

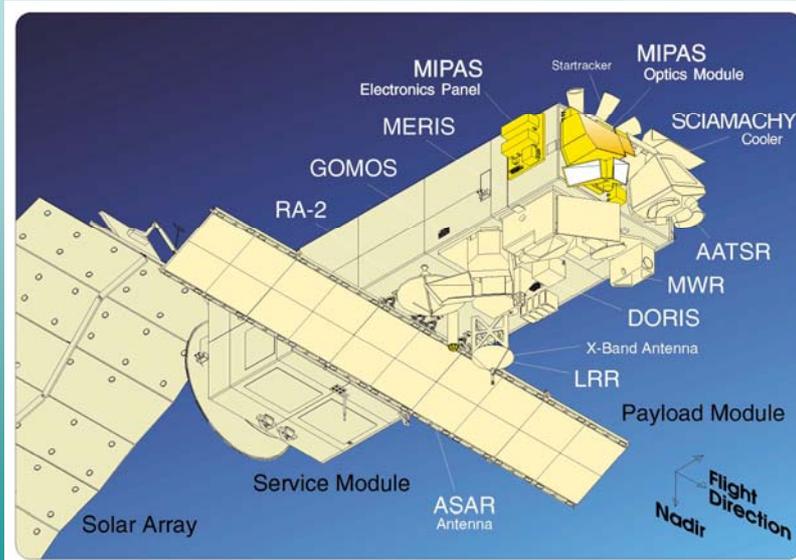
## MERIS on ENVISAT for Coastal Research



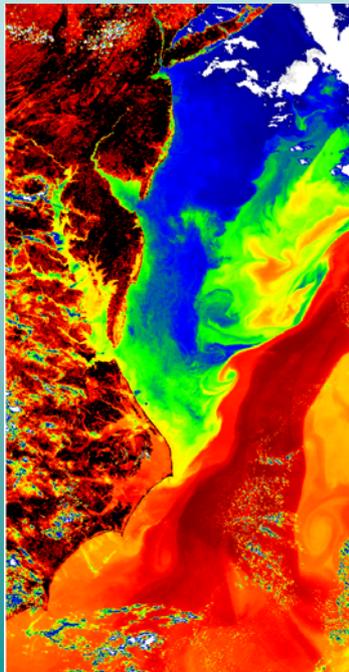
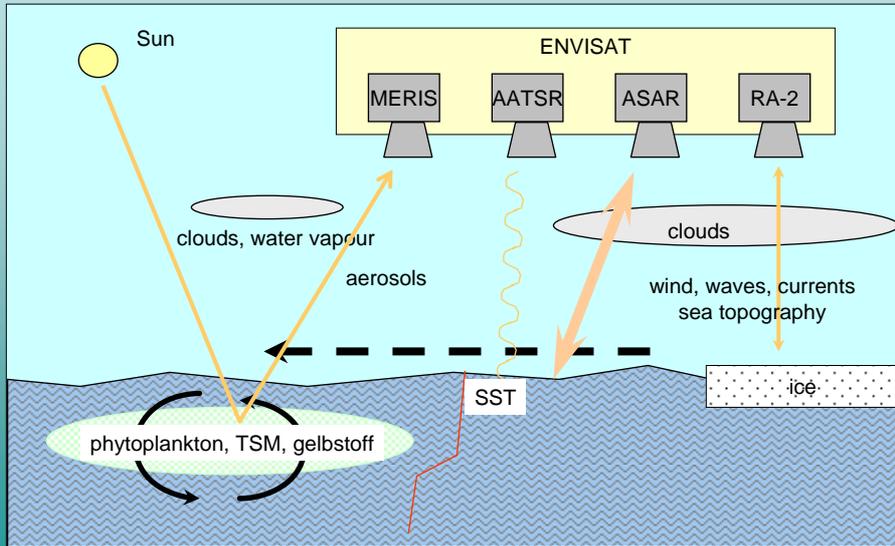
Presenter: Roland Doerffer  
GKSS Forschungszentrum  
Institut für Küstenforschung  
doerffer@gkss.de



