



High resolution monitoring of near surface waters in the Baltic Sea and the Kattegat

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Outline of talk

- Short description of FerryBox-system on Transpaper
- Results from 2011 and 2012
- Comparison Manual sampling vs. FerryBox samples
- Comparison FerryBox vs. Research vessel sampling

FerryBox system on TransPaper



In water, 3 m depth

Flow rate
Temperature, intake
Salinity
Temperature, salinometer
Oxygen
Chlorophyll fluorescence
Turbidity
Phycocyanin fluorescence
CDOM fluorescence
(pH)
(CO₂)

In air

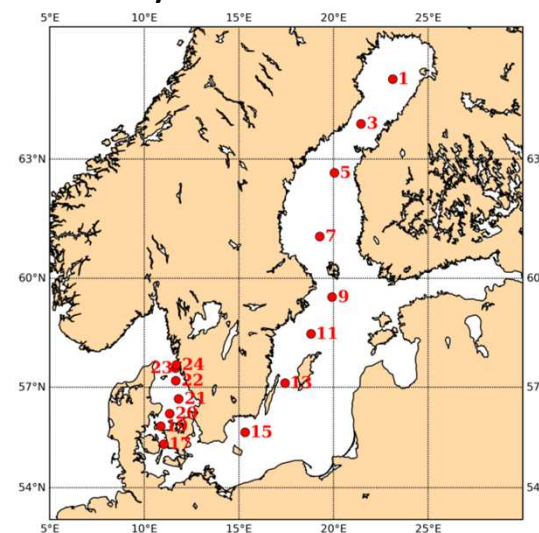
Air temperature
Air pressure
Irradiation, PAR
(CO₂)

