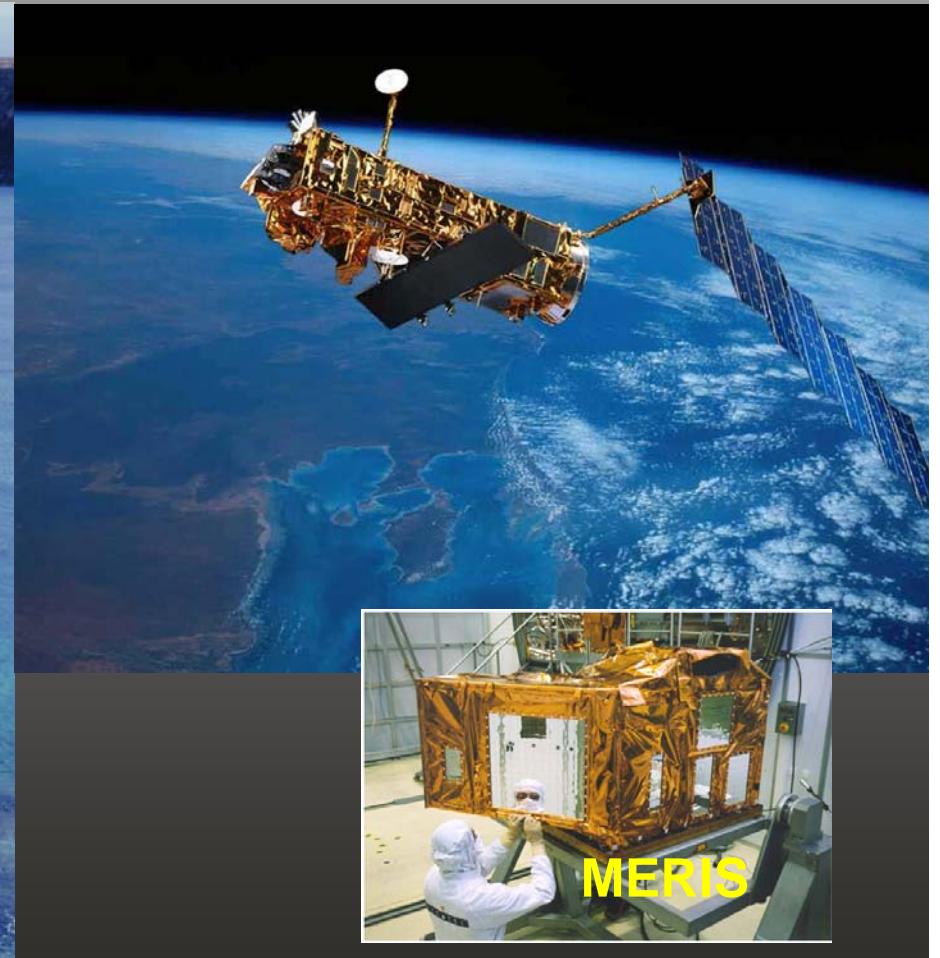


FerryBox and MERIS - Monitoring of Coastal and Shelf Sea Ecosystems by In-situ and Remote Sensing



W. Petersen, H. Wehde, H. Krasemann, F. Colijn, F. Schroeder
GKSS Research Centre, GERMANY



Why using Ferries or SoO's as Monitoring Platform?



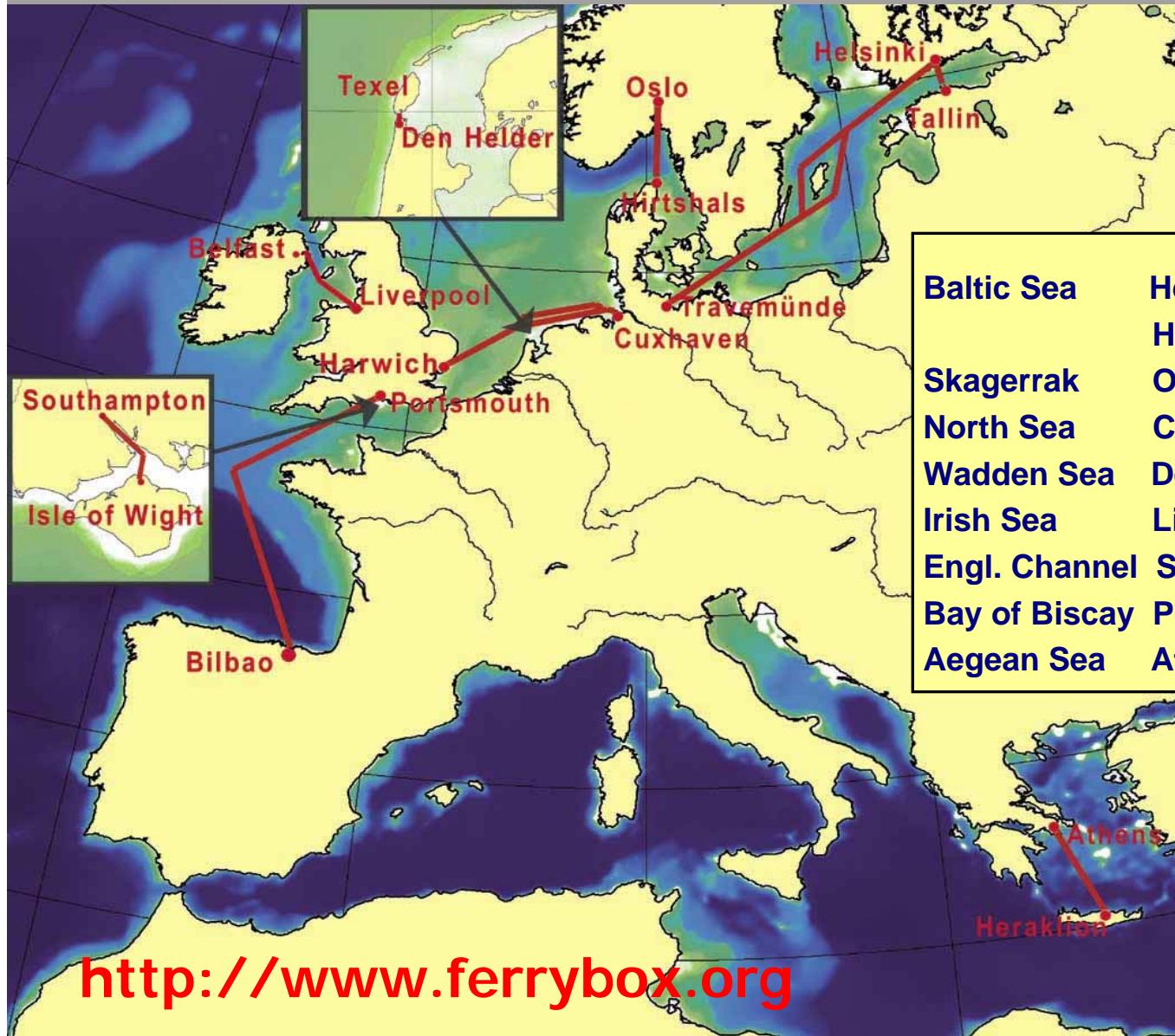
- + **high availability** (system is protected against harsh environment e.g. waves & currents)
- + **bio-fouling** can be more **easily prevented** (inline sensors)
- + **low running costs** (no cost of operation of the ship)
- + **no energy restrictions**
- + **easier maintenance** (platform comes back 'to your doorstep')
- + transect yield much **more information** compared to buoys
- + **high time resolution** of the data

