in the global CO₂ cycle. However, studies on the flux of inorganic carbon from small mountainous rivers are generally lacking. This study aims to determine seasonal changes in carbon fluxes in the Taiwanese estuaries. Results in different seasons during 2009–2010 show a negative relationship between dissolved inorganic carbon (DIC) concentration and river drainage area. The DIC concentrations are mainly controlled by hydrogeochemical processes. This is due to the relatively short residence time of mountainous rivers, hence the biological effects are relatively insignificant. The DIC concentrations also have a negative relationship with the river discharge. Concentrations of DIC are mostly lower in the wet season, and vice versa in the dry season, due to the dilution effect of the runoff. The average freshwater DIC concentration of $2567 \pm 1608 \text{ mol kg}^{-1}$ ($n=25$, n: number of rivers) is about three times that of the global average of 884 mol kg^{-1} . Overall, the total annual DIC exported from Taiwanese rivers is approximately $1.99 \times 10^{12} \text{ g C}$, and accounts for 0.5% of the world river DIC flux to the ocean. However, Taiwan only accounts for 0.02% of the global land area. That is to say, the carbon flux per unit area from the mountainous Taiwan is 25 times the global average.

Keywords: Dissolved inorganic carbon; carbon fluxes; estuaries; DIC; mountainous river

Excess and imbalanced nutrient loads modify the carbon sink in the Southern North Sea: a model study over 50 years

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Abstract

The RIVERSTRAHLER model, an idealized biogeochemical model of the river system, has been coupled to MIRO-CO₂, a model describing carbon and nutrient cycles in the marine domain, to assess the dual role of changing nutrient loads and increasing atmospheric CO₂ as drivers of air-sea CO₂ exchanges in the Southern North Sea. The whole area is characterized by variable diatom and Phaeocystis colony blooms, which impact on the trophic status and air-sea CO₂ fluxes of the coastal ecosystem. For this application, the MIRO-CO₂ model is implemented in a 0D multibox frame covering the eutrophied Eastern English Channel and Southern North Sea and receiving loads from the rivers Seine and Scheldt. Model simulations are performed for the period between 1951 and 1998 using real forcing fields for sea surface temperature, wind speed and atmospheric CO₂ and RIVERSTRAHLER simulations for river carbon and nutrient loads. Model results suggest that the coastal zone shifted from a source of CO₂ before 1970 (low eutrophication) towards a sink during the 1970–1990 period when anthropogenic N and P loads increased, stimulating C fixation by autotrophs. A progressive decrease of P loads concomitant with a decrease of primary production and of the CO₂ sink characterizes the coastal area after 1990. At the end of the simulation period, the ecosystem turns again to net heterotrophy and acts as a source of CO₂ to the atmosphere. Model sensitivity analysis on the various forcings suggests that the simulated trend in air-sea CO₂ fluxes was mainly controlled by the magnitude and the ratio of inorganic nutrient river loads. Quantitative nutrient changes control the level of primary production while qualitative changes modulate the relative contribution of diatoms and *Phaeocystis* to this flux and hence the sequestration of atmospheric CO₂.

Keywords: North Sea; eutrophication; carbon dioxide, air-sea CO₂ fluxes; nutrient changes; biogeochemical modelling

Seasonal variability of CO₂ fluxes in subtropical estuaries: Case study of Taiwan

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Abstract

Estimation of the global CO₂ flux seldom includes the estuarine and the adjacent coastal regions, so the value is subject to a large uncertainty. Further, the current estimation in the estuaries is based on a very limited data set due to the fact that data from subtropical and tropical estuaries are scarce. According to the study of Laruelle et al. (2010, Evaluation of sinks and sources of CO₂ in the global coastal ocean using a spatially explicit typology of estuaries and continental shelves, Geophysical Research Letters, vol.37, L15607, doi: 10.1029/2010GL043691), only 62 estuaries with water-to-air CO₂ flux data are presented, without seasonal classification. In this study, our team sampled 25 estuaries based on field surveys covering four seasons in Taiwan, aiming to get better quantify the estimation of CO₂ flux in the coastal regions. Results show that in western estuaries, the fCO₂ has a negative relationship with dissolved oxygen (DO) but a positive relationship with dissolved organic carbon (DOC). In eastern estuaries the relationship is not clear. It is likely that the fCO₂ in western estuaries is controlled by decomposition of organic matter. The fCO₂ and the water-to-air CO₂ flux are always higher in the upper estuaries, and decrease downstream with increasing salinity. There is no obvious seasonal variability of fCO₂, and the water-to-air CO₂ fluxes are similar throughout the year that is 75.1±211 (n=24, n: number of rivers) in spring, 60.8±145 (n=25) in summer, 67.9±167 (n=8) in autumn and 50.7 ± 119 (n=21) (mmol C/m² d) in winter. The average annual water-to-air CO₂ flux is 23.2±3.80 mol C/m² yr. This value is close to the reported value of subtropical estuaries (23.3±12.3), but a little higher than the global average of 21.0±17.6 mol C/m² yr.

Keywords: CO₂ flux; estuaries; Taiwan estuaries; fCO₂; coastal region; seasonal variability

Arsenic and mercury accumulation in brown seaweed *Sargassum sinicola* and sediments of the western coast of Bahía Concepción, Baja California Peninsula, México: assessments of the effects of geothermal, hydrothermal and groundwater discharges

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Abstract

Bahía Concepción (adjacent to central Gulf of California) distinguishes as an ideal area for the studies of biogeochemical cycles. This bay is pristine; however it receives dissolved trace elements due to geothermal, hydrothermal inputs, as well as groundwater discharges, which are probably important sources for dissolved elements. The aim of this work is try to assess the influence of different discharge types, in surface water zones with elevated ²²²Rn activity, on the elemental composition of brown seaweed *Sargassum sinicola* and the surficial sediments from the western coast of Bahía Concepción. The algae 27 specimens (cleaned and washed by deionized water) and 50 sediment samples were pre-treated (dried at 60°C and homogenized). The sediments and seaweed dry subsamples were subjected to total digestion by a mixture of concentrated strong acids with subsequent measurements of trace elements by high resolution ICP-MS. Potentially toxic elements As and Hg were measured by flameless atomic absorption spectrophotometry after soft digestion and generation of hydrides of As and elemental Hg. The concentrations of most of the studied elements in the seaweed and sediments resulted not statistically different between the three contrasting areas. The only exceptions are the contents of As, Cs, Ge, Hg and Sn, displaying larger heterogeneity between seaweeds samples. High maximum values of As (207 mg kg⁻¹) and Hg (143062 µg kg⁻¹) were found in sediments of the hydrothermal site. Arsenic and mercury presented elevated levels in *Sargassum sinicola* (22-640 mg kg⁻¹ and 14-95 µg kg⁻¹ respectively). The intertidal geothermal sources seem to be the principal suppliers of mercury for seaweeds and the sediments (25155 µg kg⁻¹ maximum value). The seaweed samples collected in the groundwater discharge area have higher contents of Fe, Ni, Pb, Sc, Sn, V and Zn.