Water samples

Salinity
Chlorophyll
CDOM
Alkalinity
Phytoplankton

Sampling frequency is every 20 seconds for most parameters

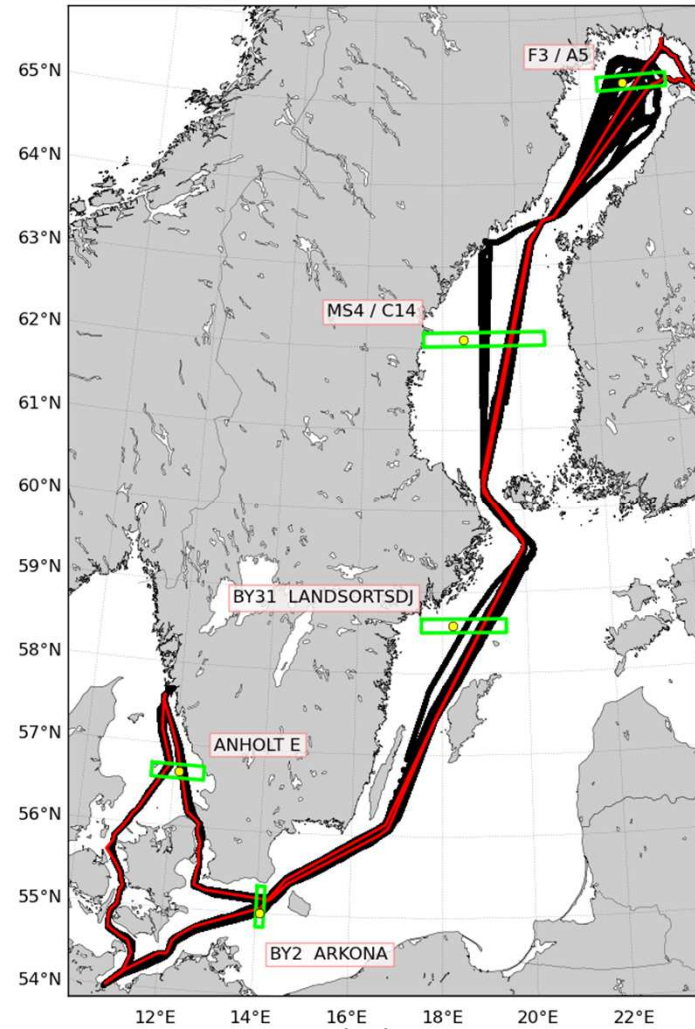
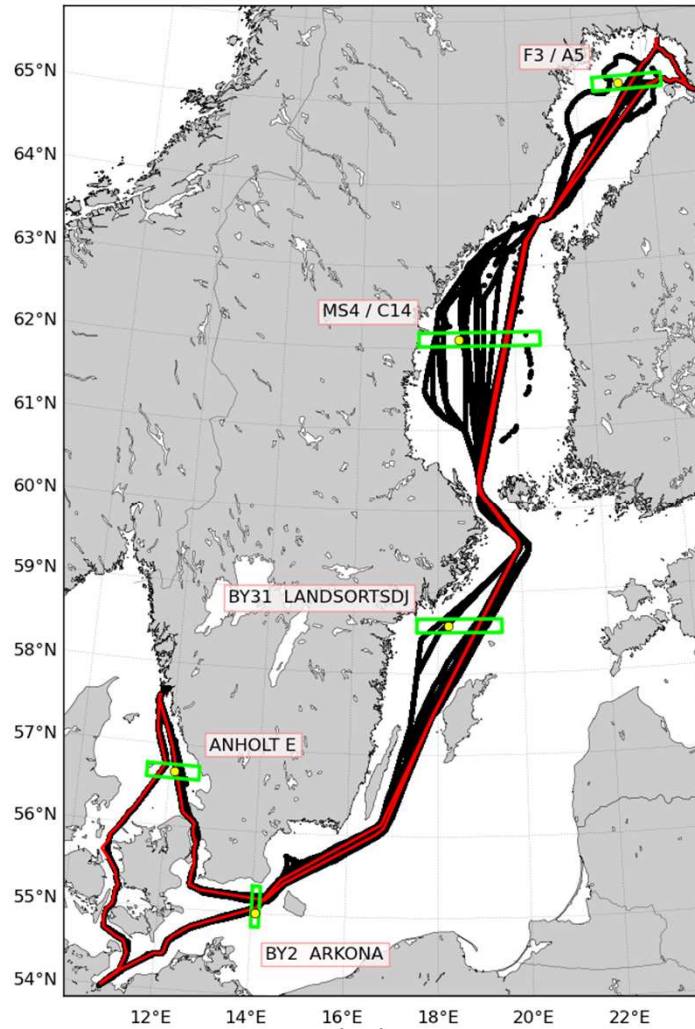
Sampled at 12 stations
Collected and analysed every second week