Drawbacks:

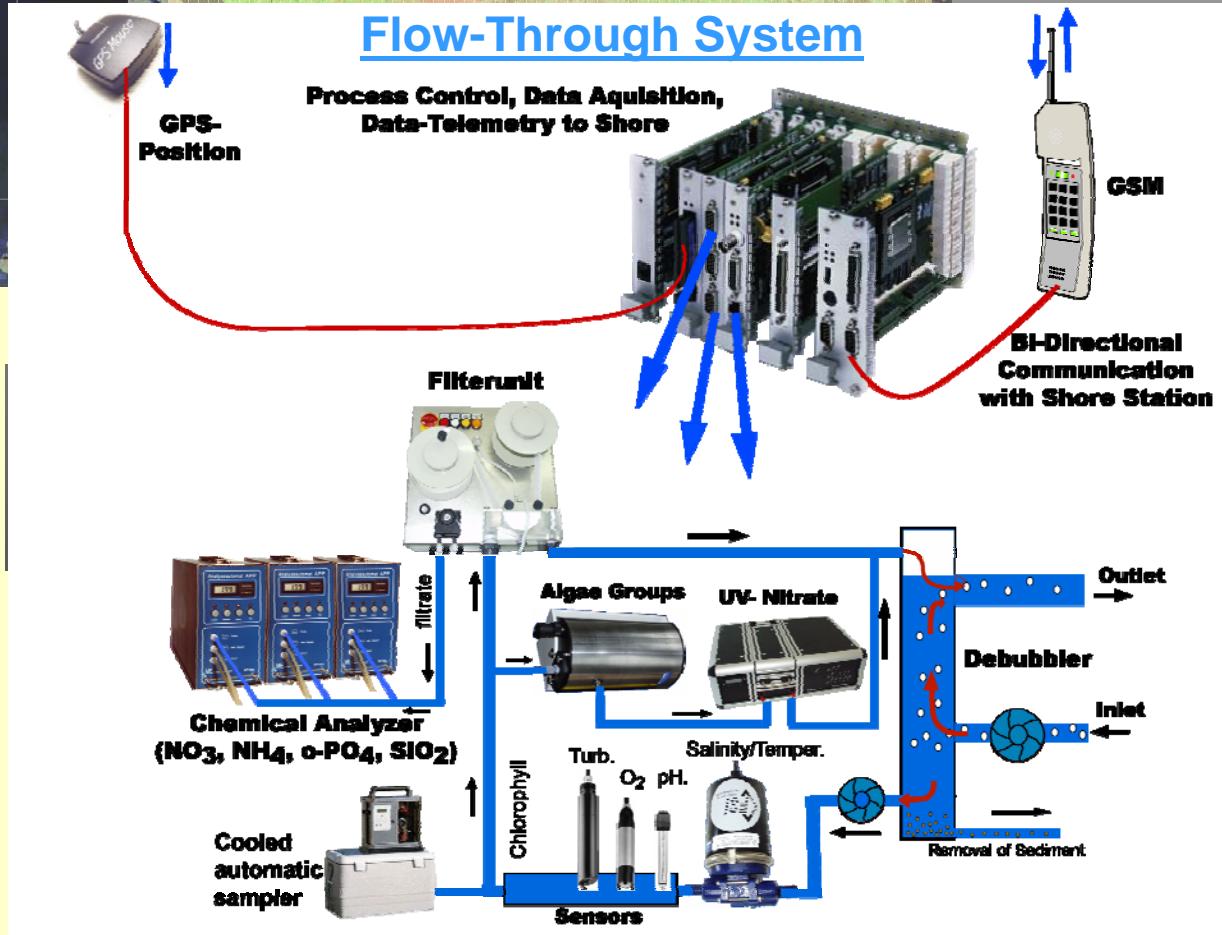
- data limited to the transect
- no depth profiles



EU FerryBox Project (9 Lines)



