

# FerryBox system on TransPaper – results from 2010 and new developments



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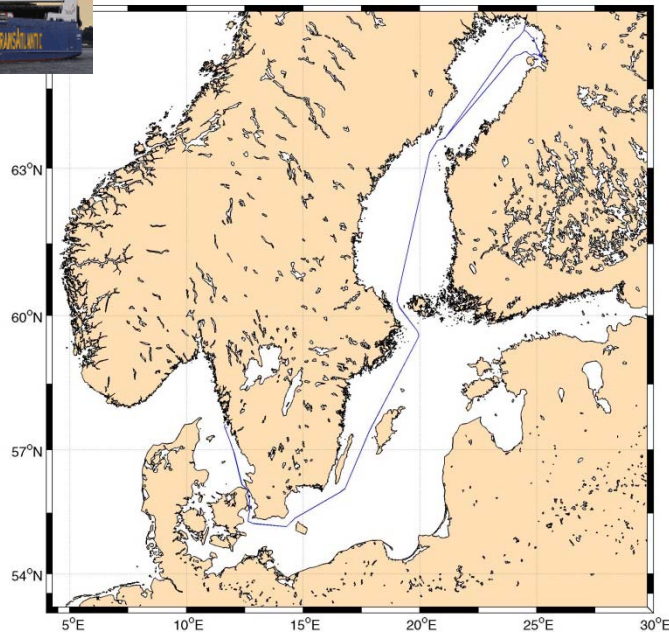
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# Collaboration between Sweden and Finland

Operation of FerryBox on TransPaper is a collaboration between the SMHI and Marine Research Centre of the Finnish Environment Institute SYKE and TransAtlantic AB.



TransPaper



Gothenburg-Kemi-Oulu-Gothenburg



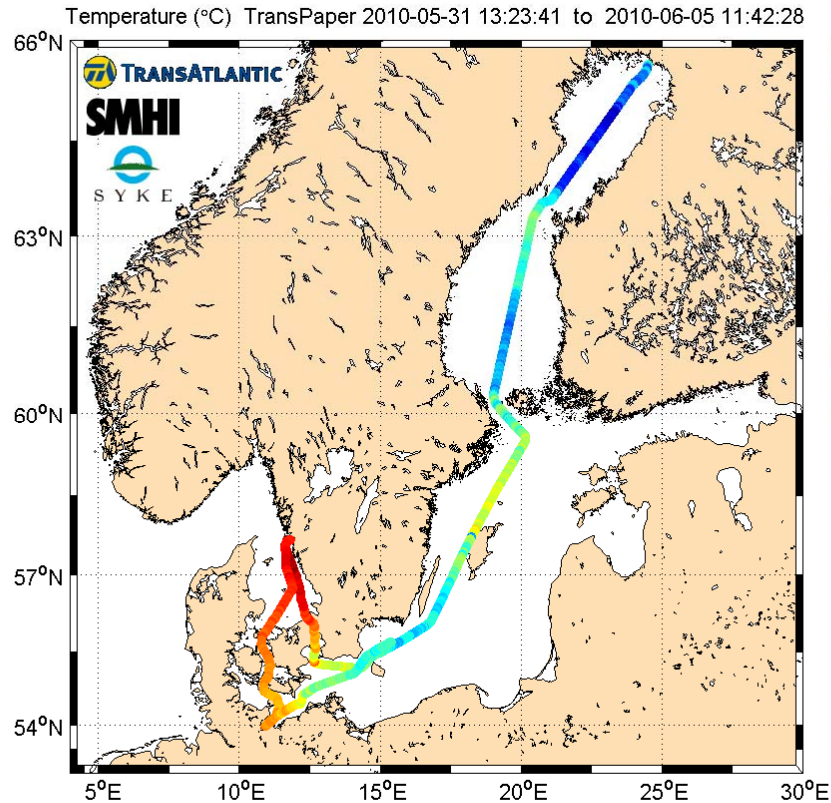
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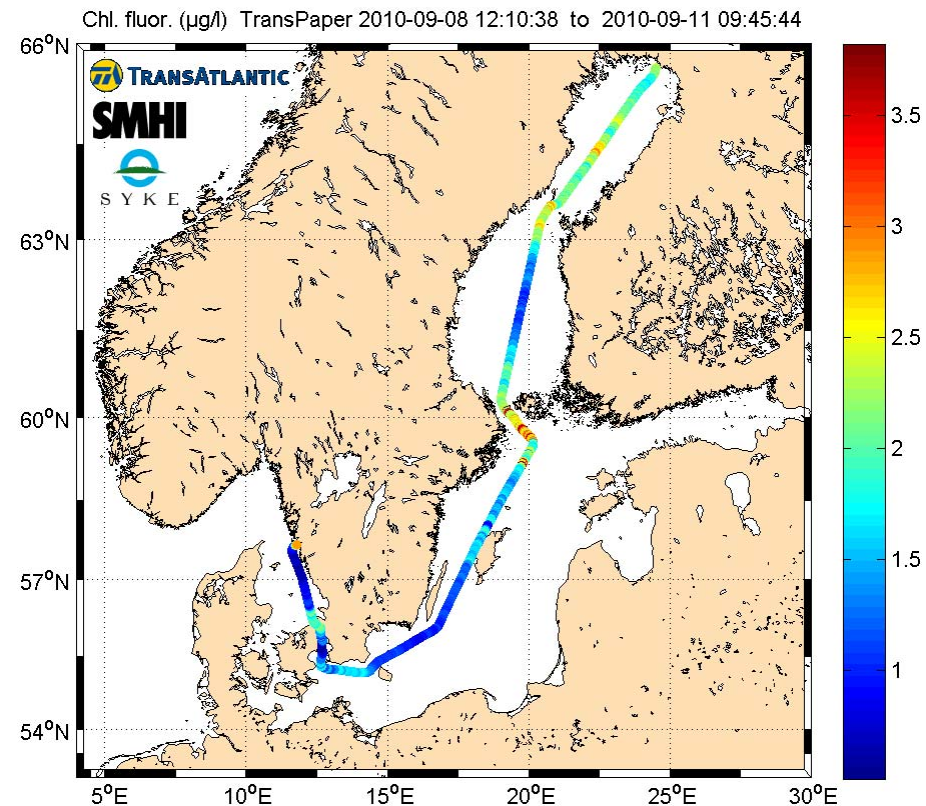
Helsinki-Travemünde