Route

2011

2012

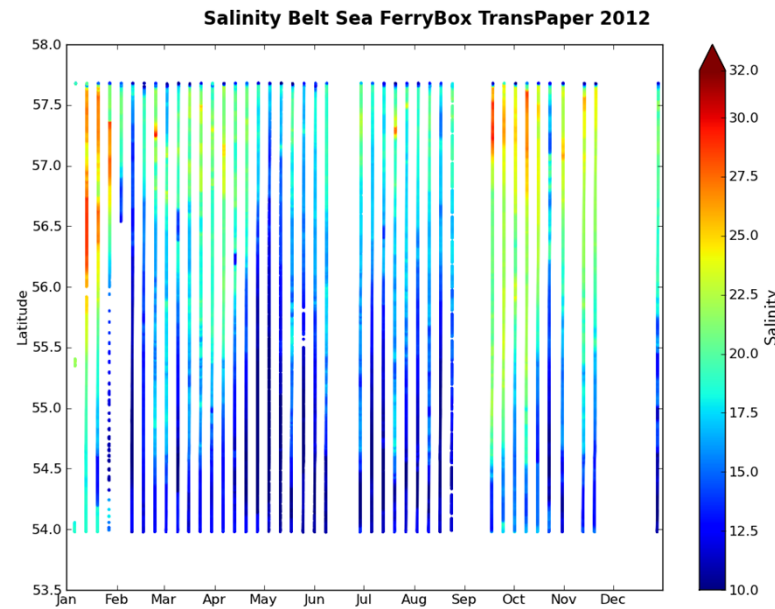
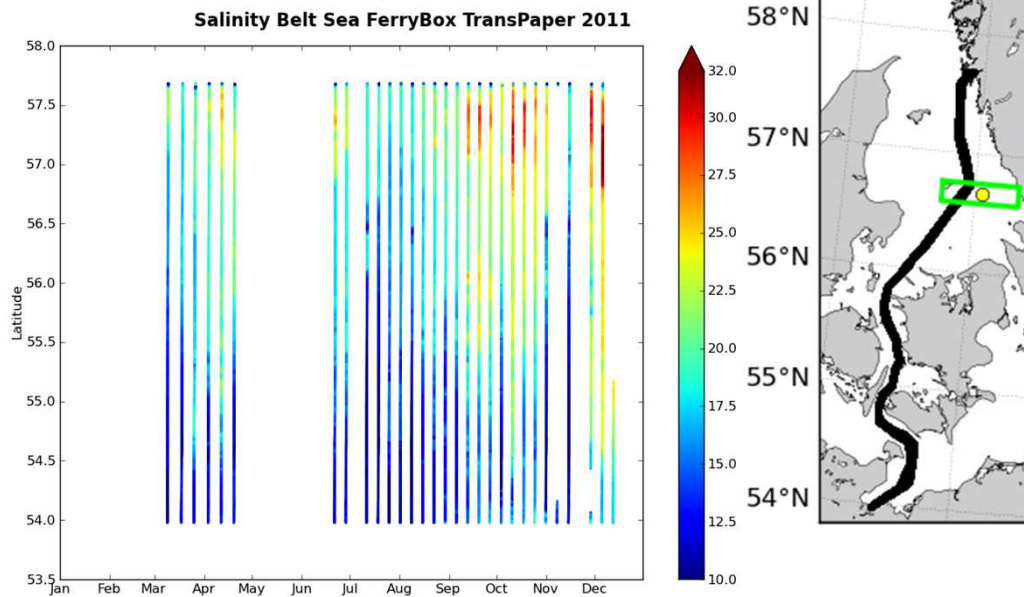