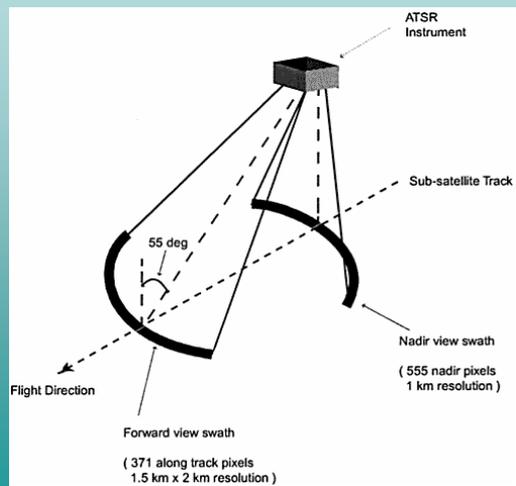
## ENVISAT Instrumente



## ENVISAT Instruments for Marine and Coastal Research



## Advanced Along Track Scanning Radiometer AATSR



Quelle: [www.leos.le.ac.uk/home/aatsr](http://www.leos.le.ac.uk/home/aatsr)



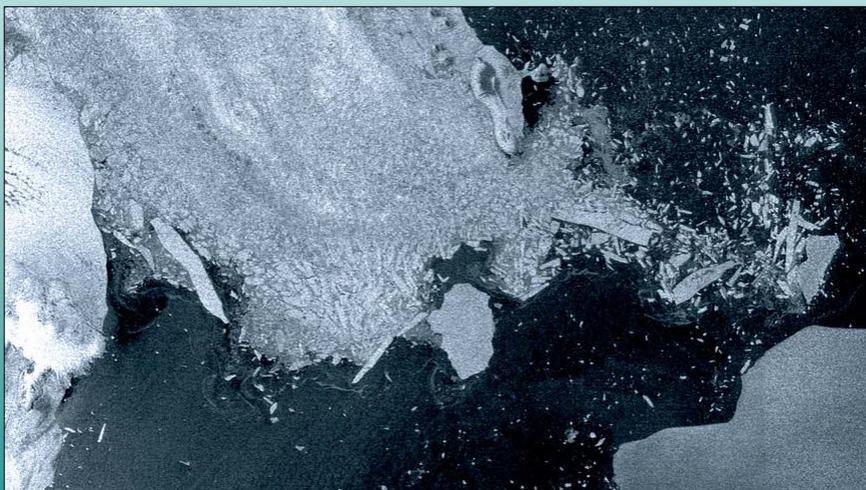
## Collapse of the Larsen B Ice Shelf



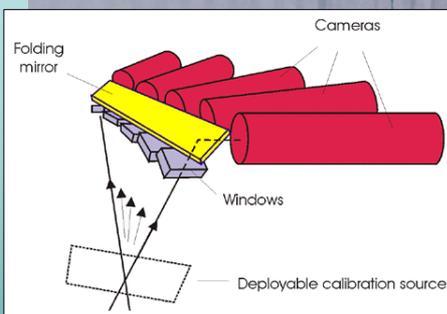
ESA  
ENVISAT ASAR



## The collapsing ice shelf March 18, 2002



### MERIS Medium Resolution I



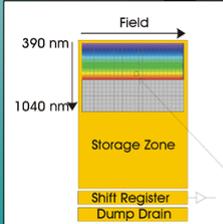
Cameras

Folding mirror

Windows

Deployable calibration source

- FOV 68.5 deg, 1150 km
- IFOV 300 m, 1200 m
- revisit period 2-3 days
- 5 cameras, each 14 deg FOV
- Spectral range: 390 nm to 1040 nm
- Spectral resolution: 1.8 nm
- Band transmission: 15 spectral bands, programmable in position and width
- Band-to-band registration: Less than 0.1 pixel
- Band-centre knowledge accuracy: Less than 1 nm
- Polarisation sensitivity: Less than 0.3%
- Radiometric accuracy: Less than 2% of detected signal, relative to sun
- Band-to-band accuracy: Less than 0.1%
- Dynamic range: Up to albedo 1.0
- radiometric resolution 12 bit



Field

Storage Zone

Shift Register

Dump Drain

260 m

1.25 nm

Architecture : Frame transfer

Size : 780 (H) x [576 x 2] (V)

Pixel size : 22.5  $\mu\text{m}$  x 22.5  $\mu\text{m}$

Technology : - Thinned CCD (thickness = 17  $\mu\text{m}$ )  
- Back side illuminated