Keywords: trace elements; *Sargassum sinicola* seaweeds; marine sediments

Session: C1 Poster

Evaluation of ICM governance capacity for sustainability: a case study in Quanzhou, Fujian, China

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Abstract

Ten coastal cities in China have been designated as Integrated Coastal Management (ICM) parallel cities for the scaling up of ICM since 2009. Most of are currently in the stages of preparing and initiating. To promote the process of ICM expansion in coastal cities and to ensure process sustainability from a long-term perspective, this study uses an ICM governance index system approach based on the Analytic Hierarchy Process (AHP) to evaluate municipal governance capacity to sustain the ICM programmes. This system comprises of five dimensions: legal and enforcement capacity, institutional capacity, financial capacity, stakeholder and public participation. Quanzhou, one of the ten parallel cities, is selected to demonstrate the feasibility and effectiveness of the approach. By measuring the current status of ICM governance, finding out gaps and drawbacks for ICM sustainability, it will also have positive implications for developing a more adaptive and sustainable ICM framework at municipal level.

Keywords: Analytic Hierarchy Process; Integrated Coastal Management (ICM); ICM governance index; ICM sustainability;

Session: C2 Poster
Seasonal variation in BOD discharge to the sea from the Ciliwung river of coastal megalacity, Jakarta

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Abstract

Jakarta is one of the Asian megalities located on the coastal alluvial plain in Indonesia. To evaluate the influence of river pollutions in megalities on coastal environments, we confirmed seasonal variation in BOD discharge at sites in Jakarta of Ciliwung river with a watershed area of 460km². River water samples were collected at 20 sites from mid to downstream in June and August of dry season and in April and December of rainy season in 2010. EC, pH and dissolved oxygen were measured on sites. Water samples were analyzed for BOD, dissolved organic carbon, major anions and nutrients. The BOD concentrations in Ciliwung river were very high, the average values was 14.8 mg/l and the highest one was 70 mg/l. In addition, a very large seasonal variation was detected from 3.5 mg/l in average of December to 26.1 mg/l in June. These results suggest that organic pollutants accumulated in the riverbed during the dry season were flushed out at a beginning of rainy season and organic decomposition occurred significantly in the rainy season due to increase of oxygen supply. Based on the runoff data in 2000, the average runoff in rainy season was 3 times of that in dry, whereas BOD concentration at the runoff station in rainy season was one thirtieth of that. Consequently, BOD load from the Ciliwung river in dry season was estimated to be 10 times of that. However, it is necessary to estimate pollutants flushing at a beginning of rainy season. In spatially, BOD concentrations declined significantly with flowing down even though sewage is supplied at many places without infrastructures. Especially, spatial variations in ratios of BOD and Cl⁻ also suggest natural decomposition with high activity in a river under the high temperature.

Keywords: Jakarta; coastal megalacity; Ciliwung river; pollutant discharge; BOD; seasonal variation

Session: C3 Poster

Climate Change in Zapata, vulnerability, impacts and adaptation.

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Abstract

Zapata is the biggest wetland in the Caribbean islands. The low lying land and other physical-geographic conditions make the Zapata an especially vulnerable place to climate change and variability. Its population is also vulnerable so it is necessary develop an adaptation program with an integrated participation of scientists, specialists, decision makers and stakeholders. Knowing the susceptibility and vulnerability in the wetland, they was possible understand the physical-geographic conditions and anthropogenization in the wetland, they was possible understand the susceptibility and vulnerability in Zapata. The use of future climate scenarios (2030, 2050 and 2100) and the current climate variability, (hurricane frequency, temperature trend, drought frequency, intensity and duration) moreover the future socio-economic perspective (considering land use change), allow have an idea of how will be the future. For this topic were used statistic method and climate change models for different emissions scenarios. Studying the climate present and the future scenarios according IPCC models it is possible to know the impacts. With this information was developing an adaptation measures program, focusing to an integrated and holistic analysis. Statistical software and GIS were also tools used in the study. The current climate shows a trend to change, more droughts, higher temperatures, more tropical storm are features of the climate today. The future scenarios show a different climate too. Sea level rise is other hazard. Ecosystem and people are vulnerability. Some land should disappear. Adaptation measures are necessary among them:

- A new university in the municipality follow develops future professionals in different brands,
- preparing the people for the life in other environment.
- Improving the civil defence and the early warning
- Improving the advising to decision makers
- Improving the educational and cultural work.
- Decreasing invader species.
- Decreasing the hazards associated with the traditions.
- Rescue the mangrove.
- Decreasing the stress in ecosystems, and other more.