# FerryBox TransPaper – routes 2010

Jan-Aug

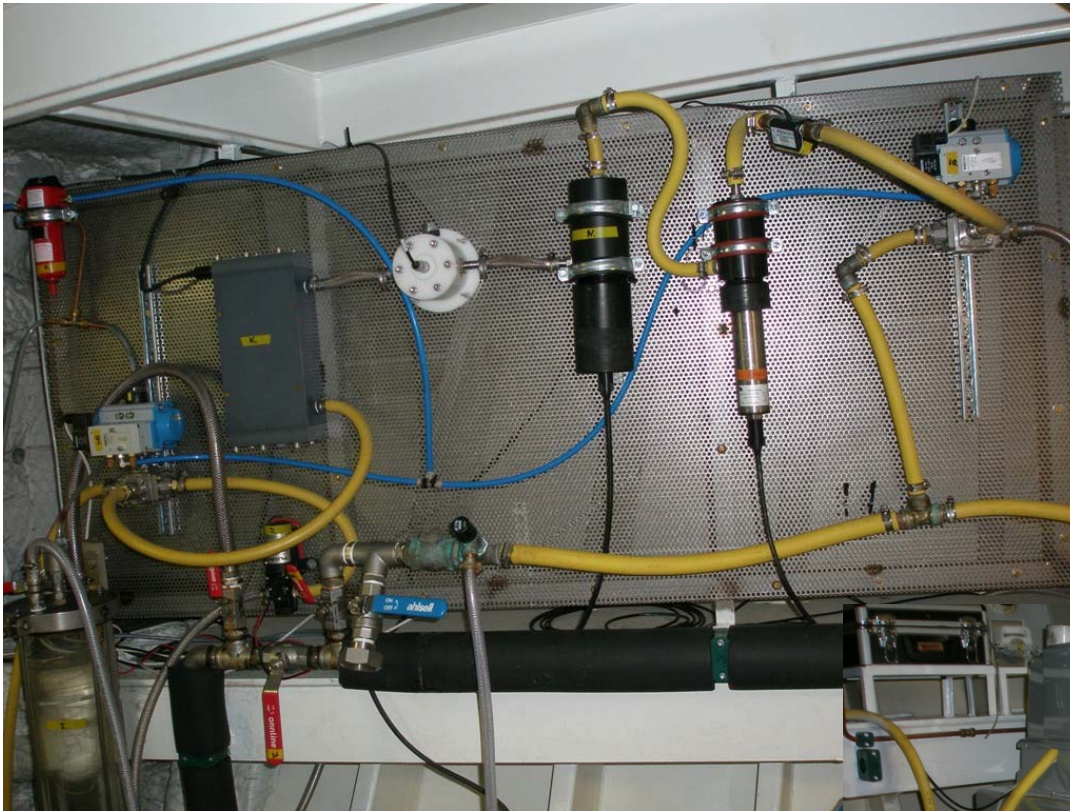


Sep-Dec





# Flow through sensors and water samplers



# pH and CO<sub>2</sub> system



General Oceanics CO<sub>2</sub>-analyser



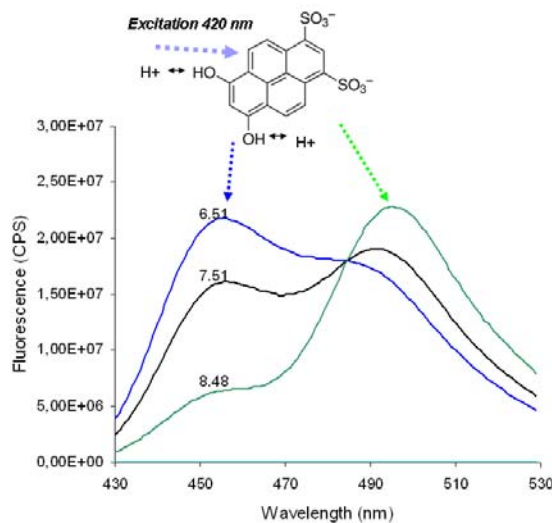
pH instrument (fluorescence based)



Reference gases for CO<sub>2</sub>-analyser

## DHPDS fluorescence

Excitation 405 nm



DHPDS = 6,8- dihydroxypyrene-1,3-disulfonic acid

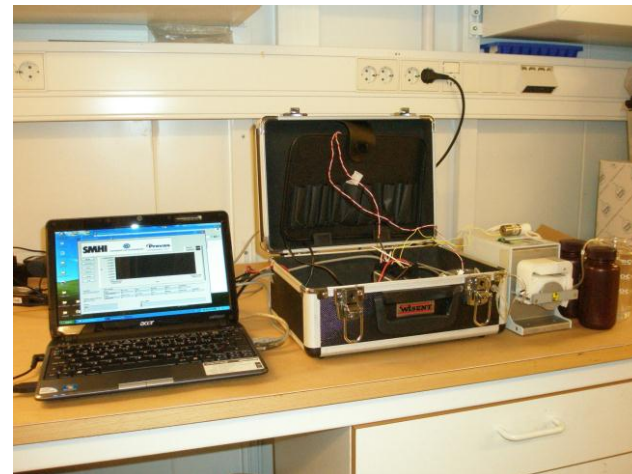
## Advantages with DHPDS

Wide dynamic range

Single LED feature

Real and immediate fluorescence ratio with an RGB CMOS camera

$\text{pK}_a^{\text{app}}$  ideal for seawater applications



System developed by Aron Hakonen, Leif Anderson and Stefan Hulth

*Department of Chemistry, University of Gothenburg*



# Sensors in air



## Real time data

### Flow through system

- Temperature near water inlet
- Conductivity
- Salinity (calculated)
- Chlorophyll fluorescence – phytoplankton biomass
- Phycocyanine fluorescence – cyanobacteria biomass
- CDOM fluorescence
- Turbidity
- Oxygen (optode)

### In air measurements

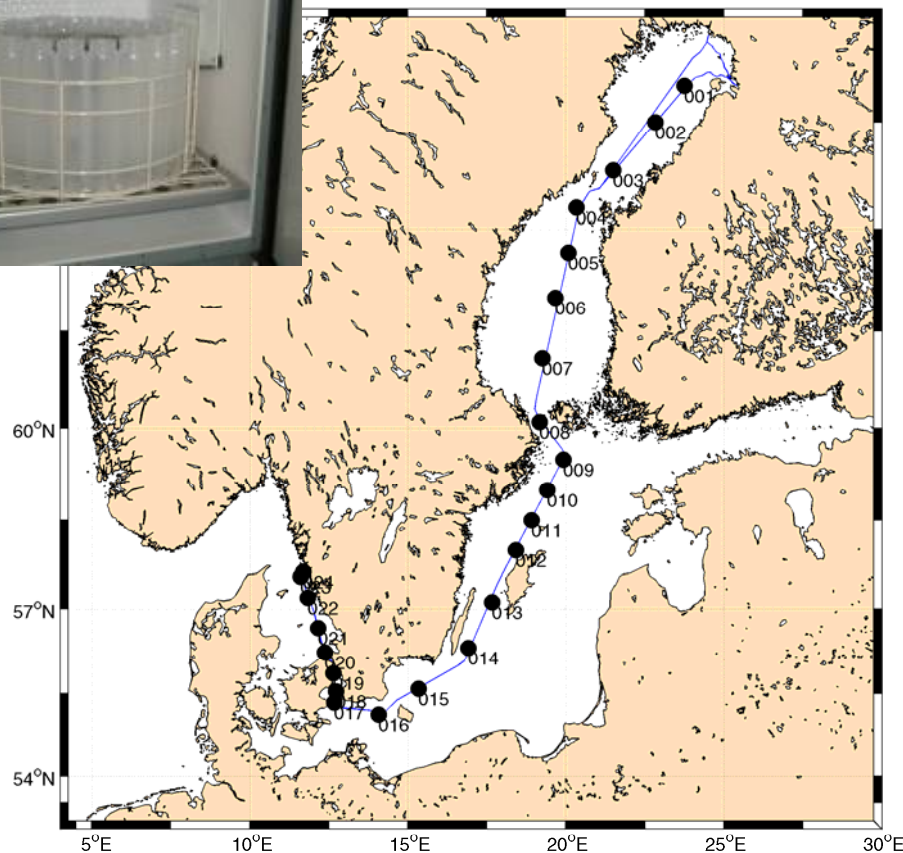
- Air temperature
- Air pressure
- Irradiation (PAR, Photosynthetic Active Radiation)
- Position and time stamp (GPS)