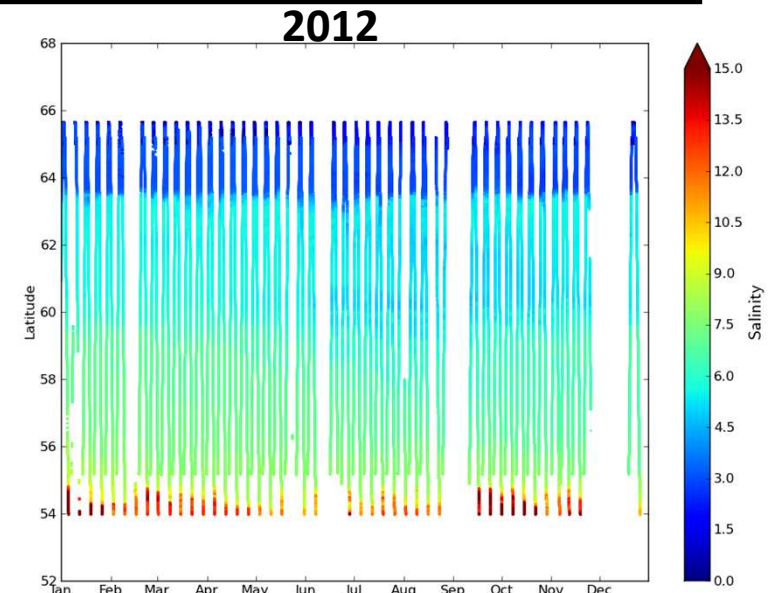
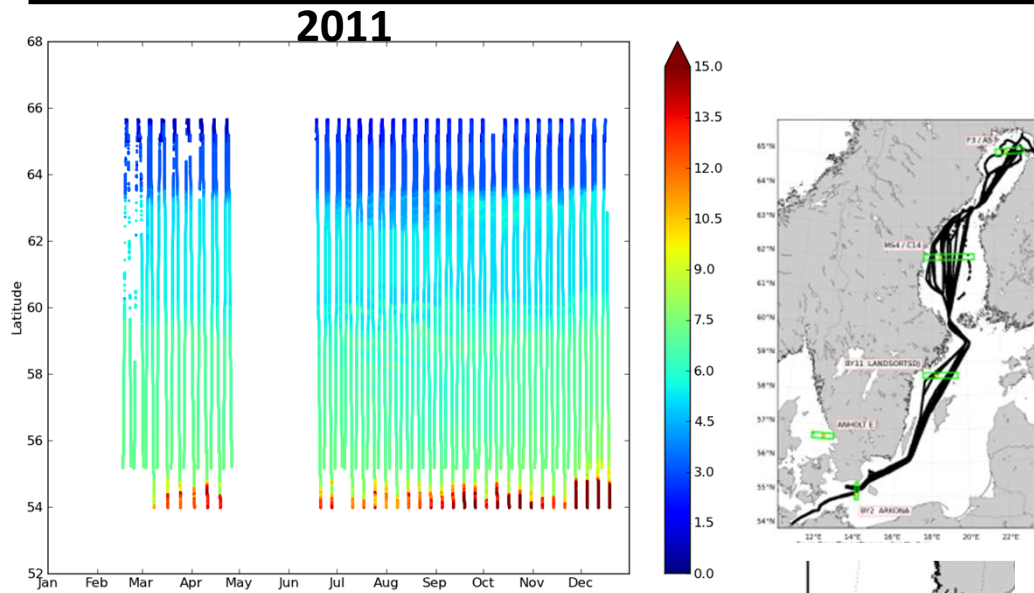