Radioisotopes concentration in water and sediment of offshore area of the Bay of Bengal, Bangladesh

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Abstract

The natural and fall-out radionuclides in offshore water and sediment in some parts of the Bay of Bengal were determined using high efficiency and high resolution coaxial germanium detector from March to October 2006. Assessment of radionuclides concentration and their spatial distribution as well as comparison of the radioactivity level between water and sediment was the principal objectives of this study. In sediment, average activity of ^{238}U , ^{232}Th , ^{40}K and ^{137}Cs was recorded 31.24 ± 5.75 , 51.88 ± 9.43 , 686.43 ± 170.47 and 0.52 ± 0.61 $\text{Bq} \cdot \text{kg}^{-1}$, respectively on dry weight basis. In water, average activity of ^{238}U , ^{232}Th and ^{40}K was 4.81 ± 1.18 , 5.43 ± 1.23 and 39.05 ± 8.64 $\text{Bq} \cdot \text{l}^{-1}$ respectively. The concentration of ^{137}Cs in water sample was below detection limit. A highly significant negative correlation was found between depth & ^{238}U ($r=-0.864$) and depth & ^{40}K ($r=-0.775$). One factor analysis of variance showed that the variance of radioisotopes concentration between water and sediment was highly significant for ^{238}U ($F=122$, $df=11$, $P=0.001$), ^{232}Th ($F=143$, $df=11$, $P=0.001$) and ^{40}K ($F=86$, $df=11$, $P=0.001$). The results showed that there was a decline in the level of radioactivity from coast to open sea. The study indicated that there was no imminent threat due to radioactivity in the investigated parts of the Bay of Bengal

Keywords: radioisotopes, water, sediment, germanium detector, Bay of Bengal

Keywords: climate change; adaptation; vulnerability; impacts; meteorological extremes

Vulnerability assessment in urban coastal zones of Viet Nam, case study in Ha Long city

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Abstract

Located in the Northern economic region of Vietnam, Ha Long city plays an important role in socio-economic development such as industry, mining, marine transport, and tourism with the world natural heritage - Ha Long bay. In recent years the economy has growth by 15.55 per cent during the last five years period thanks to the rapid development of coastal cities. Together with urbanization, the pressure of scarce resources, population density, housing demand, pollution, etc., have taken place in Ha Long city. It is principal factors in the increase in vulnerability of coastal cities. In this paper, the vulnerability level of Ha Long city, Viet Nam has been delineated by 15 indicators of three components (Urbanization, Vulnerable objects, and Resilience capacity). Vulnerability assessment result is the important issue of sustainability of future urban plan and development in Ha Long city.

Key words: vulnerability, urbanization, Ha Long city.

Pathways of Cadmium Fluxes in the Root of the Halophyte *Suaeda salsa*: A Cadmium-Selective Microelectrode Study

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Abstract

Halophytes plants offer a greater potential for phytoremediation research for reducing the levels of toxic metals from saline soils than salt sensitive plants. Using the scanning ion-selective electrode technique, we analyzed the pattern and rate of Cd²⁺ fluxes at different regions of the root apex of *Suaeda salsa*. The Cd²⁺-influx was greatest near the root tip (within 1.5 mm of the tip), and net Cd²⁺ flux decreased with increasing distance from the root tip. To verify the possible uptake pathways of Cd across the root membrane of *Suaeda salsa*, the Cd²⁺ flux into the root was also investigated after pre-treatment or in the presence of different metabolic inhibitors and ion channel blockers. Both experiments indicated that Cd²⁺ influx into roots was significantly suppressed by the pre-treatment or in the presence of two kinds of Ca²⁺ channel blockers; LaCl₃ and verapamil. The Cd²⁺ influx was also reduced by N-ethylmaleimide, which acts by binding with proteins and low-molecular-weight SH-containing compounds such as glutathione. These findings are consistent with the hypothesis that transport of Cd²⁺ is dominated by a carrier-mediated process involving these compounds in halophytes. Cd content determination and labeling of Cd using fluorescent dye support our conclusion. Further studies are necessary to elucidate the mechanisms involved in the Cd²⁺ uptake in *Suaeda salsa* and other halophytes. This will provide a more stable theoretical basis for the phytoremediation of Cd contamination, especially in saline soil of coastal zones.

Keywords: Cadmium; *Suaeda salsa*; scanning ion-selective electrode technique; metal uptake



Session: C4 Poster

Towards sustainable tourism along the Kenyan coast

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Abstract

The Kenyan coastal zone is a complex area in which there has been unplanned development in the recent past. Little is known of the coastal dynamics and biophysical changes and their impacts on the natural environment. In spite of this short coming, several tourist resorts and hotels are continually being set up along the beaches demonstrating how the lack of proper knowledge lead to uniformed decisions that may be harmful to the ecosystems. Under this understanding, a small group of researchers interested in ecosystem services for poverty alleviation have set up a proposal that aims at generating research data that can support a sustainable balance between economic welfare and environmental well-being. More specifically, what are the challenges and limits of tourism development given the geophysical, ecological and socio-cultural constraints? Sound planning and use of beach amenities being essential for sustainable tourism development, the main focus of the proposed research programme will be on development strategies to adapt spatial planning to this dynamic environment.

Keywords: Ecosystems; development strategies; Kenyan coast; poverty alleviation; sustainable tourism,



Session: D1 Poster**Molecular monitoring of plankton biodiversity in the Nakdong River estuary in Korea**

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Abstract

The Nakdong River is the second largest river in Korea and the demand for the water resources is ever increasing. The monitoring is important for the conservation and management of the Nakdong River estuarine ecosystem to keep this waterway in healthy condition. The biodiversity has been a critical measure in revealing the status of water quality. The conventional species diversity based on morphological characteristics has some drawbacks in species identification. In this study, we analyzed plankton biodiversity using molecular monitoring technique and microscopic observation with the water samples collected from the river mouth (Eulsukdo Bridge) and 25 km upstream (Mulgeum) in September 2010. The 18S rDNA clone libraries were constructed and a colony PCR and a restriction fragment length polymorphism of PCR (PCR-RFLP) were adopted to isolate unique clones from the clone library. Forty nine unique phylotypes were revealed from a total of 170 randomly selected clones at Mulgeum site and 25 phylotypes from 168 clones at Eulsukdo Bridge site. We found extensively various plankton species including cryptic species diversity. The molecular monitoring method developed here provides important information regarding the biodiversity and community structure of eukaryotic plankton in the environmental samples.