- 
- *Not yet operational*
  - *pH*
  - *pCO<sub>2</sub>*

- CO<sub>2</sub> content



# TransPaper sampling locations



## Sampling frequency

- Every two weeks

## Parameters

### 12 locations

- Salinity
- CDOM/humic substances

### 6 locations in the Kattegat-Öresund

- Chlorophyll a

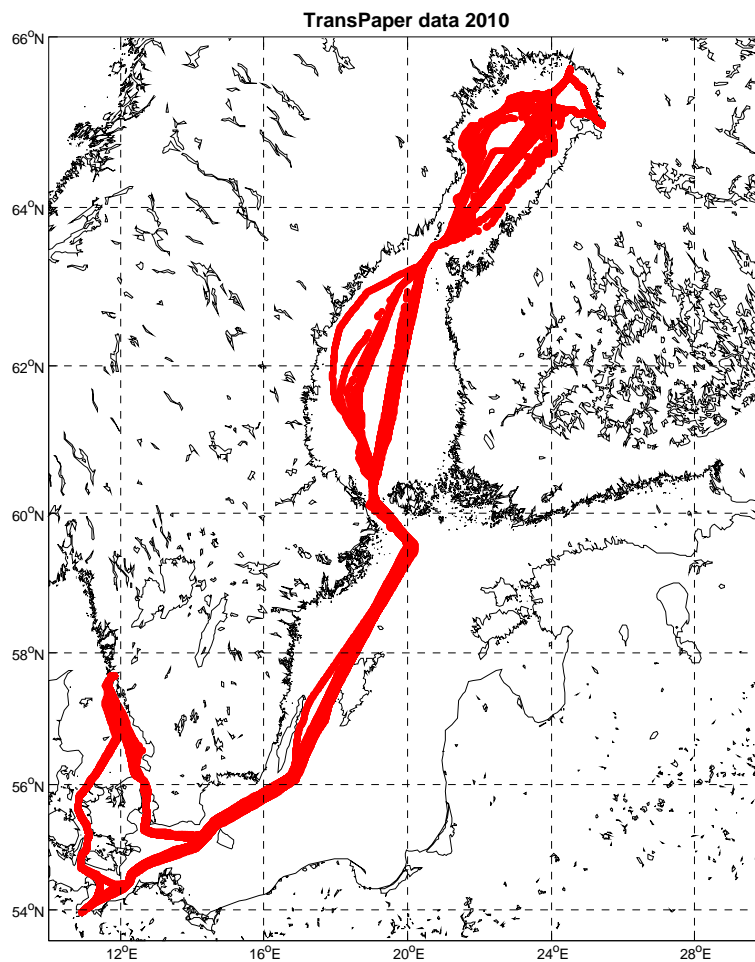
### 5 locations

- Phytoplankton  
(stations 7, 11, 13, 15 and 21)

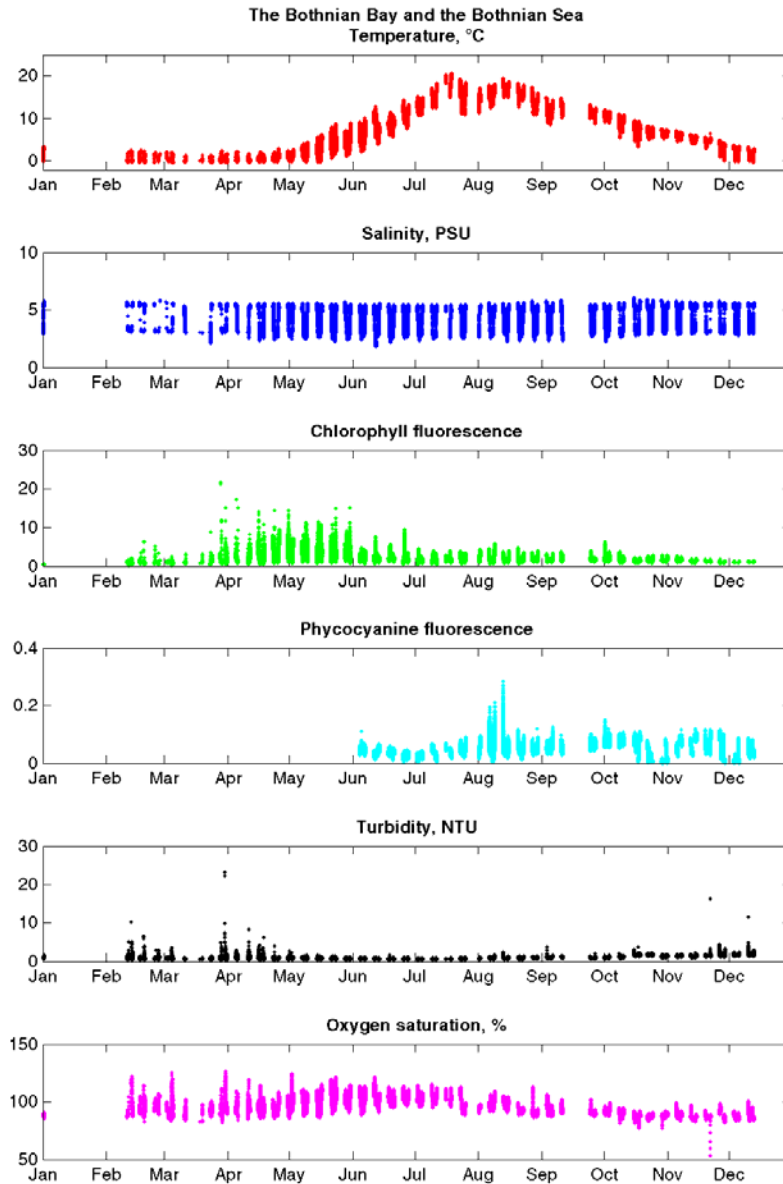
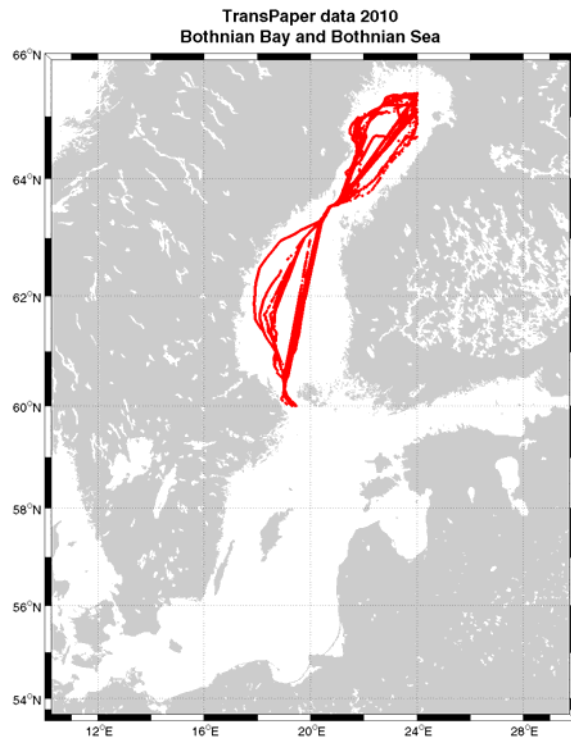
## Some results and experiences from TransPaper 2010