### Imaging Spectroscopy using MERIS



ENVIAT  
MERIS

Aerosols

Water vapour

clouds:

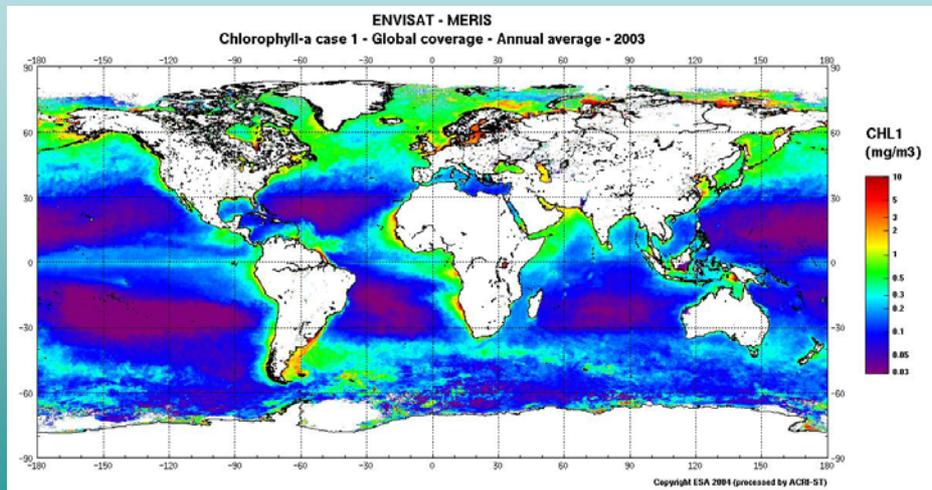
- Albedo
- optical thickness
- top height