Keywords: molecular monitoring; plankton biodiversity; Nakdong River estuary**Molecular Evolution of Phytoene Desaturase Involved in the Formation of Carotenoids in Eukaryotic Algae**

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Carotenoids play crucial roles in structure and function of the photosynthetic apparatus of bacteria, algae, and higher plants. The formation of lycopene from phytoene is catalyzed by the phytoene desaturase (CrtI, CrtP or PDS) and *zeta*-carotenooids desaturase (ZDS), which is structurally and functionally related in all organisms. A comparative genomic analysis regarding the *PDS* and *ZDS* genes revealed that the higher plant (*Arabidopsis thaliana*), red alga (*Cyanidioschyzon merolae*), and the green alga (*Chlorella vulgaris*, *Volvocystis carteri*, *Coccomyxa sp.* C-169, *Chlamydomonas reinhardtii*, and *Chlorella sp.* NC64A) possess one *PDS* and *ZDS*, respectively. This indicated that these algae obtain their *PDS* and *ZDS* from cyanobacterial through primary endosymbiotic. However, the other green algae (*Ostreococcus sp.* RCC809, *Ostreococcus tauri*, *Ostreococcus lucimarinus*, *Microcoleus* sp. RCC299, and *Microcoleus pusilla*) retained two copies of *PDS* and lost *ZDS*, suggesting an ancient gene duplication event and gene lost event must have occurred, which produced two copies of *PDS* in these algae. It is interesting that one copy *ZDS* gene and two or more orthologous copies of the *PDS* genes exist in the *Heterokontophyta* (*Phaeodactylum tricornutum* and *Thalassiothrix pseudonana*) and the *Haptophyta* (*Emiliania huxleyi*). The discovery of two classes of *PDS* families in some algae suggests that carotenoid biosynthesis is differentially regulated in response to development and environmental stress in these algae, like members of *PDS* families are differentially regulated during development or stress in some higher plants.

Keywords: Carotenoids biosynthesis; Phytoene desaturase; Zeta-carotenooid desaturase; Molecular evolution; Algae

Evolutionary Stride of Phytoene Synthase from Prokaryote to Eukaryote via Cyanobacteria

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Abstract

Carotenoids are important pigments in plant photosynthesis. They are found not only in green plants but also accumulate in archaea, prokaryotes and fungi. Phytoene synthase, encoded by crtB gene, catalyzes the reaction of converting GGDP to phytoene. Our results showed that the crtB gene came out a direct-line evolution of phytoene synthase from prokaryotes to plant via cyanobacteria. This gene derived from an ancient gram-positive bacteria group. It is notable that there was an evolutionary stride took place during the adaptation of photosynthesis life. crtB genes in most species are fairly conserved but an apparent acceleration founded in a group of recently formed cyanobacteria. As computational results showed, a significant positive selection is detected. We hypothesized that the group of cyanobacteria encountered increased oxidative stress while adapting to the environment of higher illumination.

A new anthracene derivative with cytotoxic activity from marine isolate Streptomyces sp.

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Abstract

A new anthracene derivative, named 2-Hydroxy-8-methoxy-2-methyl-1,2,3-dihydro-1H-benz[a]anthracen-4-one was isolated from the marine strain Streptomyces sp., and the structure was established on the basis of extensive spectroscopic analysis including 1D- and 2D- NMR (1H-1HCO_{SY}, HMBC, and NOESY) experiments. 2-Hydroxy-8-methoxy-2-methyl-1,2,3-dihydro-1H-benz[a]anthracen-4-one showed cytotoxicity against human lung adenocarcinoma cell line A549.

Keywords: Streptomyces; anthracene; structure establishment; antitumor

Diversity and Phylogenetic Analysis of Bacteria associated with *Laminaria japonica* Gametophyte

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Abstract

The diversity and phylogenesis of bacteria associated with *Laminaria japonica* gametophyte were investigated and analyzed using the construction of 16S rDNA gene libraries. We compared two kinds of samples, adding with the ampicillin and untreated. Restriction Fragment Length Polymorphism method was used to do further research. Totally 98 clones, digested with HaeII and MspI respectively, were grouped into 6 and 12 operational taxonomic units. Each representative clone was finally sequenced and homology analysis showed that the majority were affiliated to α , β , δ -Proteobacteria, firmicutes and uncultured bacterium. And we found the bacterial species in these two samples differed greatly which indicated the antibiotic treats played a vital role in the community of bacteria associated with *Laminaria japonica* gametophyte. The effects of antibiotic treats could cause some subordinate species to become dominate.

Keywords: 16S rDNA; *Laminaria japonica* gametophyte; RFLP; phylogenetic analysis

Molecular Cloning and Expression Analysis of an Iron Superoxide Dismutase gene from *Laminaria japonica* (Laminariaceae, Phaeophyta)

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Abstract

Superoxide dismutases (SODs) constitute the first line of cellular defense against oxidative stress in plants. SODs generally occur in three different forms with Cu/Zn, Fe, or Mn as prosthetic metals. In this study, We cloned the full-length cDNA of the *Laminaria japonica* iron superoxide dismutase (designed as LjFeSOD) gene using degenerate RT-PCR and rapid amplification of cDNA ends (RACE). Quantitative real-time RT-PCR analysis revealed a general increase in LjFeSOD transcriptions in response to various abiotic stressors, e.g., high light, excessive amounts of iron or sodium acetate, either singly or in combination. Differential expressions of SOD isoenzymes under different abiotic stressors were also investigated and discussed, at both mRNA and protein levels.

Keywords: Superoxide dismutase; Oxidative stress; *Laminaria japonica*; Gene expression; Molecular cloning

Study on the fermentation of Jerusalem artichoke wine

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Abstract

Jerusalem artichoke has many advantages over other plants: it can grow well in unfertile land such as arid soil and saline, and resist many plant pests and diseases. The fermentation of mashed tubers was conducted using *Kluyveromyces marxianus* and different wine yeasts. After fermentation, filtration, post fermentation and aging, different flavors of Jerusalem artichoke wine can be obtained. The product wine had soft taste, sweet smell, bright colour, typical fruit aroma and special Jerusalem artichoke aroma. It was worth for emphasized popularizing, not only is Jerusalem artichoke not competing with grain crops for arable land, but also benefit for the ecological environment protection.