<http://www.ferrybox.org>

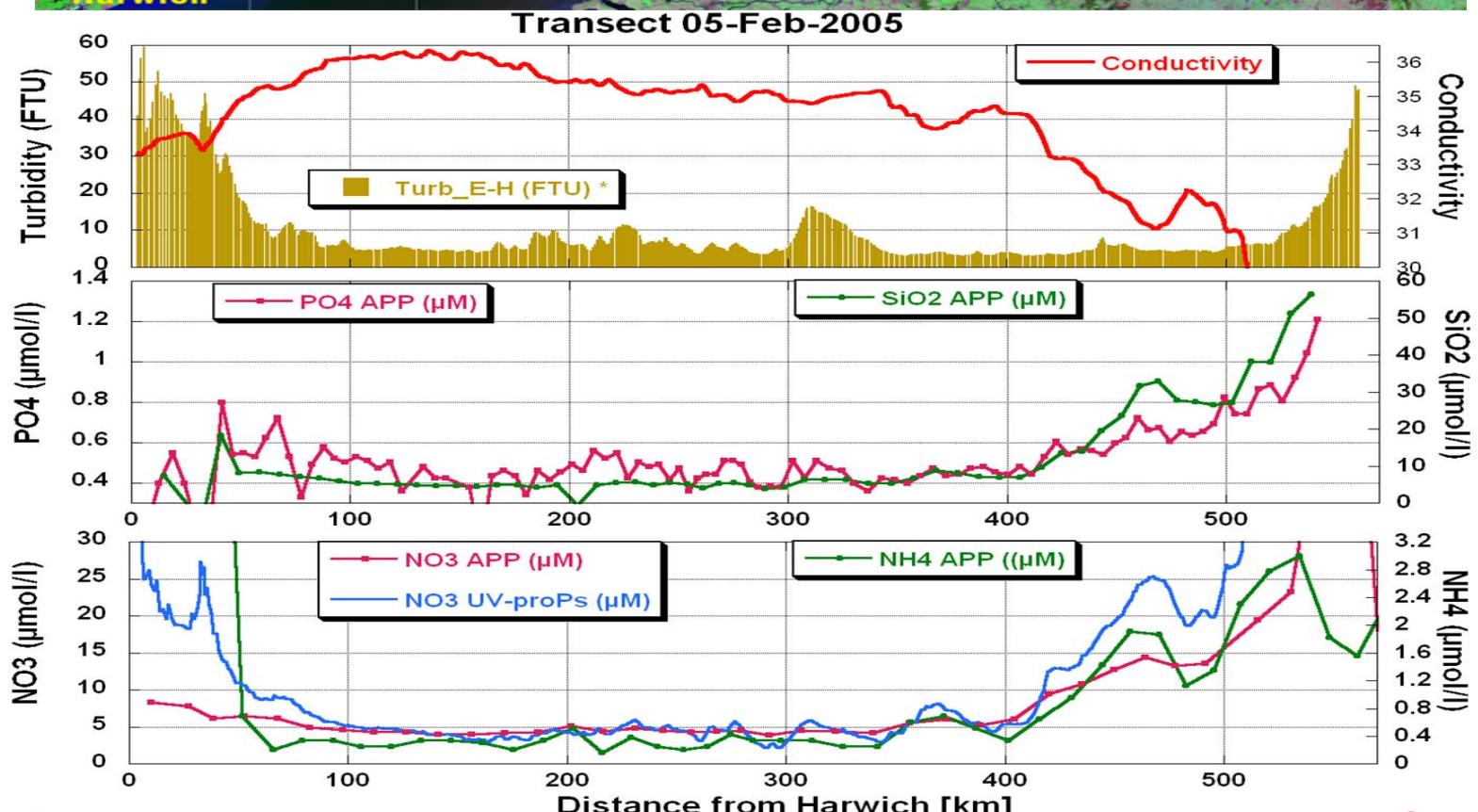
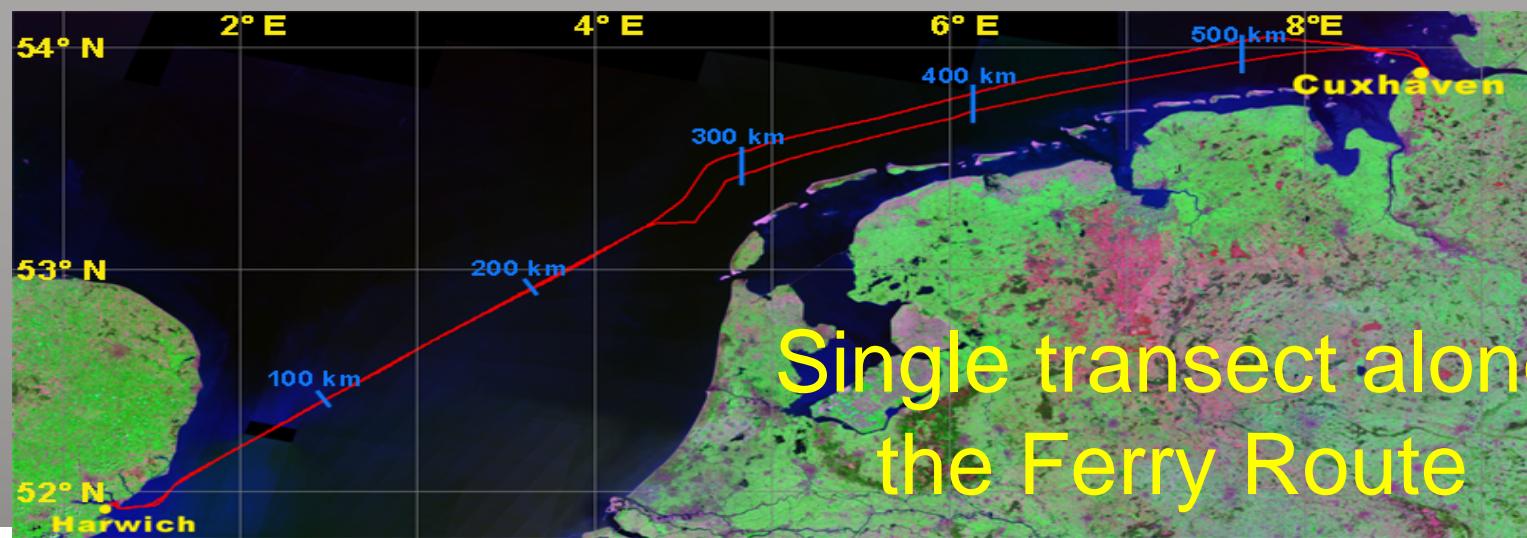


Measured Variables

- temperature
 - salinity
 - turbidity
 - chlorophyll
 - oxygen, pH
 - algal groups
 - nutrients
- + automatic water sampler for further lab analysis

Main Features:

- running autonomously
- controlled by GPS position
- self cleaning (after each cruise)