Phytoplankton  
primary production

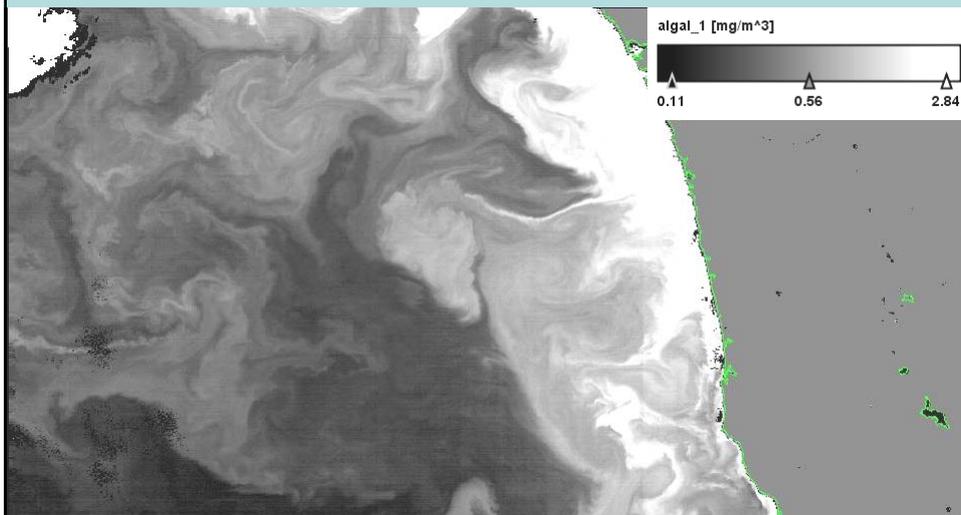
Suspended matter  
Gelbstoff

Vegetation / Land use

## MERIS Global chlorophyll distribution 2003



## Chlorophyll distribution off the coast of Oregon derived from MERIS





MERIS: Aufnahme der Helgoländer Bucht

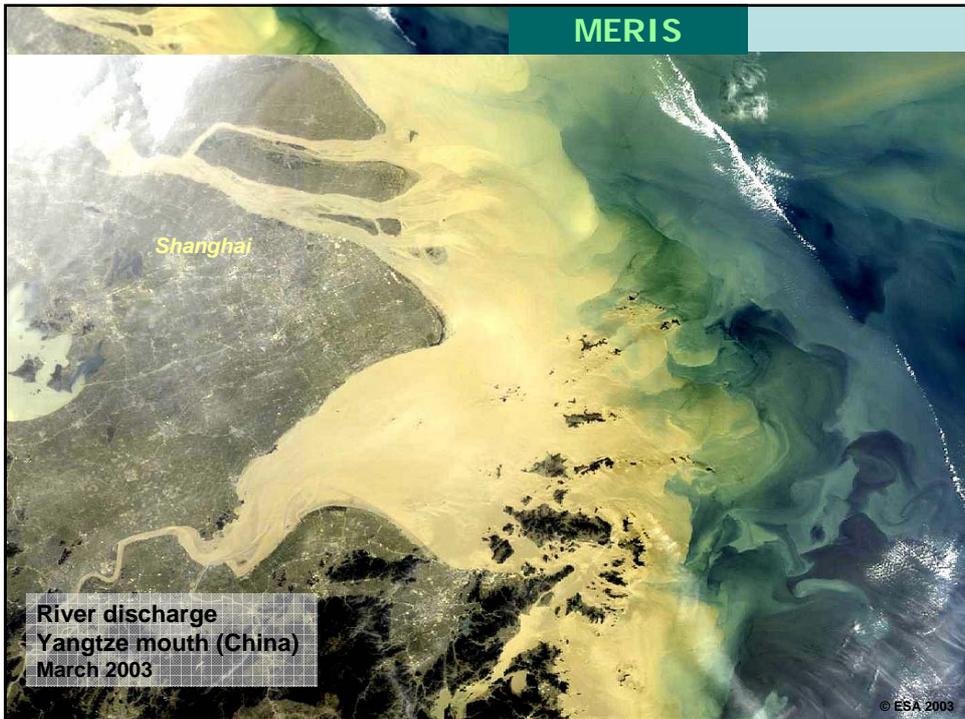


MERIS FR  
16.4.2003

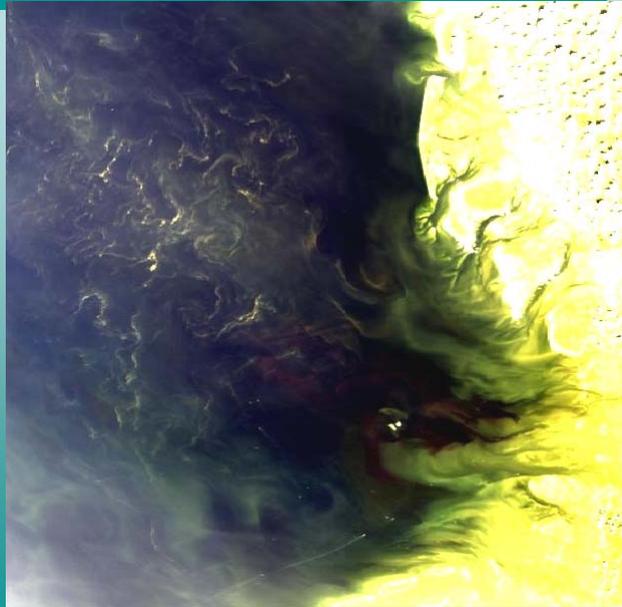
Helgoland Bight

Section  
160 km

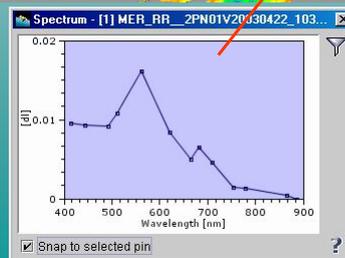
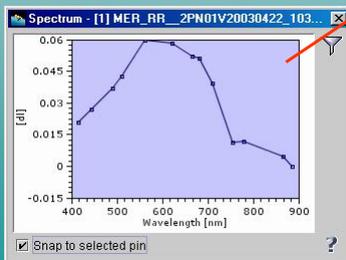
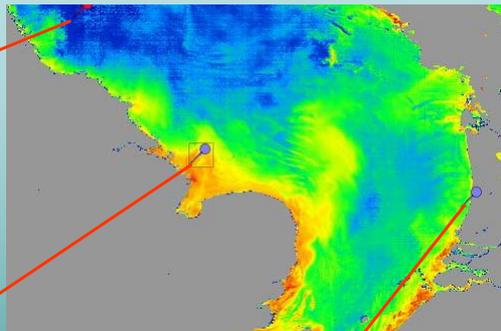
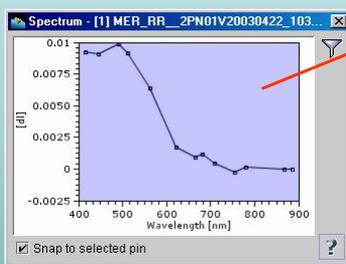