- Flow through system operational from March-Dec
- One week problem with data collection in September
- Main pump broke down in December
- Water sampling for phytoplankton started – Lugols
- Water sampling for salinity, chl. a and CDOM tested
- CDOM flurometer installed
- pH and pCO<sub>2</sub> installed
- Web presentation of data updated every hour
- Testing of phosphate analyzer in the laboratory

# Real route 2010

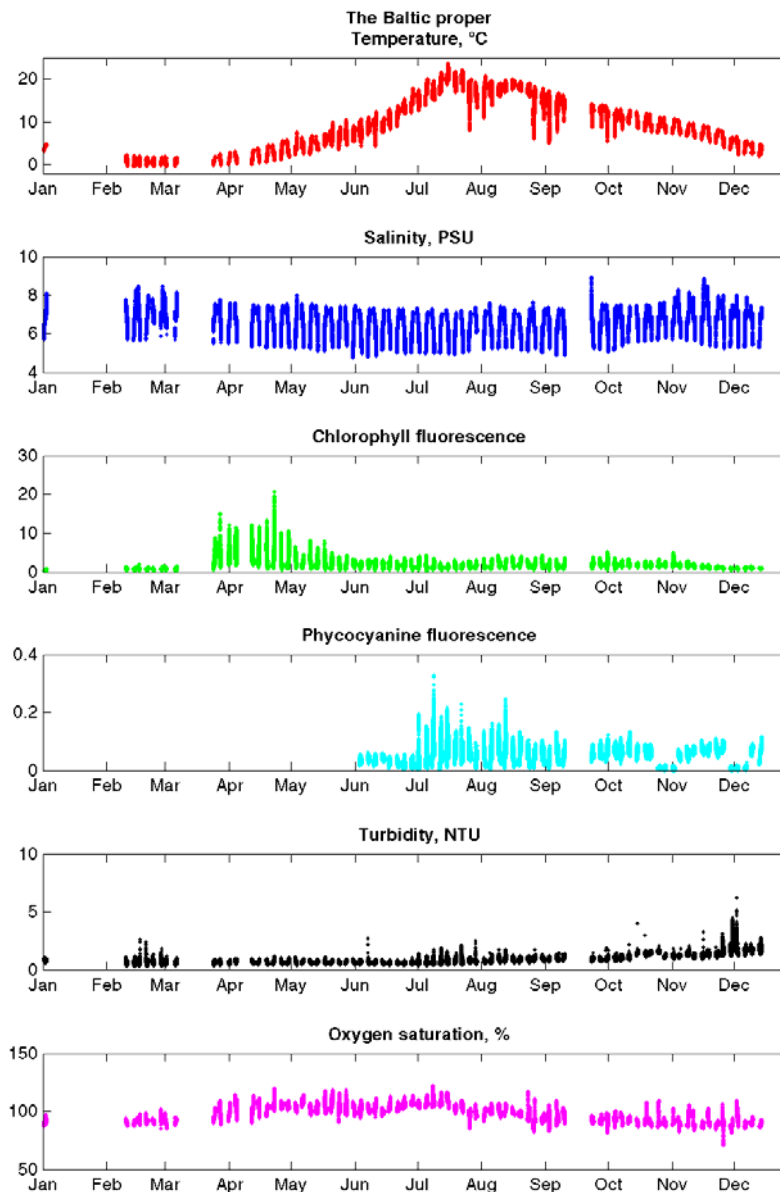
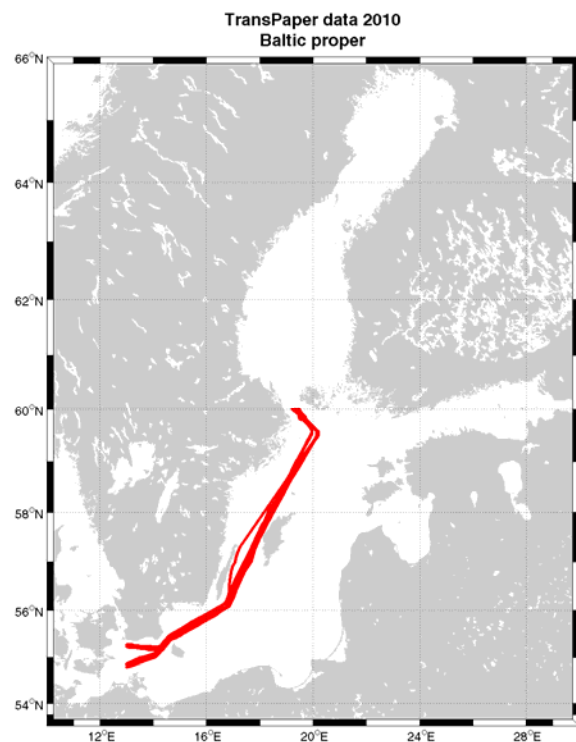