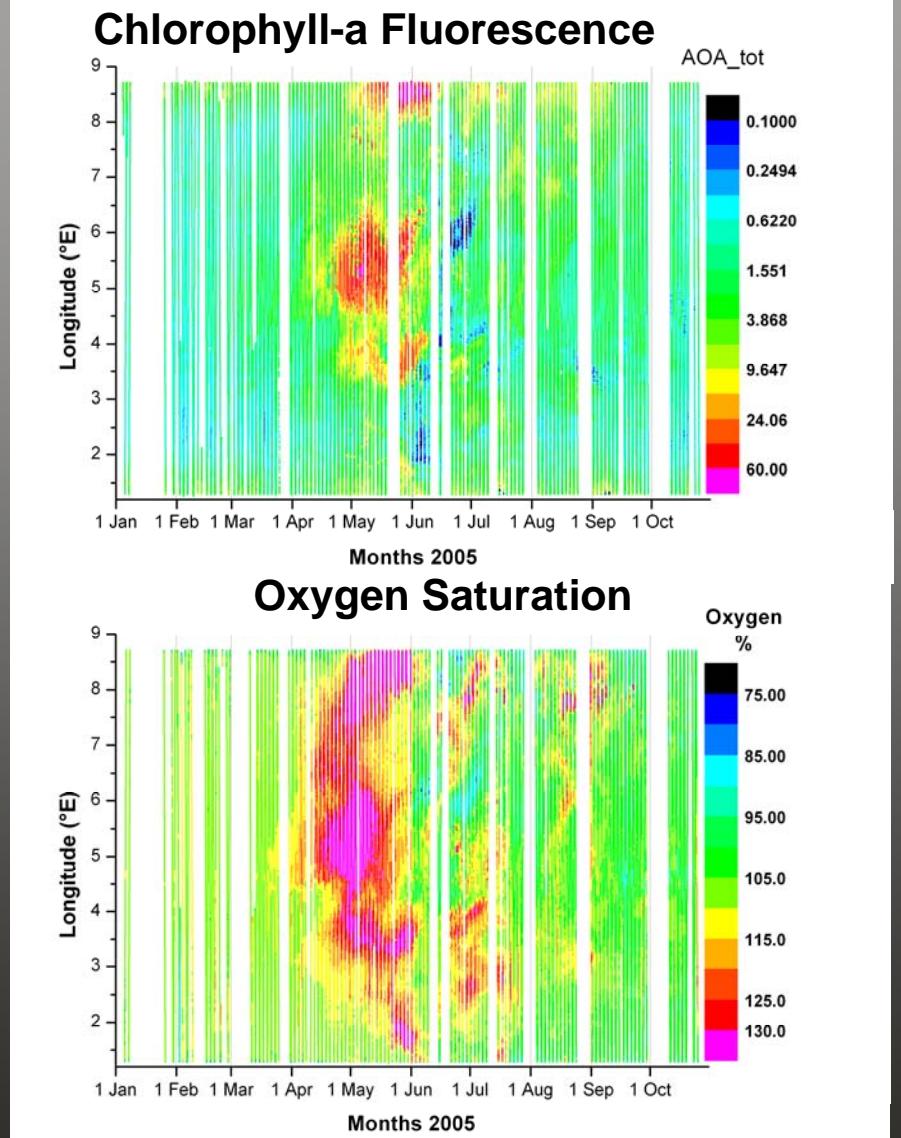
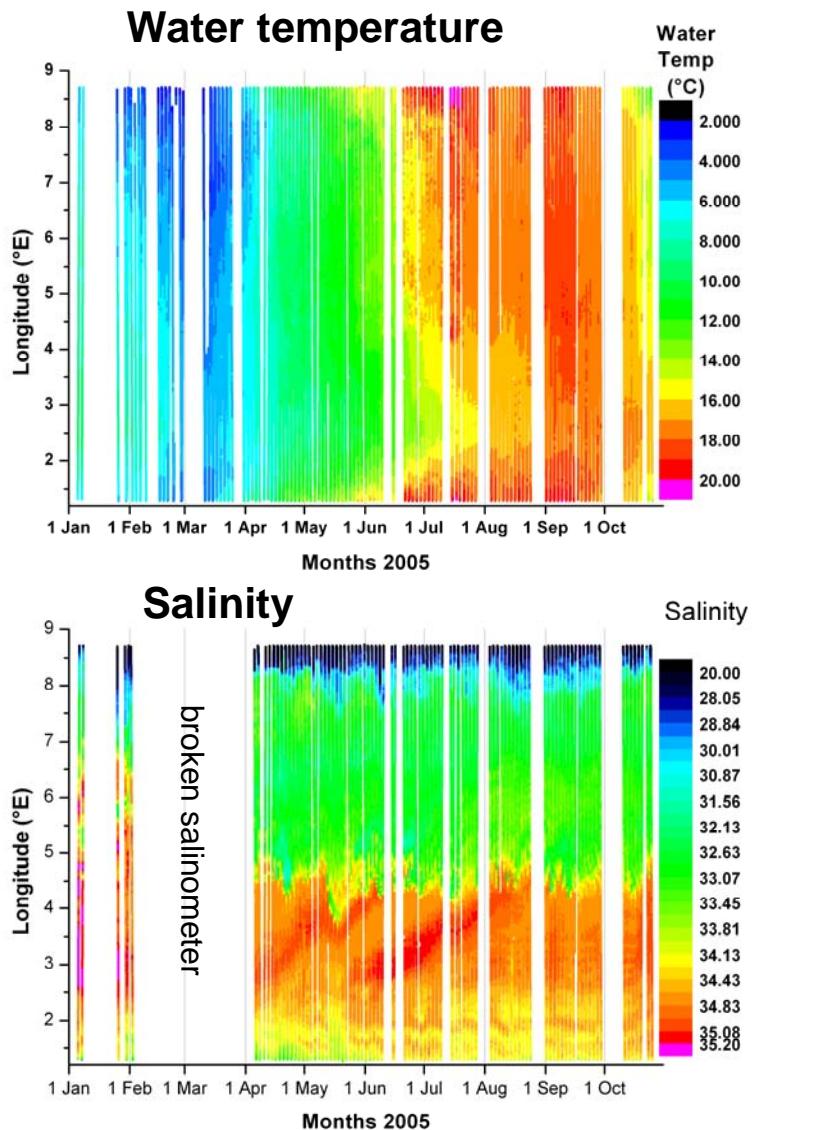


Commercialized Version:



www.4h-jena.de

Data Examples in 2005 (colored dot plots of all available data)



FerryBox Internet Database



<http://ferrydata.gkss.de>

GKSS FerryBox Database - Time-Series Plot - Mozilla

File Edit View Go Bookmarks Tools Window Help

Back Forward Home Bookmarks Search Print

GKSS FERRYBOX

GKSS FERRYBOX Database

Time-Series Plot [Transect Plot | Transect Plot | Time-Series Plot | Home] [Forward | Back]

Route: Cuxhaven-Harwich

Parameter Selection: Single Multiple

Parameters: DO, DO_Sal-corr, FlowRate_Inlet, Fluor_Turner

Latitude: 52.69821 °N

Longitude: 3.14413 °E

Directions: Cuxhaven Harwich

Latitude range: 5 km

Longitude range: 5 km

Begin Date: 1.10.2003 (DD.MM.YYYY)

End Date: 1.10.2004 (DD.MM.YYYY)

Plot Geometry: auto x 200 (Pixel)

Y-Axis Scaling: fixed automatically

Point Size: 1 3 5 7 9

Plot Conditions: Cuxhaven, Harwich

GKSS FerryBox Database - Time-Series Plot - Microsoft Internet Explorer

Date Bearbeiten Ansicht Erweitern Extras 2

Parameters: AOA_Catch_Tst, AOA_Cryptophytes, AOA_Diatoms

Latitude: 53.37487 °N

Longitude: 5.44669 °E

Directions: Cuxhaven Harwich

Latitude range: 20 km

Longitude range: 15 km

Begin Date: 01.03.2001 (DD.MM.YYYY)

End Date: 16.4.2005 (DD.MM.YYYY)