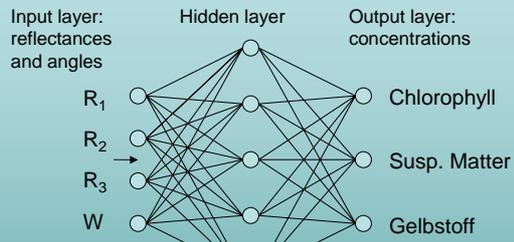
### Red Tide Myrionecta rubra German Bight 3.8.2004



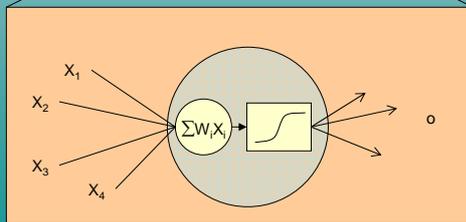
### Case 2 water reflectance spectra North Sea



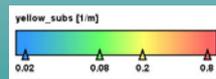
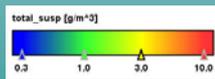
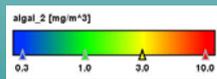
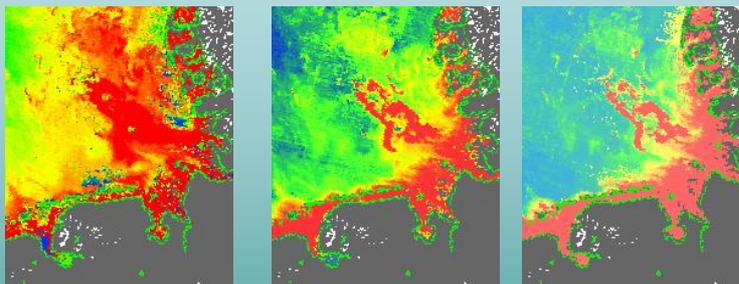
### Simplified scheme of NN Algorithm