# Overview of results the Bay of Bothnia 2010

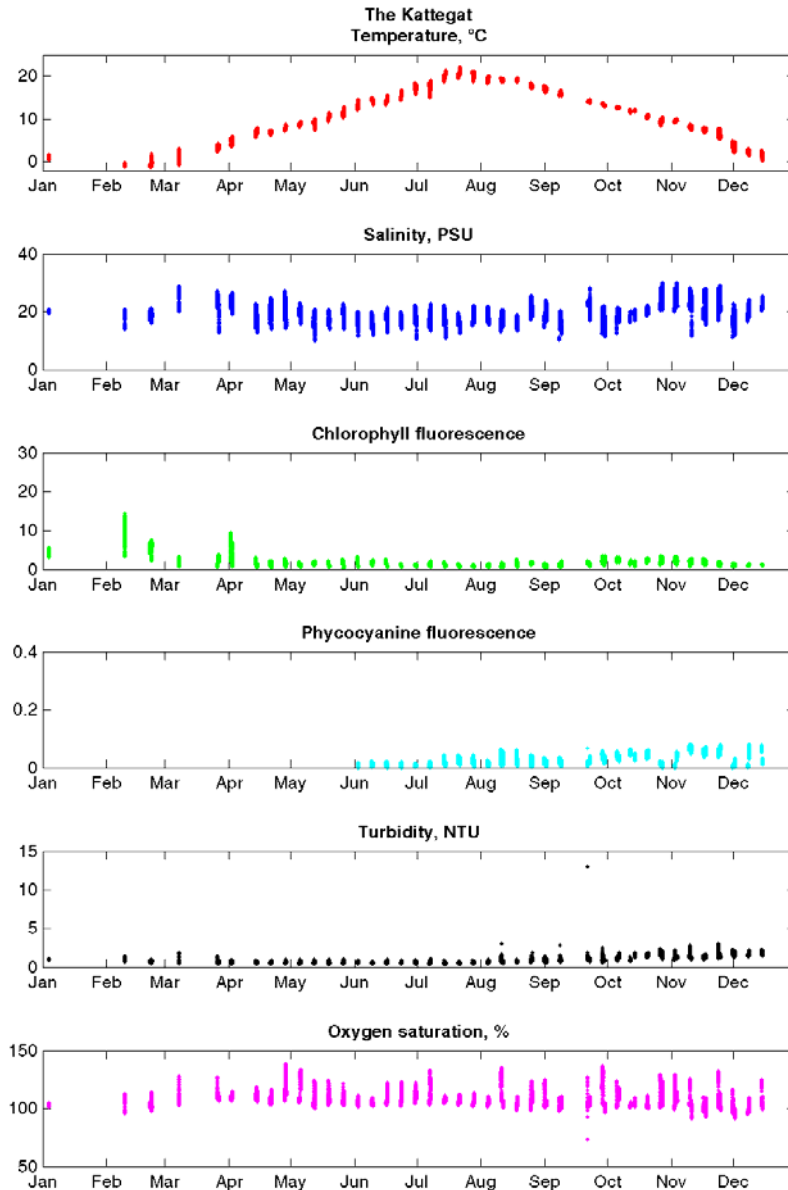
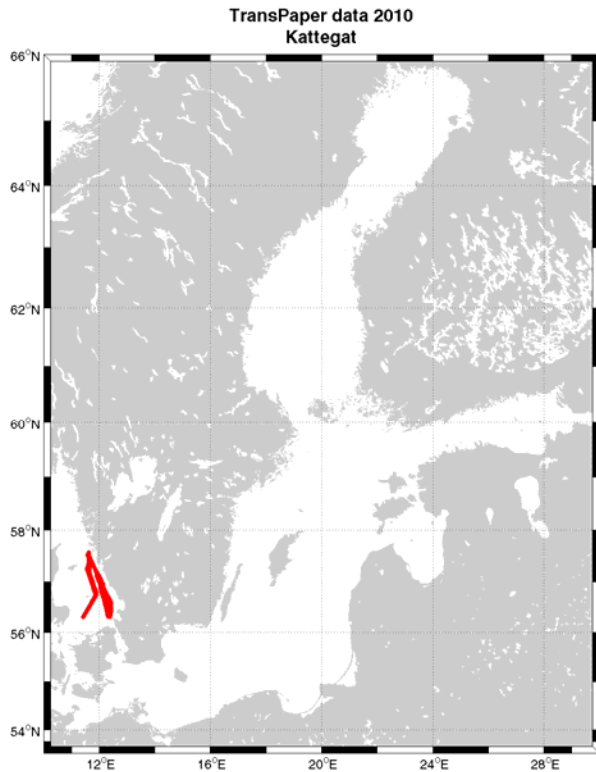




# Overview of results the Baltic proper 2010

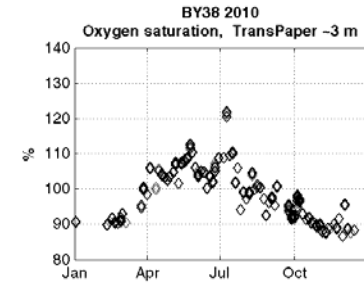
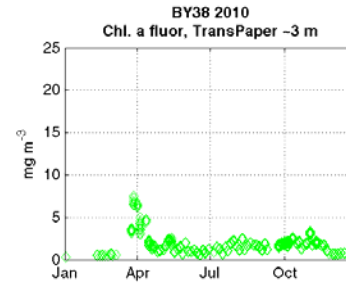
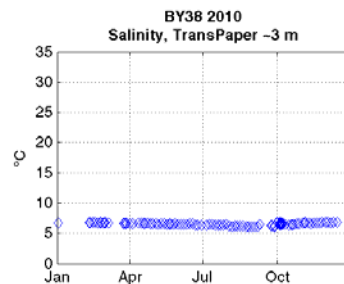
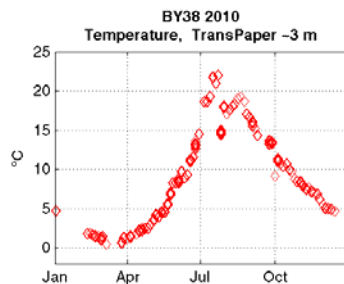
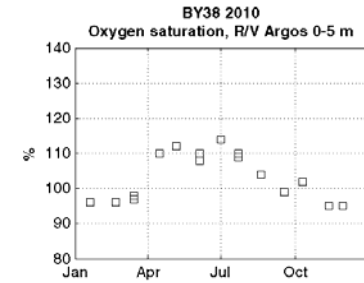
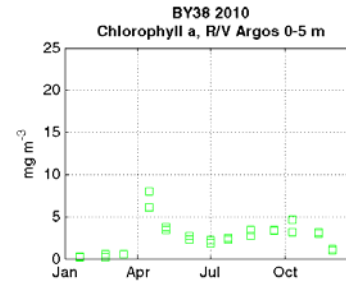
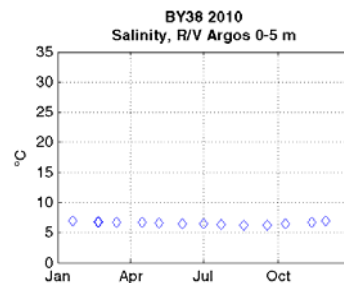
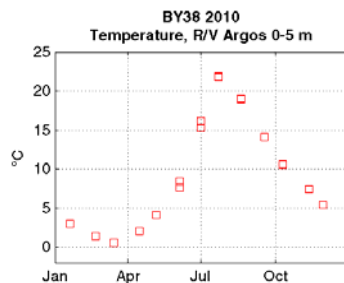
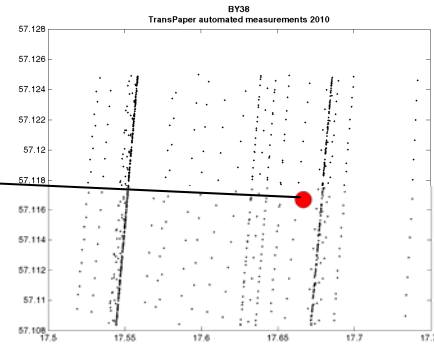
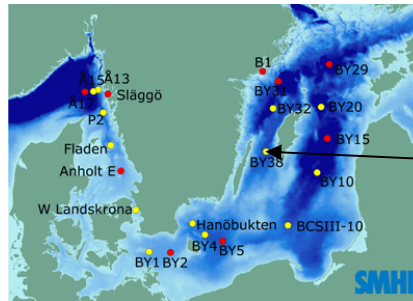