Plot Caching: yes no

HOA_Diatoms

Lat.: (1329 max) 53.399 53.759 Long.: (1307 max) 5.229 5.474

Time: 01.03.2001 01.04.2001 01.05.2001 01.06.2001

13764 points, 2.33s/1.20s

HOA_GreenRig

Lat.: (1325 max) 53.399 53.759 Long.: (1479 max) 5.229 5.474

Time: 01.03.2001 01.04.2001 01.05.2001 01.06.2001

16162 points, 16.33s/4.55s

02-Sat-Ind

Lat.: (4056 max) 53.399 53.759 Long.: (1236 max) 5.229 5.474

Time: 01.03.2001 01.04.2001 01.05.2001 01.06.2001

13096 points, 4.27s/2.77s

WaterTemp_FSI

Lat.: (4943 max) 53.399 53.759 Long.: (1325 max) 5.229 5.474

Time: 01.03.2001 01.04.2001 01.05.2001 01.06.2001

14001 points, 2.24s/1.05s

Time-Series Plot Selection of the position on the map

54° N 2° E 4° E 6° E 8° E

53° N 300 km 400 km 500 km

52° N 100 m

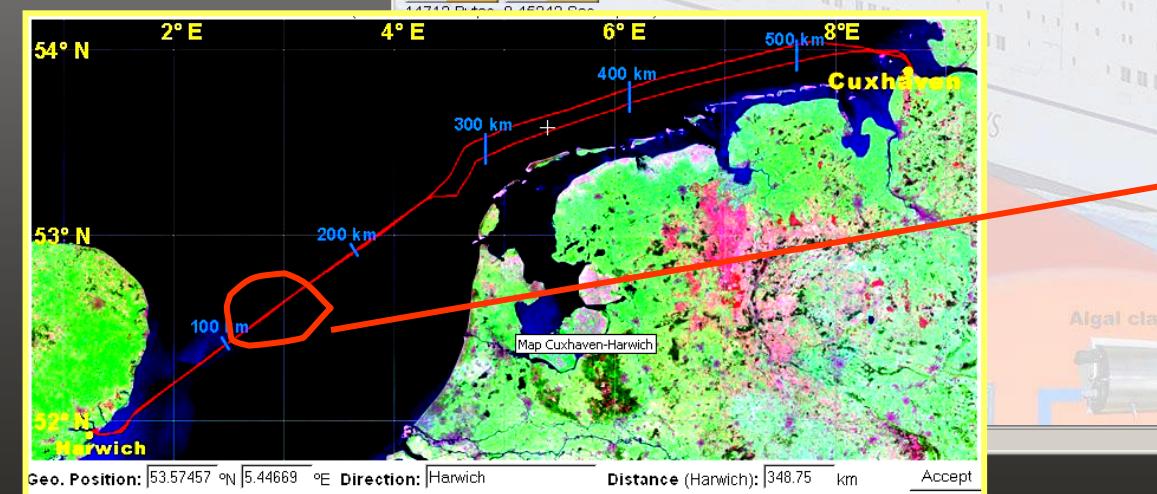
Narwich Cuxhaven

Map Cuxhaven-Harwich

Geo. Position: 53.57457 °N 5.44669 °E Direction: Harwich Distance (Harwich): 348.75 km Accept

HTML 4.01 W3C CSS 4.47410 Points 0.45040 Gps

Time-Series Plot
Selection of the
position on the map





FerryBox versus Remote Sensing

	FerryBox	Remote Sensing
constituents:	numerous parameters (oceanograph., biol.-chem.)	restricted to optical active substances (e.g. chlorophyll-a, TSM ..)
temporal resolution & data availability:	high (daily) year-round	high (daily) but in reality often very limited (e.g. clouds & glint)
spatial resolution:	high along the transect ("1-dimensional")	high on full area

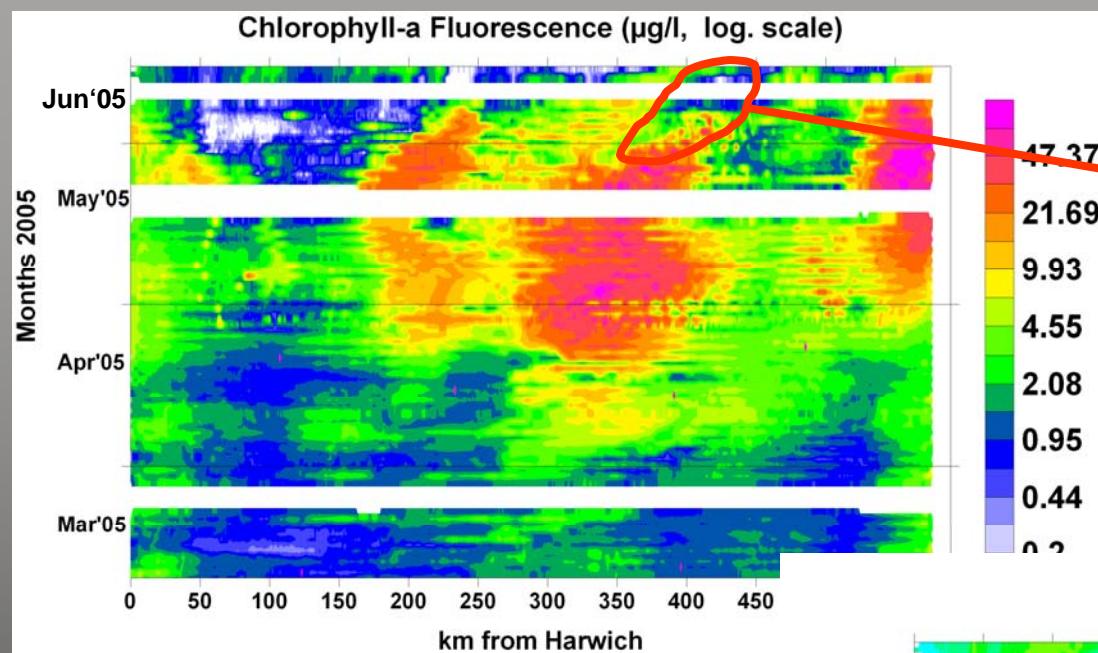


Algal Dynamic in the Southern North Sea in 2005

Observations by FerryBox and MERIS

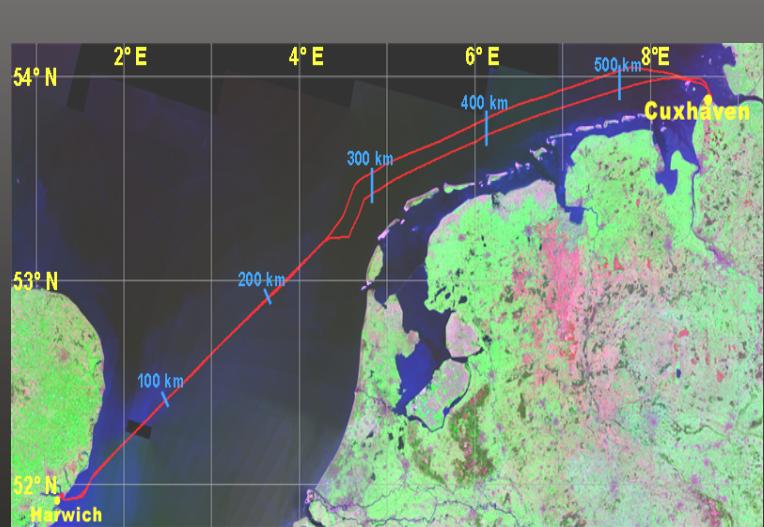
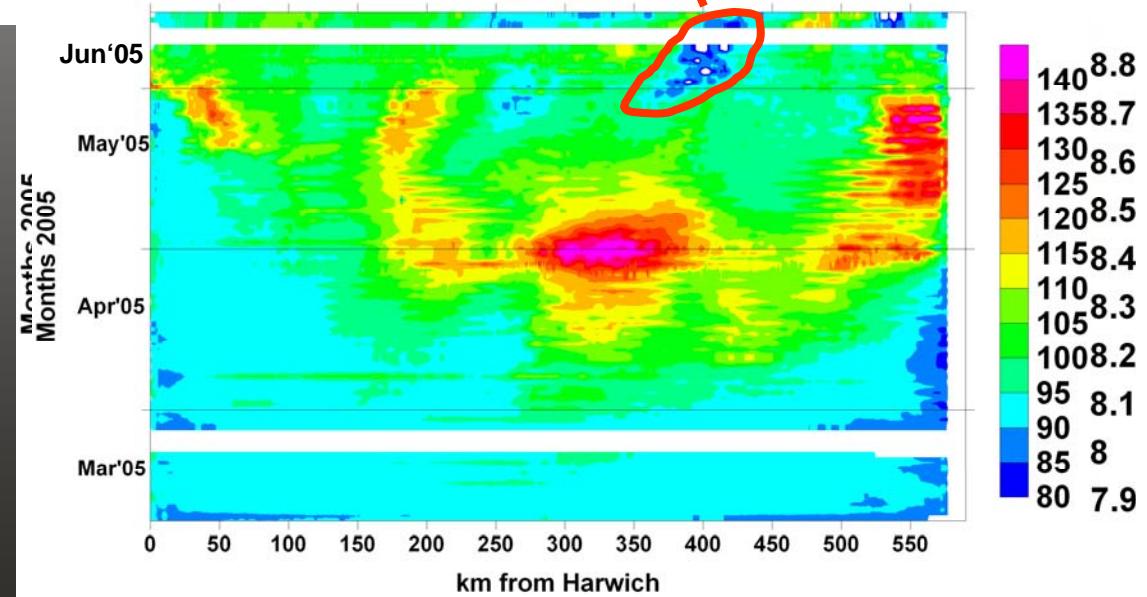