— Planned routes

— Reality

● Monitoring stations

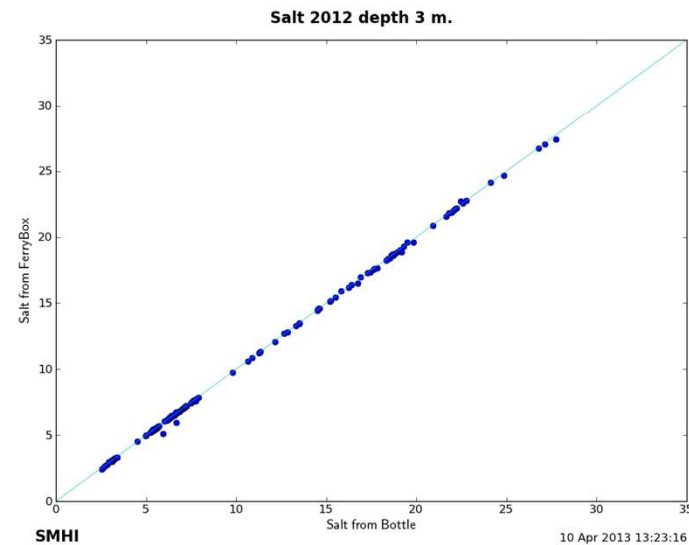
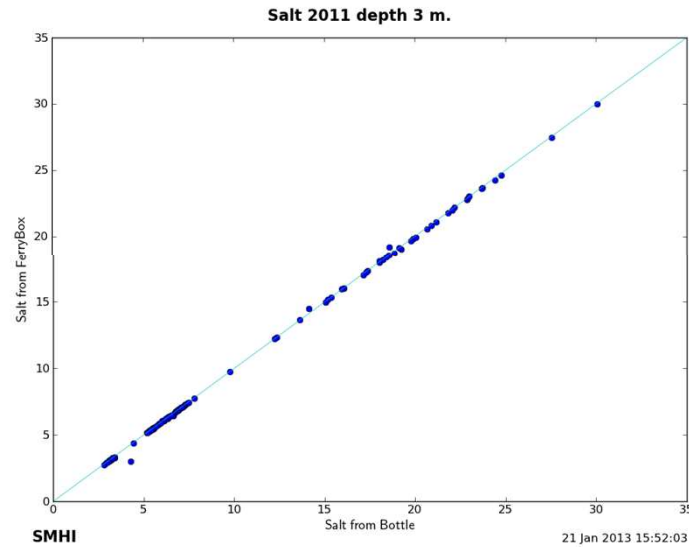
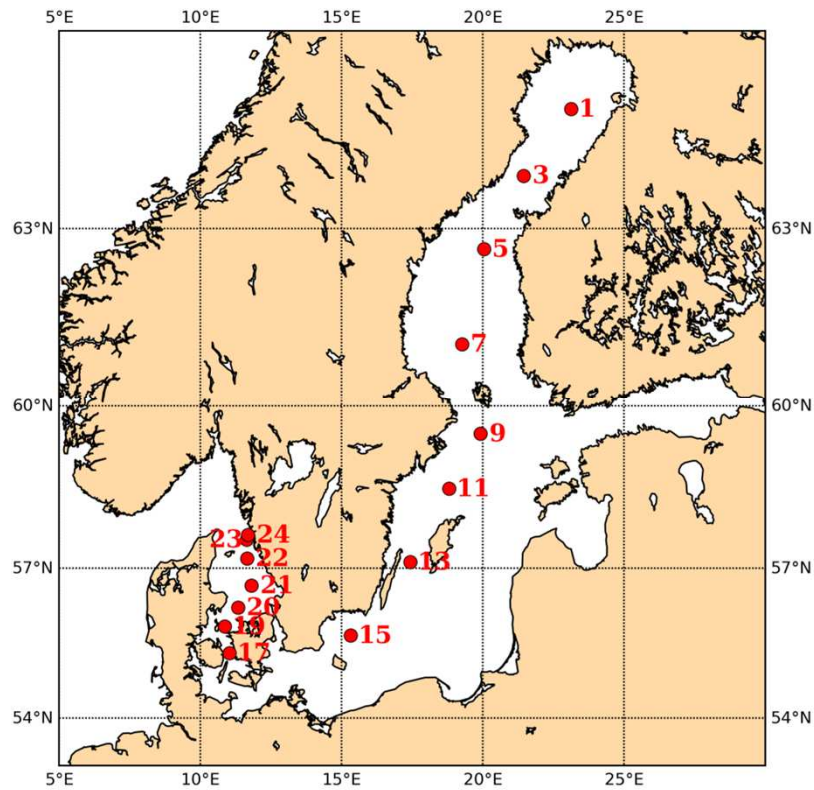
Salinity in The Baltic Sea, Belt Sea and the Kattegat



Salinity Ferry Box vs. Salinity from water samples



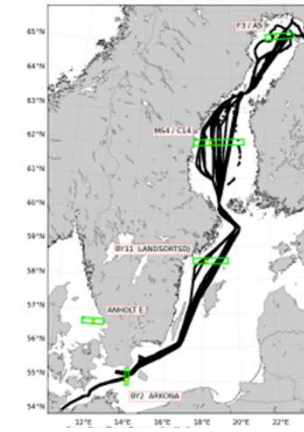
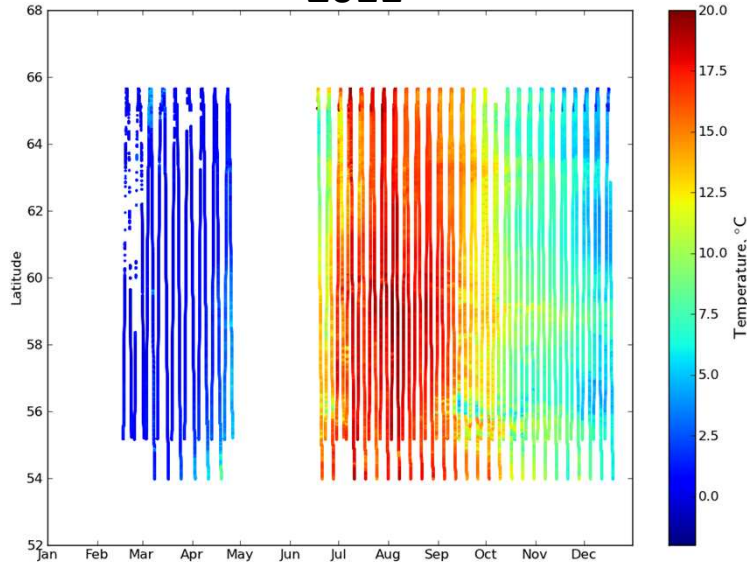
Water samples collected every two weeks at 12 positions, analysed using laboratory salinometer.