Keywords: Jerusalem artichoke; fruit wine; yeast

Physiological responses of halophyte *Suaeda salsa* to water table and salt stresses in coastal wetland of Yellow River Delta

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Abstract

The Yellow River Delta (YRD) is one of the three main estuarine wetlands in China. In recent decades, the coastal wetlands in the region were suffering ecological degradation and soil salinization due to discontinuous flow of Yellow River, marine denudation and climate changes. The objectives of this paper are to: (1) investigate the adaptive mechanism of *S. salsa* to the environment with changeable salinity and water table in the YRD; (2) provide new knowledge for the restoration of degraded saline wetlands in the YRD. The results showed that plant height, number of branches and biomass were significantly affected by water table and salt stress. With enhanced salt stress, the ratio of leaf to total biomass increased and the ratio of root to total biomass decreased. The contents of Chl *a*, *b*, Chl *a+b* and Carotenoids (Car) decreased significantly with increasing soil salinity and the water table level. Salt stress enhanced the activity of Superoxide dismutase (SOD) and Catalase (CAT), but reduced the content of protein. With the lowering water table level, the activity of CAT and protein content increased, and activity of SOD decreased. Na⁺ and Cl⁻ content were up-regulated with increasing salt stress (NaCl), whereas the contents of other cations (K⁺, Ca²⁺ and Mg²⁺) and anions (SO₄²⁻ and NO₃⁻) were decreased. In summary, the results indicated that the *S. salsa* plants could adapt to the adverse soil environments through modifying their growth and physiology status at the highly saline and intertidal zone, such as the Yellow River Delta estuarine wetlands, and also could be used as a bio-reclamation plant to decline the high salt in saline soils.



Study on biomass allocation in *Suaeda salsa* population in different habitats of coastal zone

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Abstract

Suaeda salsa with a strong salt tolerance and wide distribution is one of the most important pioneer species and plays an important role in the stability and succession of ecosystem in the Yellow River Delta, China. Shape and biomass allocation of *S. salsa* population in the intertidal and supratidal zone were studied. On the individual size, plant height and basal diameter of *S. salsa* in the intertidal zone were higher than that in the supratidal zone. Comparing with the scattered distribution, *S. salsa* in the intertidal zone had higher plant height and lower biomass in the dense distribution. On the biomass allocation, *S. salsa* in the intertidal zone devoted more biomass into growth of branches, flowers and leaves, while in the supratidal zone, *S. salsa* in the dense distribution tended to accelerate growth of root and stem. Moreover, *S. salsa* with a scattered distribution in the supratidal zone was top phase of *S. salsa* population \square and \square . Therefore \square *S. salsa* may adapt to different habitats of the intertidal and supratidal zone by changing their shape and biomass allocation characteristics in order to maintain their population stability and improve quality of soil.

Keywords: *Suaeda salsa*; biomass; density; Yellow River Delta

Effects of infertile and arid environment on tannin production of *Casuarina equisetifolia* seedlings branchlets

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Abstract

Casuarina trees are planted along the infertile and arid coastal sandy area of the South China as windbreaks. Nutrient, water, and their interactions influence the allocation of investment by the plant to resistance and tolerance traits. A completely crossed randomized-block design experiment was used to examine the independent and interactive effects of nutrients and water availability on tannin production of *C. equisetifolia* seedlings. The results showed that, nitrogen and phosphorus fertilizer have significant effects on total phenolics (TP) and extractable condensed tannins (ECT) contents of branchlets. TP and ECT contents decreased with fertilizer addition and increased in arid condition. This pattern tends to support source-sink hypothesis such as the carbon-nutrient balance (CNB) hypothesis and the growth- differentiation (GDB) hypothesis. Soluble sugars or starch contents were both inversely related to TP content. However, there is no significant correlation between them and ECT content. In addition, chlorophyll content had a positive linear correlation with TP and no significant correlation with ECT. On the contrary, chlorophyll a/b ratio was negatively correlated with TP and positively correlated with ECT. The discrepancy of relationship between carbohydrates with TP or ECT showed that the biosynthetic route of different tannin were different. In this study, no significant correlation between TP and N, or ECT and N did not support protein competition model (PCM). TP-N and ECT-N ratios were higher in nutrient deficiency and arid conditions, which was one of the important nutrient conservation strategies for *C. equisetifolia*. Because high TP:N and ECT:N ratios may help reduce herbivory in green foliage and provide a nutrient conservation mechanism by reducing decomposition rates and decreasing N leaching potential of litter.

Keywords: *Casuarina equisetifolia*; coastal environment; drought stress; Fertilization; tannin

» POSTERS D2 «

Session: D2 Poster

Long term changes of copepods and hydrology in a eutrophic tropical lagoon in Taiwan

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Abstract

We investigated successions of copepod communities and hydrology in Tapong Bay, a hypertrophic tropical lagoon with a single tidal inlet connecting to the sea off southwestern Taiwan, during three important periods: the extensive oyster-culture racks and cage-farming facilities (1999 to 2002), after the removal of all aquaculture facilities (2003 to 2004), and the construction period in the Bay (2009 to 2011). Our results showed that the removal caused increase in salinity, chlorophyll a concentration, species number and abundance of copepods, and reduced the ranges of seasonal and spatial differences in salinity and copepod abundance. The recent coastal constructions in the Bay decreased the abundance of copepods, but it is still higher than before the removal. However, the distribution trend of copepod species richness was generally higher in winter and in the outer Bay, lower in summer and in the inner Bay. The result of principal component analysis also indicated distinctive variation of copepod assemblages among three periods, particularly before and after the removal. We conclude that the increase in copepod abundance and species richness in the Bay after the removal was the result of increased water exchange rate, increased availability of phytoplankton due to the absence of oyster population which filter-feed on phytoplankton, and reduction of feeding impact by moon-jelly that previously aggregated in the inner Bay and settled down their polyps on the mariculture racks. **Keywords:** Copepods, phytoplankton, abundance, mariculture racks, lagoon.