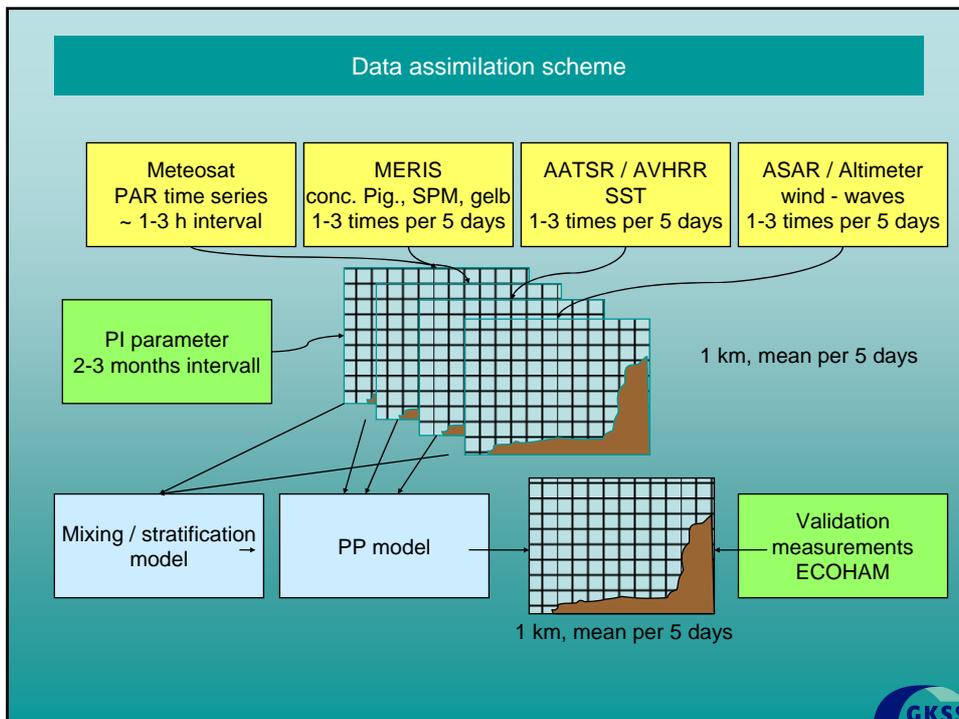
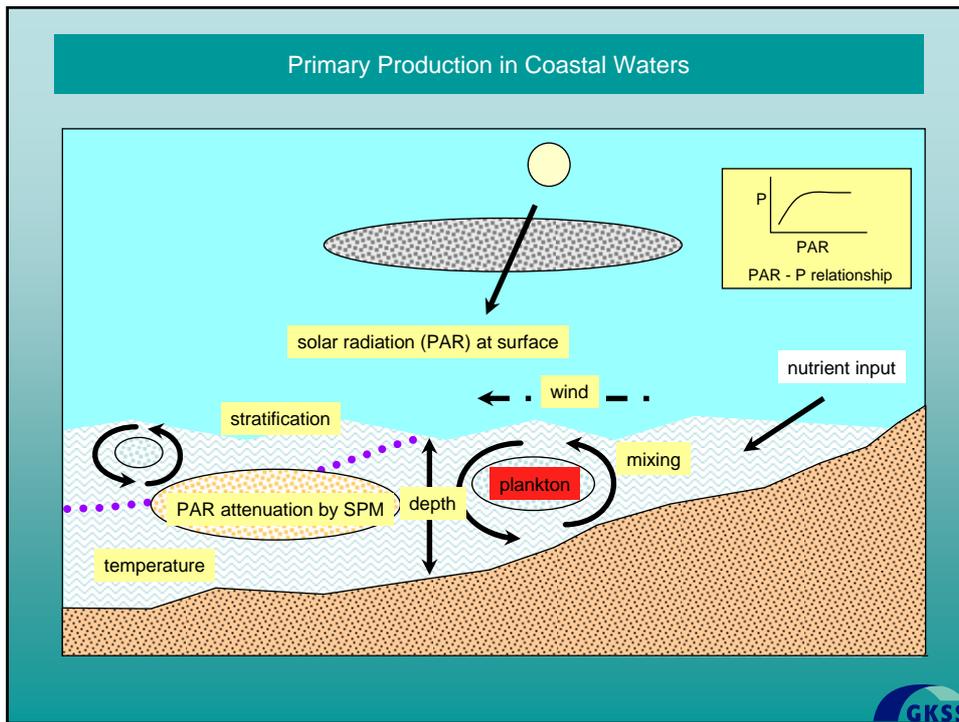


$$y_i = s(-d_i + \sum_{k=1}^3 w_{ki} \cdot s(-c_k + \sum_{j=1}^5 v_{jk} \cdot s(-b_j + \sum_{i=1}^4 u_{ji} x_i)))$$