Algae Dynamic Spring 2005 I

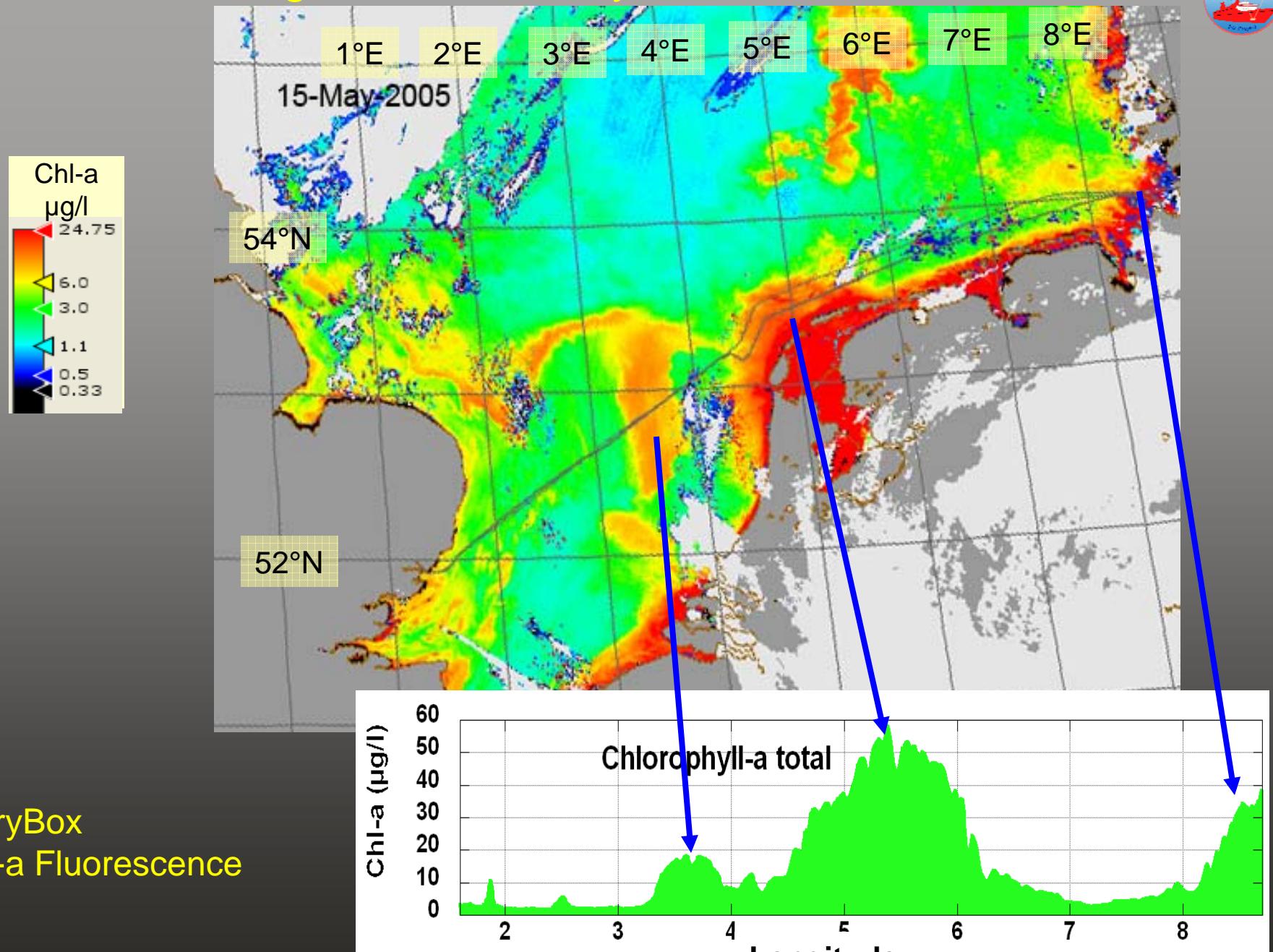


algaе break-down
==> oxygen depletion

pH_Value
Oxygen-Saturation Index (%)