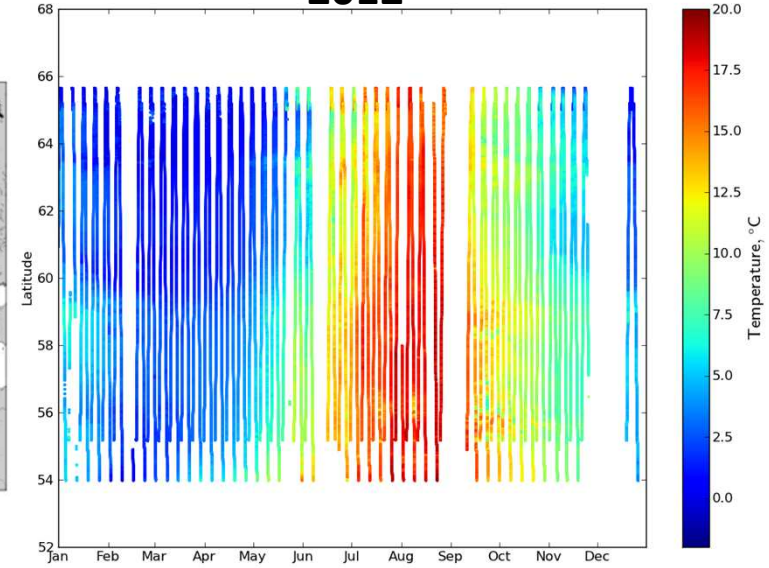
Temperature in The Baltic Sea, Belt Sea and The Kattegat



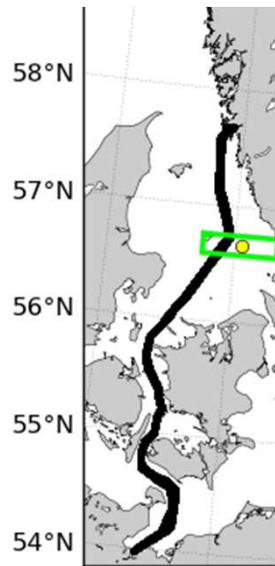
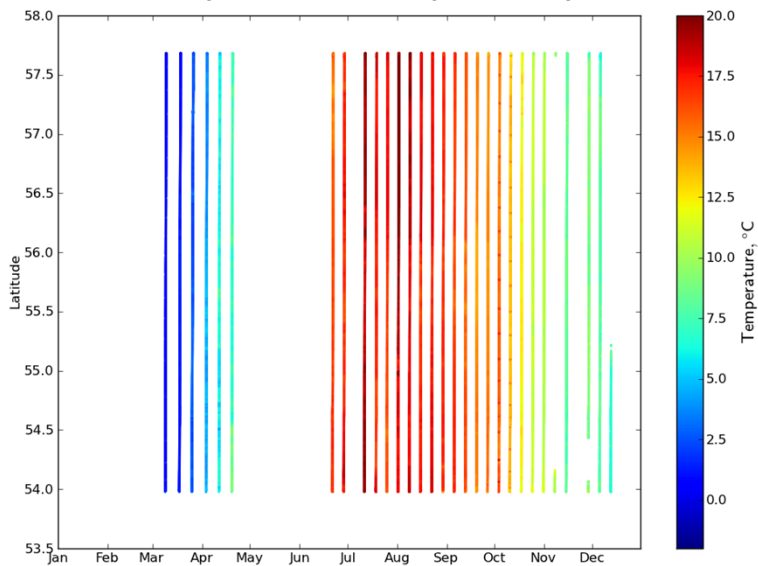
2011