# Overview of results the Kattegat 2010



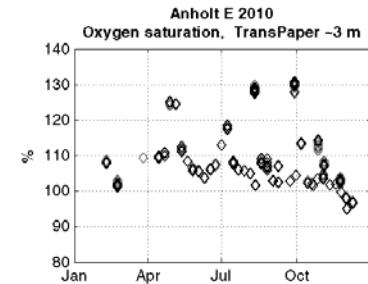
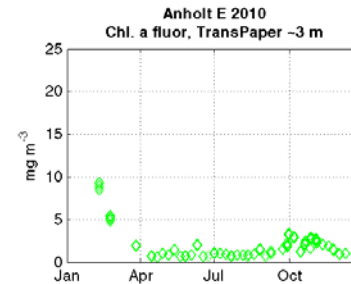
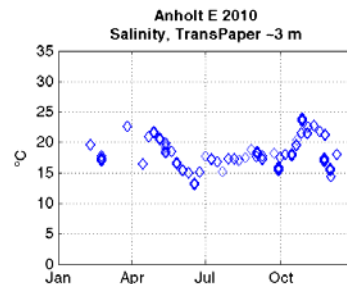
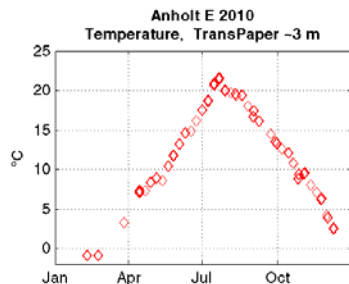
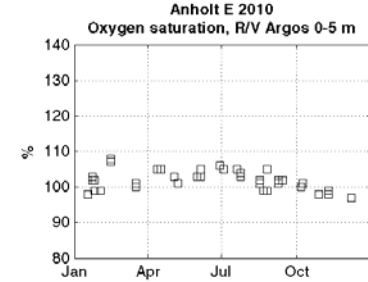
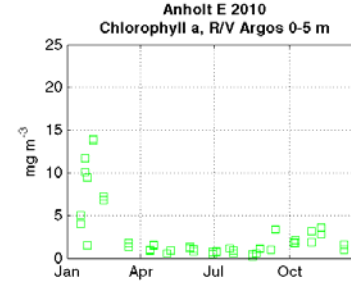
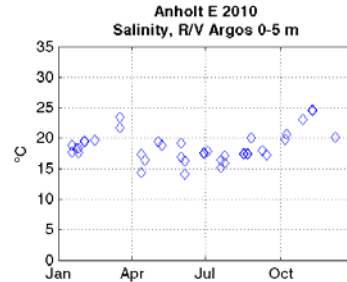
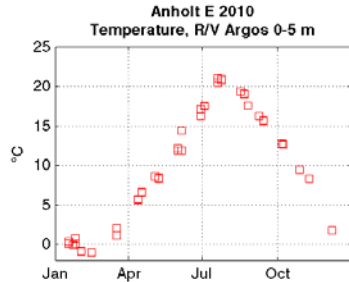
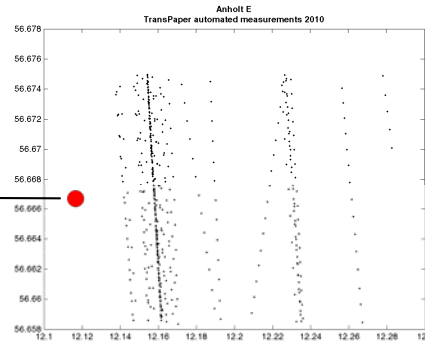
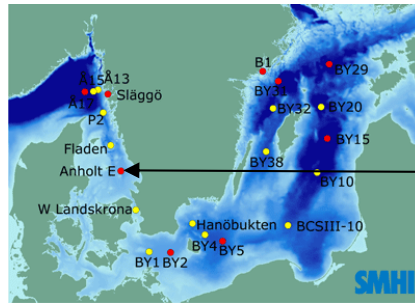
# FerryBox results compared to data from water samples from research vessel