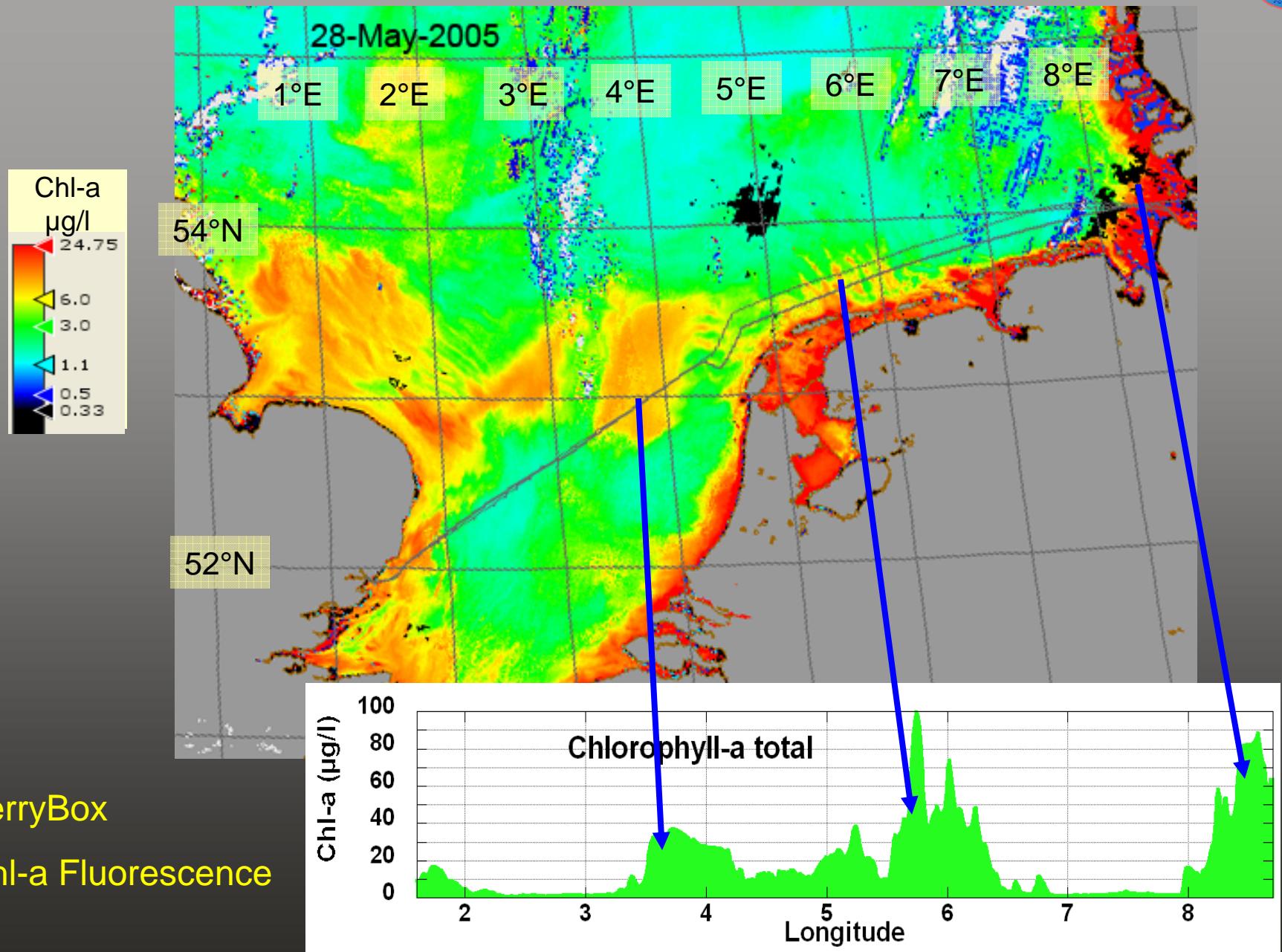


Remote Sensing & FB Data May 2005 I



FerryBox
Chl-a Fluorescence

Remote Sensing & FB Data May 2005 II



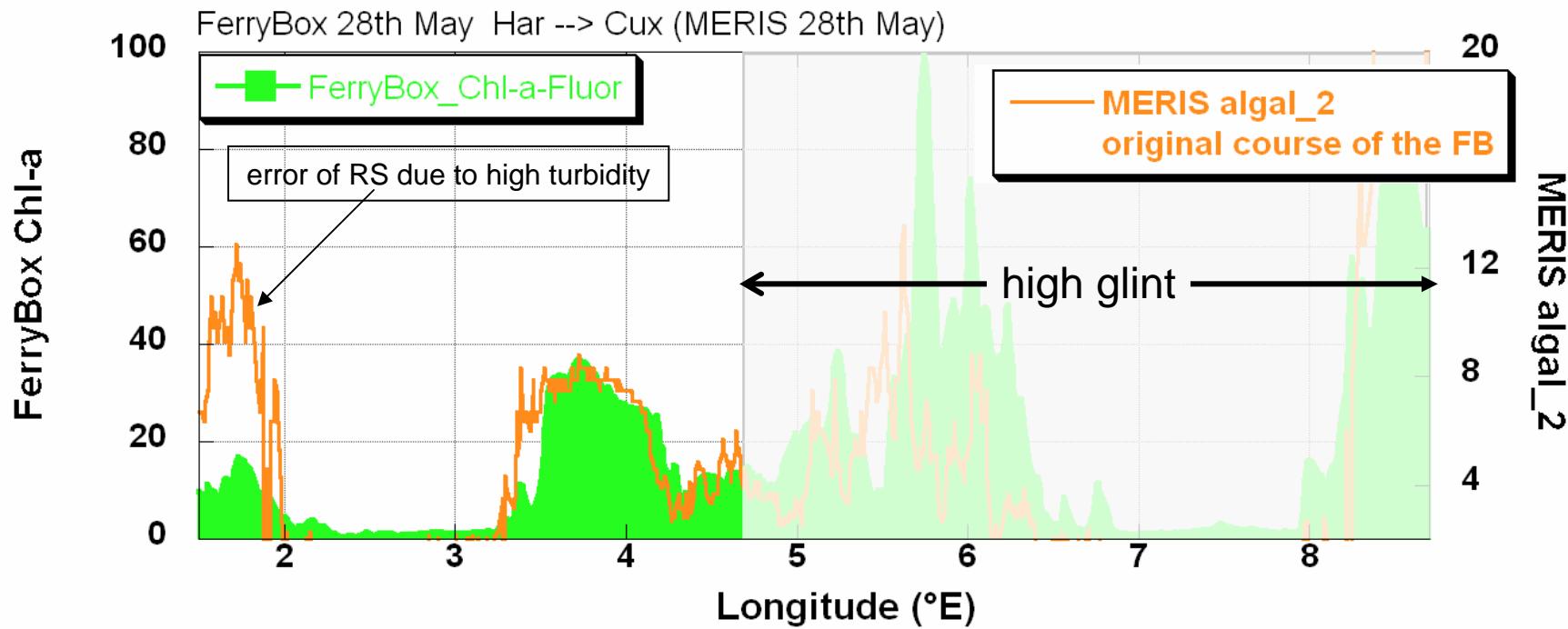
FerryBox

Chl-a Fluorescence

Comparison of FerryBox data with Remote Sensed Data I



Comparison FerryBox - Remote Sensing without drift correction





Drift of the water body during the moment of the FB observation and the date of RS image estimated by a hydrodynamic model