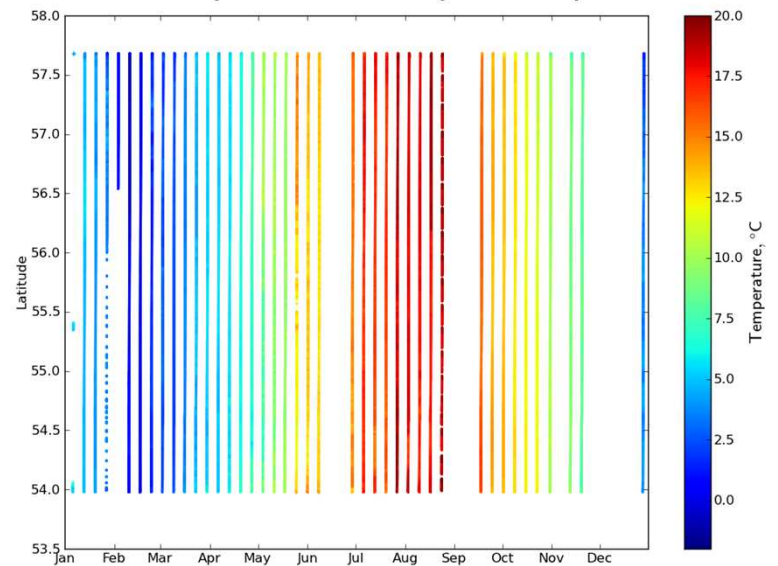
2012



Temperature Belt Sea FerryBox TransPaper 2011



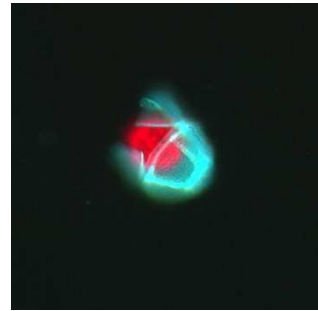
Temperature Belt Sea FerryBox TransPaper 2012