Long-term change of an Acropora dominated community at Tao Island, the Gulf of Thailand

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Abstract

Coral reefs are sensitive, and are recognized as one of the most vulnerable ecosystem to anthropogenic disturbances and climate change. This study aimed to document a long term change of an Acropora dominated community at Tao Island in the Gulf of Thailand. It is an isolated island in the western Gulf of Thailand and has been faced several stresses from natural disturbances and tourism impacts. A long-term monitoring program was initiated in 1988 with focusing on changes of live coral cover at Ao Tian, southern part of the Island. The survey in 1988 showed that Acropora occupied nearly all the coral community. The strong typhoon Gay hit southern Thailand in 1989 and it resulted in decrease in Acropora cover to 55%. The observations in 1991 revealed that there was an increase in Acropora cover to 66%. The first extensive coral bleaching phenomenon in the Gulf of Thailand occurred from April-June 1998 and affected most coral communities at Tao Island. The survey in early 2010 showed that there were no Acropora in the study site. An average of live coral cover was only 4.8%, mainly covered by *Pocillopora damicornis* and *Fungia* spp. Dead branching corals comprised 80.2% of all benthic components, followed by macroalgae (15.0%). The severe 2010 coral bleaching event again affected this coral community and it led to decrease in live coral cover. This study documents the importance of climate change related coral bleaching event as the greatest threat to coral reefs in the Gulf of Thailand. An appropriate management plan and proper coral restoration techniques are urgently needed to facilitate coral recovery.

Keywords: coral community; Acropora; bleaching; recovery; monitoring; Gulf of Thailand

Global warming, solar radiation and it's effectiveness on *Nodularia* algae bloom in the Caspian Sea

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Abstract

Anomaly climate changes parameters follow with global warming are the noticeable outlines in aquatic ecosystems in which are importance in increase or decline of some environmental occurrences. Recently, *Nodularia* bloom is one of the unpredictable phenomenon's which happen in the Caspian. In this study, day time period changes and solar radiation in the algae bloom was investigated in the southern Caspian Sea from 2005. Up till now, there is not any concern with meteorological aspect in *Nodularia* bloom investigation.

Keywords: Meteorology, Environment, *Nodularia*, Solar radiation.

Stochastic forcing on little Swamport estuary: late Anthropocene paleoreconstructions, long-term data imputation and hindcasting

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Abstract

A healthy ecosystem can be defined by its natural short and long-term variability and by how natural stochastic inputs control that variability. Any deviation from this natural variability and/or its relation to stochastic control can be considered a metric of anthropogenic impact on the ecosystem's health. However, long-term data sets with sufficient continuity, temporal length and power on which to make such an assessment are not available for most estuaries. In response a Late Anthropocene paleoreconstruction of inorganic nitrogen supply (PDN) stratification and flushing times was fashioned using multiple proxies of surface and bottom salinities from sediment core signatures of pore water salinity and diatom assemblage, as a conservative dilution metric for models of rainfall river flow inorganic nitrogen supply and long term data sets of coastal nitrate supply. The models and data sets were further imputed and hind casted using singular spectrum analysis verified using long-term data sets as lines of evidence from cetacean standings and multiple linear regression models for surface salinities from contiguous data sets of modelled river flow, wind fetch proxies and tidal variance from sediment core sedimentology and rainfall/ river flow models as multiple linear regressions of wind, tide and river flow. It was found that over the 83 years of available modelling data that coastal nitrate was a robust controller of the net inorganic nutrient supply to the estuary. Whereas, river supply variance, although higher in concentration and effecting changes in flushing time and entrance exposure was not significantly correlated with nitrogen supply.

Keywords: Paleoreconstruction, salinity, flushing times, inorganic nitrogen, imputation.

Distribution of Biomarkers in Sediment Core of the northern Yellow Sea and Its Ecological Significance

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Abstract

Biomarkers are widely used to reconstruct the biomass of marine phytoplankton and the change of community structure. Among the biomarkers the brassicasterol and dinosterol are considered to be the biomarkers of diatom and dinoflagellate respectively. Diatom and dinoflagellate are two kinds of major phytoplankton in the coastal marine ecosystems and the changes of their biomasses are dependent on the changes of environment and human activities. In this study we extracted the brassicasterol and dinosterol in the sediment core from Sishili Bay, Yantai and analyzed the concentrations of the two sterols. The concentrations of the brassicasterol and dinosterol reflected the biomasses of diatom and dinoflagellate in the local coastal marine ecosystem from 1857. The range of the concentrations of brassicasterol and dinosterol are 2.4–78.6 ng/g and 3.4–54.1 ng/g respectively. The high concentration intervals of the two sterols appeared after 1980s. The high concentration of the two sterols was the result of the eutrophication in the coastal marine ecosystem caused by human activities, besides the climate changes in recent years, such as the change of temperature, precipitation, monsoon and so on also played an important role in changing the biomasses of diatom and dinoflagellate.

Keywords: Brassicasterol; Dinosterol; Biomass; Climate; Human activities

Long-term ecosystem change in Jiaozhou Bay and its catchment: the driver-pressure-state-impact-response approach

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Abstract

Jiaozhou Bay is a semi-closed embayment, affected by anthropogenic factors around Qingdao, China. This article illustrates the long-term change in the Bay and its catchment using the driver-pressure-state-impact-response (DPSIR) approach. Under the Chinese national macro-socioeconomic policy, rapid development and massive urbanisation occurred in Qingdao that has resulted in the serious reduction and quality deterioration of its arable land and the variation in water resources. The production and consumption pattern changed with population growth with an increasing demand for water and food as well as pollutants emissions. The pressure alteration in the Bay and its catchment has created far-reaching impacts on the ecosystem. These changes include, significant deterioration in Water quality of the catchment; decreased river runoff into the bay; shift in the nutrient regime of the Bay; decreased tidal prism in the Bay area; increased eutrophication in the Bay; fragmentation of natural habitats and loss of biodiversity. Relevant policies aimed at the promotion of the water quality in the system have been formulated. However, the degradation trend has not yet been halted or reversed. Hence new management mechanisms are under discussion to improve the ecosystem in this area.

Keywords: catchment; coastal zone; ecosystem; DPSIR; Jiaozhou Bay; long-term change

Session: D4 Poster

Port development and eco-sensitive coastlines in Beibu Gulf Economic Zone: a GIS analysis

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Abstract

Ecologically sensitive coastlines including protected areas, scenic areas and aquaculture sites etc. occur in the coast of Beibu Gulf Economic Zone (BGEZ), which includes the coastal area of Guangxi, coast of Leizhou Peninsular in Guangdong, and the west coast of Hainan. However, port development has been threatening these lines. The sensitivity of these coastlines is categorized and digitalized according to different plans and available maps. The overlay analysis for the digitalized planned ports and the sensitive coastlines is then conducted in order to compare their spatial distribution. It shows 13.7% of the planned port coastline overlaps with the sensitive coastlines, and the overlapping percentage in Guangdong, Guangxi and Hainan is 14.8%, 11%, and 20%, respectively. Hence, it is recommended these plans of the overlapped coastlines should be readjusted or cancelled, and the port coastline should not be longer than 502 km after adjusting, 185.7 km in Guangdong coast, 238.7 km in Guangxi coast, and 77.3 km in Hainan coast. It is also suggested that development priority should be given to Zhanjiang Port, Fangcheng Port, and Yangpu Port in BGEZ.