## BY38 Karlsö deep



# FerryBox results compared to data from water samples from research vessel

## Anholt E





# Cyanobacteria monitoring using FerryBox

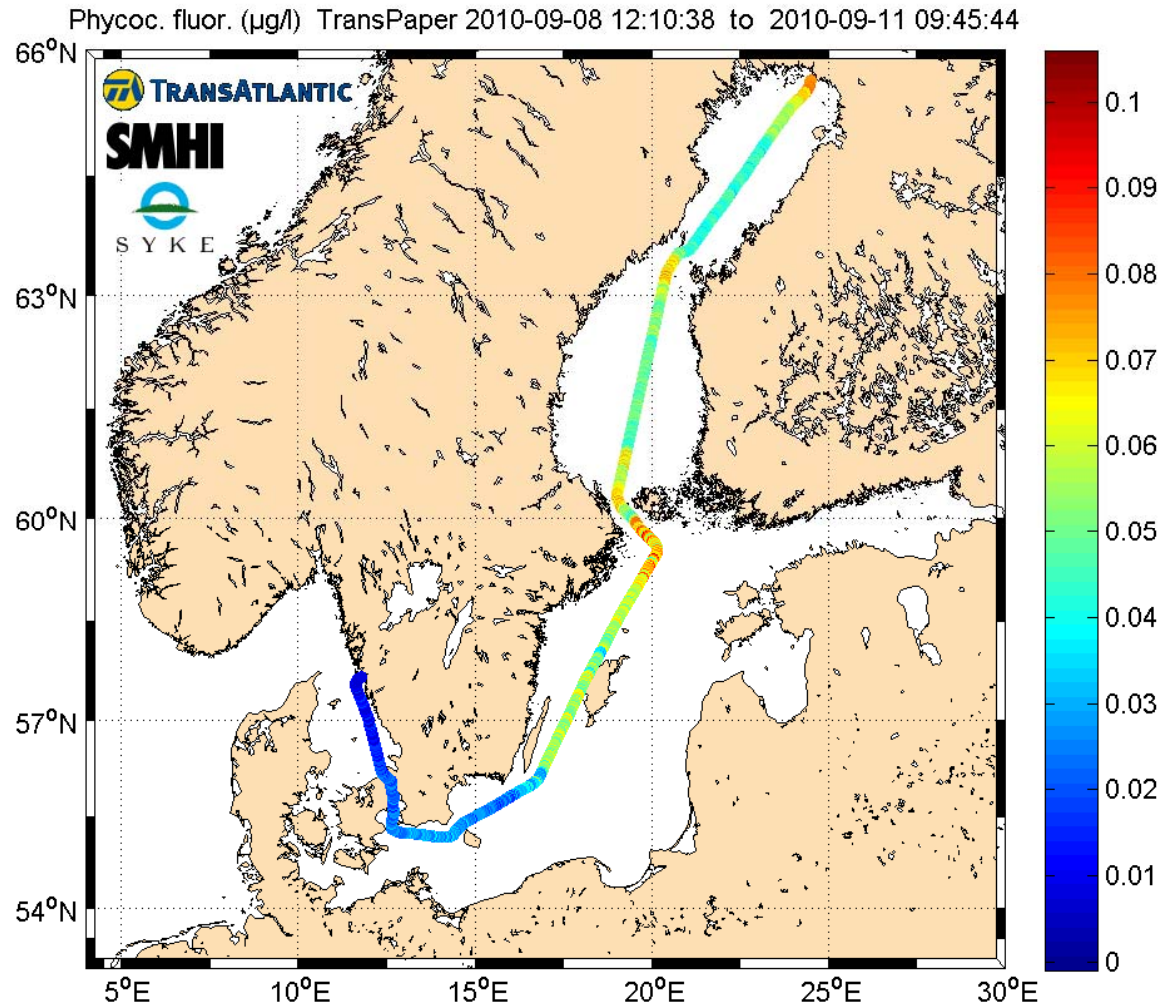
- Automated water sampling for microscope analysis of phytoplankton
- Phycocyanin fluorescence – a proxy for cyanobacteria biomass
- Temperature
- Phosphate concentration (not yet implemented)



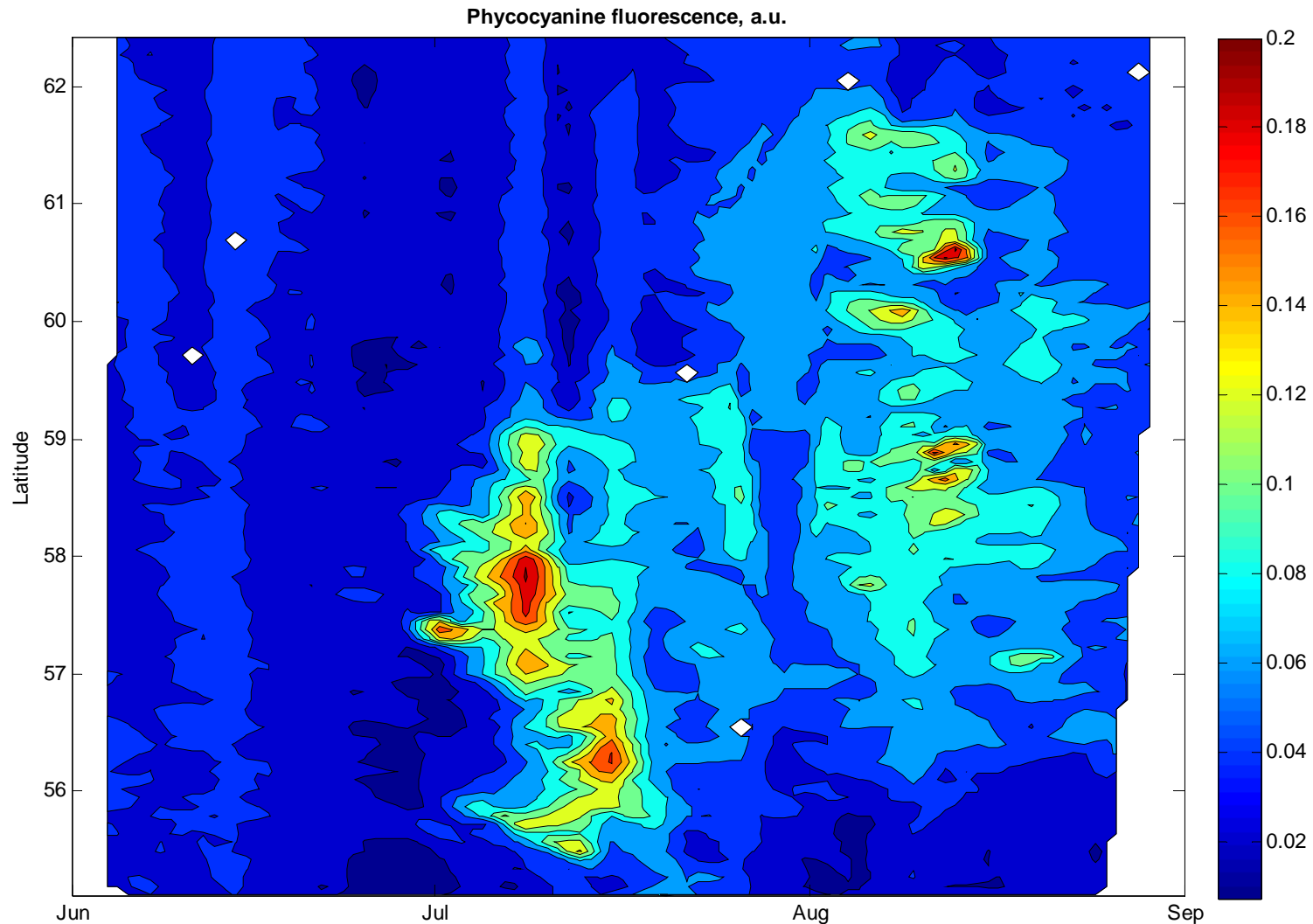
Cyanobacteria bloom at north cape of Öland 2006