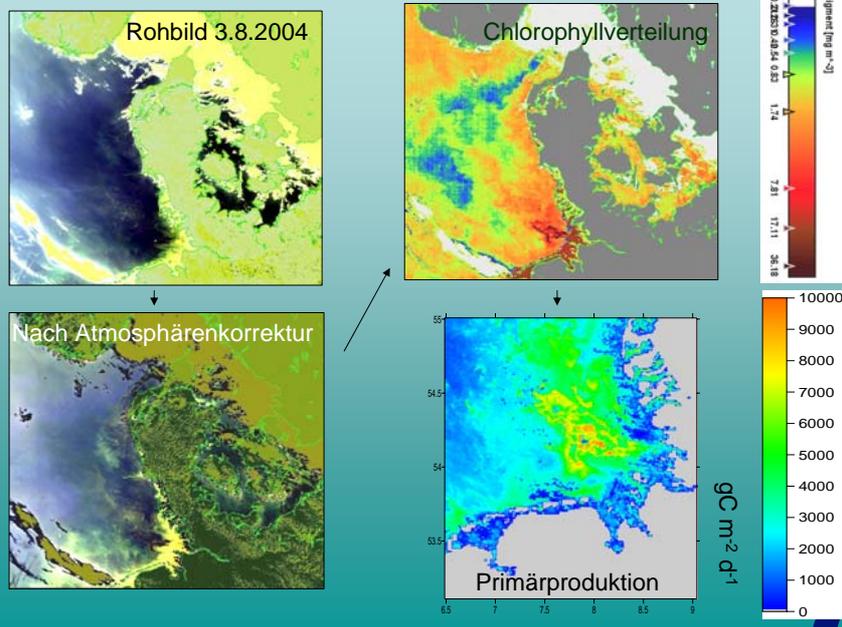


### Concentrations from MERIS





### Auswerteverfahren für ENVISAT – MERIS für ESA



### Common variables to be observed, selected by Coastal GOOS

Variable	RS	indirect	remark
Sea level	+		
Water temperature	+		SST
Salinity	o		future
Currents	+		
Waves	+		
Oxygen		+	phytoplankton, turbidity, depth
Anorganic nutrients		o	phytoplankton
Attenuation of solar radiation in water	+		
Bathymetry	o		Optical /radar
Coast / Shore line	+		
Suspended matter and organic	o	o	SPM, eulithoral
benthic biomass	o		Eulithoral, partly
Phytoplankton biomass	+		
Fecal indicators	-		

## Summary

- ENVISAT provides us with important information about the coastal zone
  - Wind and waves
  - Temperature
  - Ice
  - Phytoplankton und Suspended Matter
  - Light attenuation
  - Oil pollution
  - Coastal and shore line morphology
- These variables can be used as indicators for changes in coastal zone waters
- In combination with models processes such as transport of SPM or primary production can investigated and quantified.
- RS provides us with important information about the far field



Screenshot of the ENVISAT website in Microsoft Internet Explorer. The browser window title is "nvisat - Microsoft Internet Explorer" and the address bar shows "http://envisat.esa.int/". The website header features the ESA logo and the ENVISAT logo with the tagline "CARING FOR THE EARTH". Navigation tabs include "Mission and System", "Instruments", "Product Handbook", and "User Services". The main content area is titled "Earthnet Home" and dated "03 Nov 2005". It contains several news items:

- Multimedia Links:** 3D Model, Envisat Tour, Where is Envisat?
- Envisat Quick Links:** News, Image Showcase, Documentation, Tools, Sample Products, Catalogues, Applications, Workshops, EO PI Portal.
- Search:** A search box with a "GO" button and a link to "Advanced Search".
- News Items:**
  - New Envisat MOE and POE orbit data:** New Envisat MOE and POE orbit files will be made available from the F-PAC from 20-25 of October for the MOE orbit (Preliminary orbit file) and from beginning of cycle 41 and with the usual delay of 5 weeks for the POE orbit information (Precise Orbit file). The recent evolution of the CNES POD software configuration and standards will lead to improved orbit products, mainly corrected for systematic descending and ascending errors as well as for some geographically correlated errors. [Read more](#)
  - Health of coral reefs detected from orbit:** Australian researchers have found Envisat's MERIS sensor can detect coral bleaching down to ten metres deep. This means Envisat could potentially monitor impacted coral reefs worldwide on a twice-weekly basis. [Read more](#)
  - MERIS monitoring tracks planetary photosynthesis levels:** Daily multispectral observations from Envisat's MERIS sensor are being combined with a sophisticated processing algorithm and powerful Grid computing to reveal global photosynthesis activity on land. This permits researchers to trace the state of health of terrestrial plant cover, identifying areas under stress and assessing damage from drought or fires. [Read more](#)
  - GOMOS instrument resumes its operations:** The GOMOS instrument is operational again since 29 August 2005 after several months of anomaly investigations.
- GOMOS:** In order to provide an optimal operational service the azimuth field of view is reduced to a range of 20 degrees currently located between -10 to +10 degrees. This ensures that around 50% of the stars which could be obtained from the full azimuth range are used for measurements. For the observed stars, the quality of the individual occultations remains as before. Further optimisation will consider the star properties, like brightness, temperature and position, as well as the data

## Wie komme ich an ENVISAT Daten ran?

- Allgemein: <http://envisat.esa.int>
- Datenkatalog: <http://cat.envisat.esa.int>
- Antrag: <http://envisat.esa.int/services>
- Software: <http://envisat.esa.int/beam>