Keywords: BGEZ, eco-sensitive coastlines; overlay analysis; Port development

Analysis of status quo of the sea area utilization and countermeasures in Liaoning

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Abstract

Comparison between the functional divisions of the sea and the status quo of sea area utilization in Liaoning by ARCGIS can display the problems of the sea area utilization, which contain the size and location not being in conformity with the functional divisions of the sea for aquaculture, port, tourism and reclamation. Finally some countermeasures how to alter the status of sea area utilization are brought up.

Keywords: Liaoning marine resources status quo

Monitoring urban phenology in Bohai Rim using MODIS data

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Abstract

Urban heat island effect is one of the most obvious consequences of urbanization. Compared to surrounding rural areas, the higher temperate in urban areas may induce change of vegetation phenology. In order to identify the influence of urban heat island on vegetation phenology, this study extracted the phenophases in urban and rural areas in Bohai Rim using asymmetric Gaussian model based on MODIS NDVI data and compared the differences in the starting date and end date of growing season in urban areas and rural areas. The results indicate that, there are earlier starting date and later end date of growing season in urban areas, and the higher land surface temperature is, the earlier the starting date is and the later end date is. So we conclude that land surface temperature may be the main cause inducing the difference in phenophases between urban and rural areas, but there may be many other factors including photoperiod or light pollution, CO₂ etc. which may influence urban phenology.

Keywords: urban phenology, MODIS NDVI; land surface temperature

Detection of oil spill pollution using SAR image by ENVI and Next 4A

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Abstract

Sea oil pollution causes marine ecological disasters that damage the quality and productivity of the marine environment, and produce severe financial consequences associated both to clear-up operations, and to the decrease of coastal tourism and the related economy. Synthetic Aperture Radar (SAR) is the key tool to accomplish oil spill countermeasures because of its wide field-of-view, full weather independence and day/night capabilities. This paper present detection of oil spill pollution using ERS and ENVISAT-ASAR images in Yellow sea and Gulf of Thailand. We will compare with ENVI and Next 4A quality in detection of oil spill pollution.

Keywords: Sea oil pollution, Synthetic Aperture Radar, ENVI, Next 4A

A coastline changing detection method based on buffer zone and least square theory – an example of Liao Dong Bay

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Abstract

Three traditional methods were summarized of calculating the mean distance of the coastline changing including baseline method, dynamic segment method and area method, but each of these methods have one or more drawbacks. Baseline method was depended on the selected approximate parallel, which mixed with the subjective factors. Dynamic segment method was relied on the distance to the same proportion segment, which was influenced by the coastline changing degree. Area method was greatly influenced by the length and curvature of the coastline. In order to overcome these drawbacks and quantify the changing distance of coastline, a new method based on buffer zone and least square theory was proposed to detect the coastline changing. This method was compared with the three traditional methods by two groups of stimulate coastlines and two real coastlines. The coastlines were picked up from remotely sensed images with different acquiring time period. One coastline was regarded as baseline and the other as detection line. Using buffer zone analysis of detection line according to the baseline, and cutting the detection line according to the buffer zone of the baseline, then each cutting length of buffer zone of the detection line was acquired. Supposing those distances of buffer zone was submit to normal distribution, then the mean distance and the root mean square error were obtained using least square theory. The mean distance reflected the mean changing distance of coastline, and the root mean square error reflected the approximate range of coastline changing. Using GIS platform and Python program language, the method based on buffer zone analysis and least square theory was realized in the area of Liao Dong bay of Chinese continental sea-Bo Hai sea. The result includes two parameters: mean distance and root mean square error. And the latter parameter expressed the complexity degree of coastline changing. The result showed that the method based on buffer zone and least square theory was more accurate and more efficient than those traditional methods.

Keywords: coastline change detection, baseline method, dynamic segment method, area method, buffer zone, least square theory

Beach erosion caused by tsunami on 26 December 2004 in Phang Nga Province using IKONOS imagery

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Abstract

Investigation classification of beach morphology and land loss effected by tsunami on 26 December 2004 were conducted in three districts areas; Ban Nam Khem, Khaoy Lak and Thai Mueang of Phang Nga. The IKONOS satellite imagery of pre (13 January 2003) and post (26 January 2005) tsunami were used to classify the beach area located in the intertidal zone and derive the map of beach classification and the erosion area. In these 3 study sites, there are four beach types which are (a) Sandy beach, (b) Rocky beach, (c) Mud flat, and (d) Urbanization area. The results indicated that land loss areas occurred in all beach type affected from tsunami. The beach erosion of the Mud flat type was occurred of the greatest loss area in Thai Mueang and Ban Nam Khem at 96.40 % and 52.72 %. The Sandy beach erosion area in Khaoy Lak showed land loss at 65.45 %, followed by Ban Nam Khem and Thai Mueang at 22.66 % and 5.33 % respectively. The Urbanization areas which were households and ports in Ban Nam Khem and Thai Mueang were correspondingly observed 47.62 % and 11.38 %. In addition, the Rocky beach in Khaoy Lak was eroded 55.83 %.

Keywords: beach erosion, beach classification; remote sensing; tsunami

Session: D5 Poster

Temporal and spatial variations of Chl *a* and its implication on the food source to clam in the intertidal area of the Yellow River Estuary

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Abstract

In order to demonstrate the mechanism on supporting a high clam productivity, a one year round investigation was monitored in the intertidal area of the Yellow River Delta. Results show that Chl *a* in sediment ranged at 20.676-124.454 mg/m² (ave. 72.047 mg/m²), while that in seawater at 1.582-6.275 mg/m² (ave. 3.757 mg/m²). Meanwhile, microphytobenthos dominated in both species (67-100%) and density (55-100%) in the sediments. Based on the ¹³C isotopes of clam mussel, phytoplankton from seawater and river water, and microphytobenthos, it was estimated that the food source was contributed by 70.7% from the microphytobenthos, 29.3 % from phytoplankton in seawater, but little from river water. It was concluded that microphytobenthos prior phytoplankton provided the primary foods supporting the clam secondary productivity in the intertidal area of the Yellow River Delta.