Photo by Swedish Coast Guard, Air Patrol

# Phycocyanine fluorescence – a proxy for cyanobacteria biomass

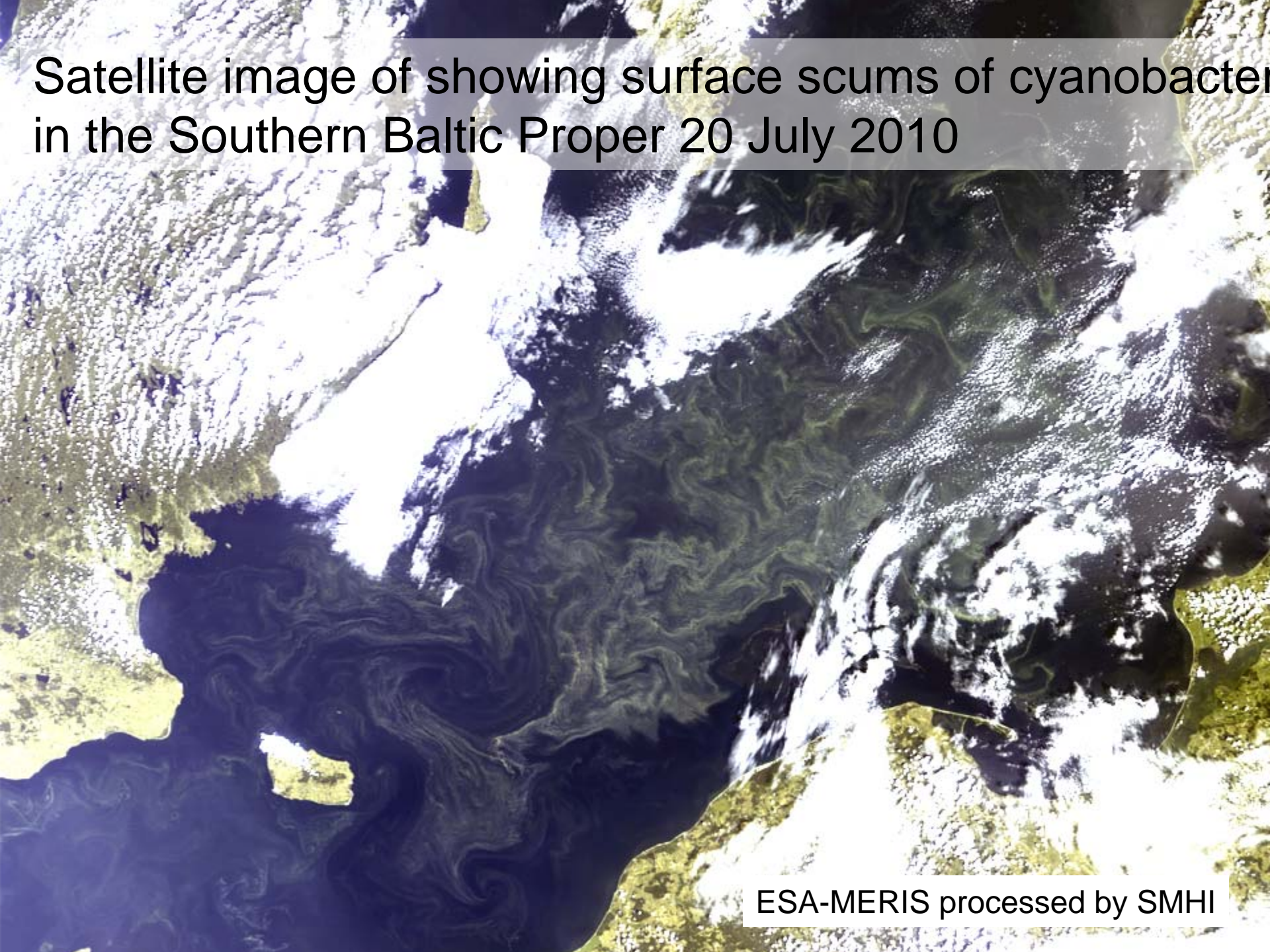


# Distribution of cyanobacteria 1 June-30 August 2010 as indicated by phycocyanine fluorescence





Satellite image of showing surface scums of cyanobacter  
in the Southern Baltic Proper 20 July 2010

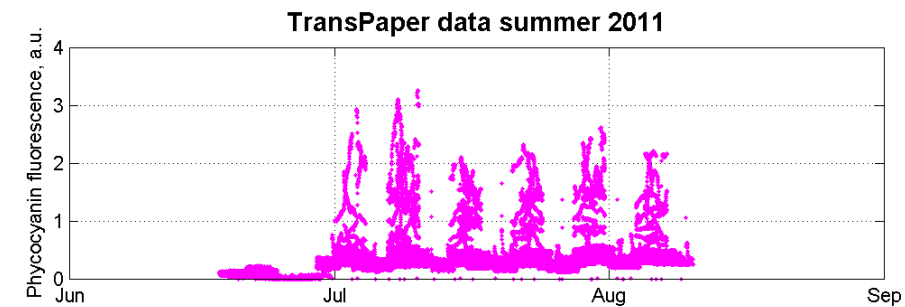
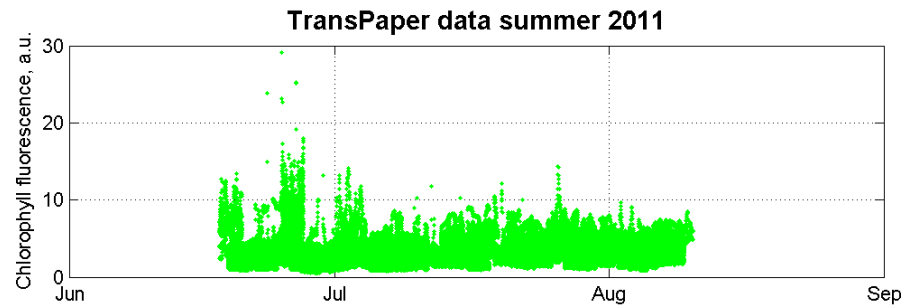
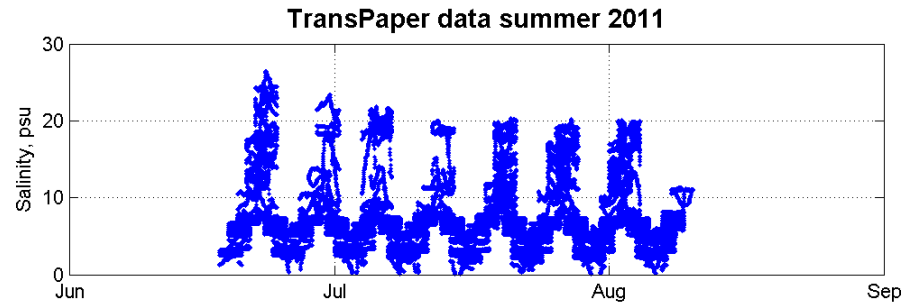
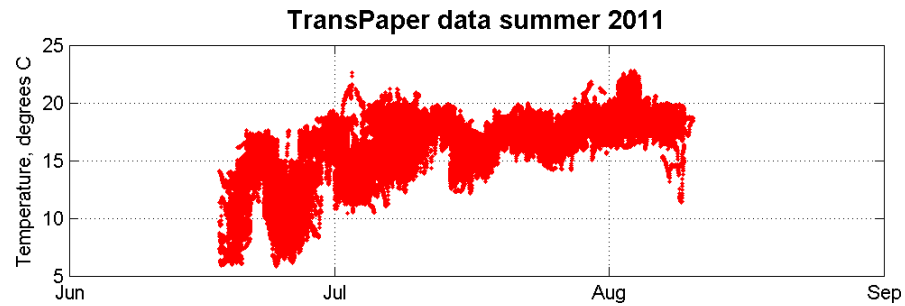


ESA-MERIS processed by SMHI



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# Some recent results



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Thank you for your attention



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