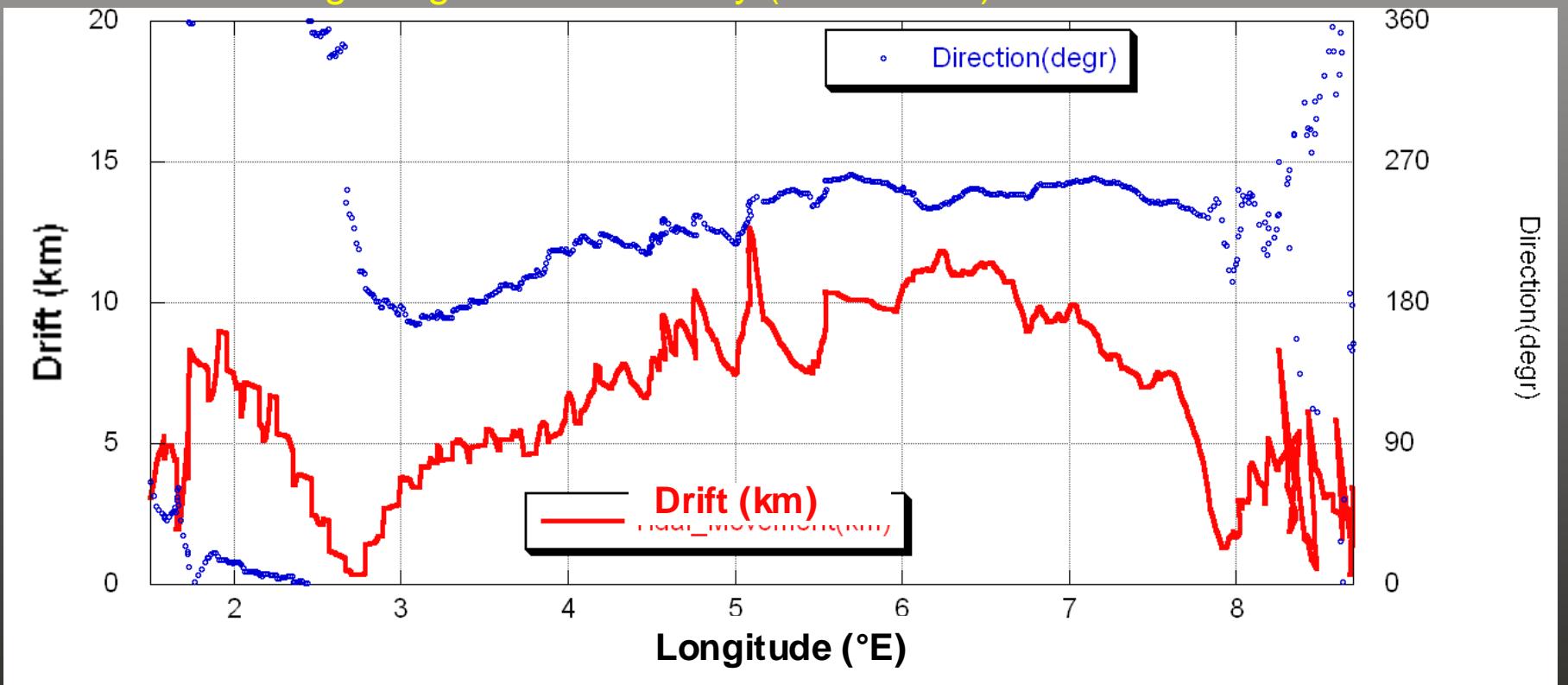
Ferry Crossing:

Start: 28th of May (15:21 UTC) from Harwich (GB)

Remote Sensing Image:

28th of May (10:25 UTC)

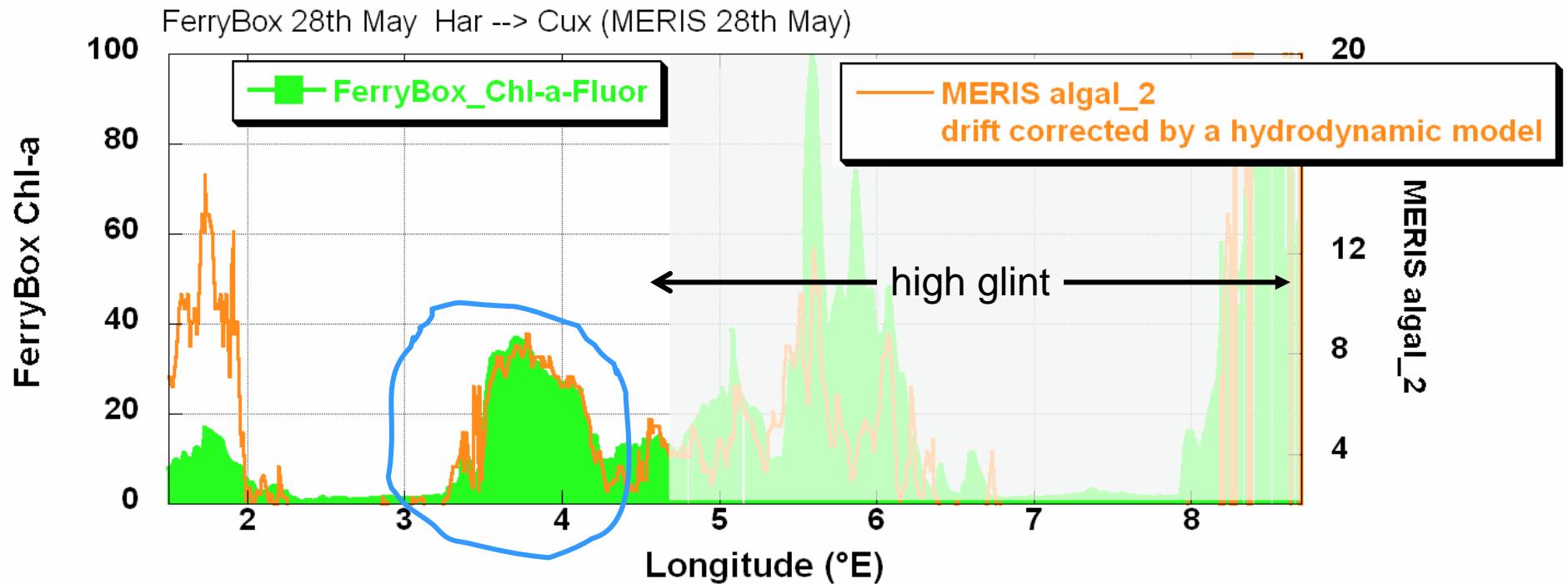
End: 29th of May (9:20 UTC) in Cuxhaven (DE)



Comparison of FerryBox data with remote sensed Data II



Comparison FerryBox - Remote Sensing with drift correction



combination of FerryBox data with Remote sensing requires drift correction by hydrodynamic models



New FerryBox Routes in the North Sea in 2006

Cuxhaven (DE) - Immingham (GB)

May 2006

DFDS Tor Line



Oslo (NO) - Hamburg (DE) - Rotterdam (NL)
September 2006

DFDS LysLine





Summary:

- Monitoring water quality by FerryBoxes delivers cost effectively data of high temporal and spatial distribution
- Synergistic effects by combination of FerryBox (FB) and remote sensing (RS) data together with numerical models (NM)
 - FB --> ground truth values for remote sensed data
 - RS --> expansion of transect to spatial view
 - NM --> filling data gaps & forecasting (e.g. algal blooms)

→ **Integrated Observation System:**

**Combination of FerryBox data with stationary observations,
remote sensing and data assimilation to models
(hydrodynamic and eco-system models)
--> getting a deeper insight in coastal processes**