Keywords: Intertidal area; Yellow River Delta; Chl *a*; phytoplankton and microphytobentos; ¹³C isotope



Session: D6 Poster

Signals of the Changjiang River Plume demonstrated by radium isotopes

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Abstract

Changjiang River enters the East China Sea (ECS) in the Pacific Ocean, bringing tremendous amounts of terrigenous materials into the ocean and affecting the biogeochemical processes in the coastal ocean. Radium isotopes have been shown to be good tracers of river plumes. To trace terrigenous inputs into ECS, distributions of radium isotopes in ECS were investigated in the winter of 2009. Activities of radium isotopes along the shoreline from the Changjiang River estuary southward appear to be of low temperature and low salinity. Besides groundwater input, the Changjiang River plume seems to be the other reason for the high activities of radium isotopes. The distribution of radium indicates the far reach of the Changjiang River plume southward.



Session: D7 Poster**OSL dating and grain size of loess deposits in the Southern Laizhou Bay of Shandong Peninsula and its environmental significance**

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Abstract

Chinese loess-paleosol sequence has provided the most detailed terrestrial records of climate changes during the Quaternary. Detailed analysis of the depositional characteristics of Chinese loess is required to determine the nature of the paleoclimate record preserved in these extensive sediments. In recent years, increasing interest has been focused on the loess outside the Chinese Loess Plateau in order to derive environmental information from a wider area. Loess and paleosol sequences are well developed in the Southern Laizhou Bay on the west coast of the Bohai Sea, eastern China. Despite decades of research, the optically stimulated luminescence (OSL) chronology of the loess in Shandong Peninsula is poorly constrained. In this study samples from the loess section of Xulinzhuan in Changyi on the Laizhou Bay plain were dated by OSL of fine-grained quartz using a Simplified Multiple Aliquot Regenerative dose protocol (SMAR). The preliminary OSL dating results show that the equivalent doses (D_{eq}) of the two samples from the depth 350 cm and 750 cm are 131.62 ± 3.15 Gy and 145.00 ± 3.01 Gy, and the dates are 26.83 ± 0.64 ka and 34.80 ± 0.72 ka, respectively.

86 grain-size samples at 10cm interval were also analyzed by Malvern Mastersizer 2000. The grain size data show that average median grain size (M_d) is $75.80 \mu\text{m}$, and the percentage of sand, silt and clay are 63.20% , 25.34% and 11.46% . The environment-sensitive size fractions of this section respectively are $70.8\text{--}79.4\mu\text{m}$, by analyzing grain-size class vs. standard deviation values method. On the basis of the OSL dates and related stratigraphic evidence it is proposed the Changyi section of the lower four layers of loess-paleosol recorded the variations of paleo-environmental evolution and sea level changes over the last glacial stage.

Keywords: South China Sea; mid-Holocene; sea level change; grain size; clay mineral; geochemistry significance.

History of sea level change in the late mid-Holocene: Reflected by sedimentology of core from inner shelf of the northern South China Sea

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Abstract

Sediment grain size, clay mineral, geochemistry and ^{14}C dating of the core C069 (113°49' E, 21°15' N, water depth: 70 m, length: 2.1 m), which is from inner shelf of the northern South China Sea, have been investigated to reveal source and sedimentary environment evolvement. The results indicate that sediments became finer and well from bottom to top. In the lower segment (1.2~2.1 m) sediments, the frequency distribution curves of grain size are poor sort with bimodal distribution, lower strontium content (99×10^{-6}) and Sr/Ba ratios (0.29), and higher chemical index of alteration (6.1). However, in the upper segment (0~1.2 m) after 4.4 ka, the sediments have single peak frequency distribution curves, with higher strontium content (235×10^{-6}) and Sr/Ba ratios (0.67), and lower chemical index of alteration (5.4), which show relative sea level changes. The clay mineral assemblage consists dominantly of illite, lesser abundance of kaolinite and chlorite, with scarce smectite. Kaolinite of the northern South China Sea is major origin from the Pearl River. The content of kaolinite decreases from 27% (1.2~2.1 m) to 18% (0~1.2 m), and illite crystallinity and illite chemistry index decrease similarly. It displays that more contribution of illite from Taiwan was carried by surface current in relative sea level highstand after 4.4 ka. A higher mid-Holocene sea-level highstand exists in the South China Sea and adjacent areas. However, relative sea level fluctuation changed in inner shelf of the northern South China Sea in the late mid-Holocene.

Keywords: South China Sea; mid-Holocene; sea level change; grain size; clay mineral; geochemistry



Human Activity and Climate Co-driven fluctuations in Chlorophyll-*a* Concentration at the Enclosed Coastal seas: the Daya Bay, China

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Abstract

In-situ measured and satellite-derived data were combined to study the responses of phytoplankton to anthropological and climatic impacts at the Daya Bay. The results show that annual chlorophyll-*a* concentration (Chl-*a*) increased from 1.5 $\mu\text{g/L}$ by 0.1 $\mu\text{g/L}$ year from 1.5 $\mu\text{g/L}$ during 1986–2008 ($R^2=0.79$), this trend was consistent with the concurrent increase in economic development around the bay which could be indexed by land cover and vegetation index. The seasonal pattern of satellite-derived Chl-*a* was verified by the field measurements. The inter-annual variation of Chl-*a* was significantly correlated to the changes in precipitation ($r=0.69\sim0.71$, $p<0.001$), which suggests that the input of non-point source nutrients carried by runoff enhanced the growth of phytoplankton and caused the inter-annual changes in Chl-*a* at the bay. The impacts of ENSO (El Niño/La Niña-Southern Oscillation) events on the fluctuations in Chl-*a* were also discussed. This study demonstrates a good case of human activity and climate co-driven changes in coastal aquatic environment.

Keywords: Chlorophyll-*a* concentration; inter-annual fluctuations; coastal seas; the Daya Bay



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