Chlorophyll in The Baltic Sea

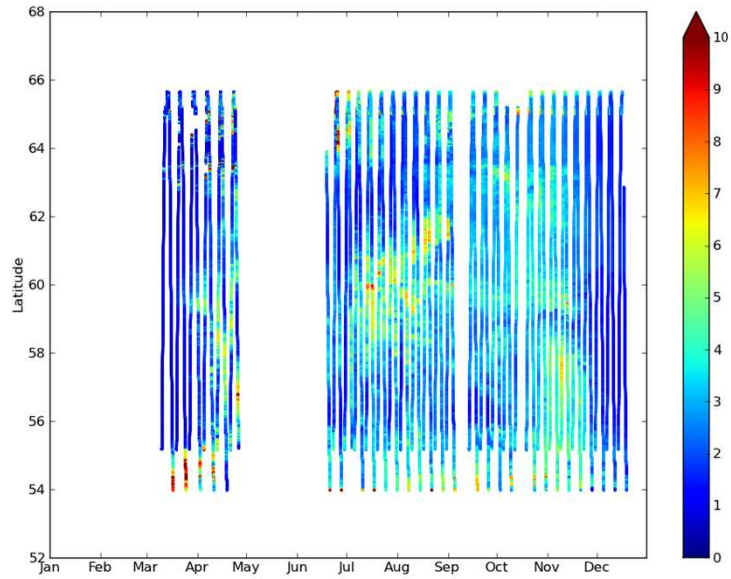


2011



2012

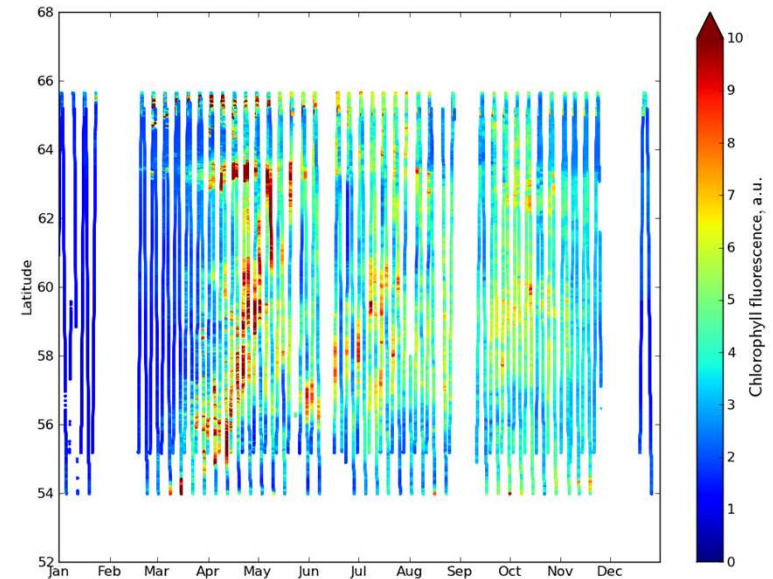
Chlorophyll fluorescence Baltic Sea FerryBox TransPaper 2011



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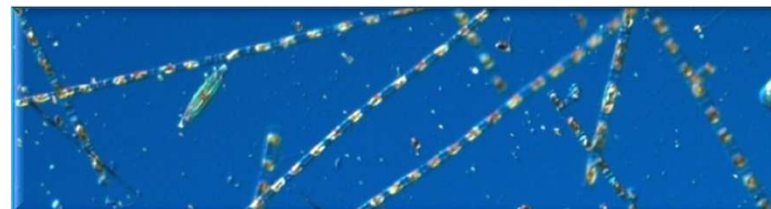
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Chlorophyll fluorescence Baltic Sea FerryBox TransPaper 2012



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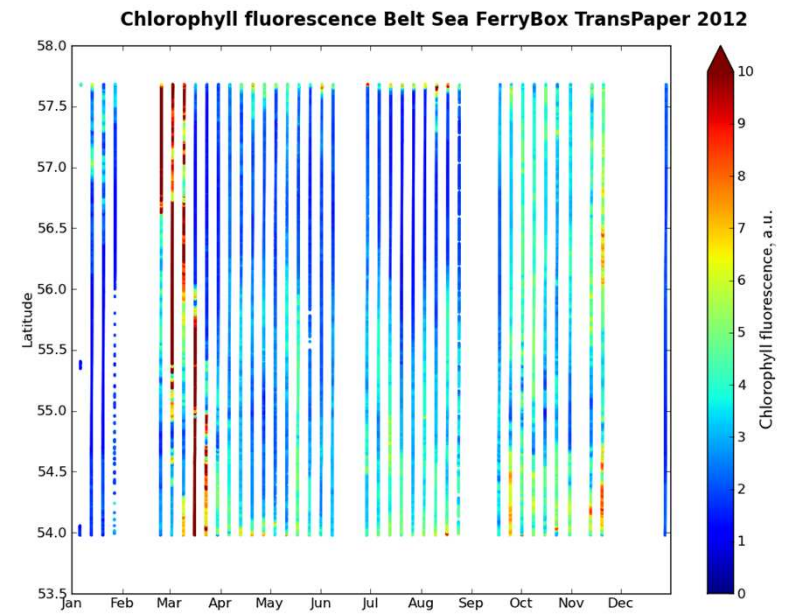
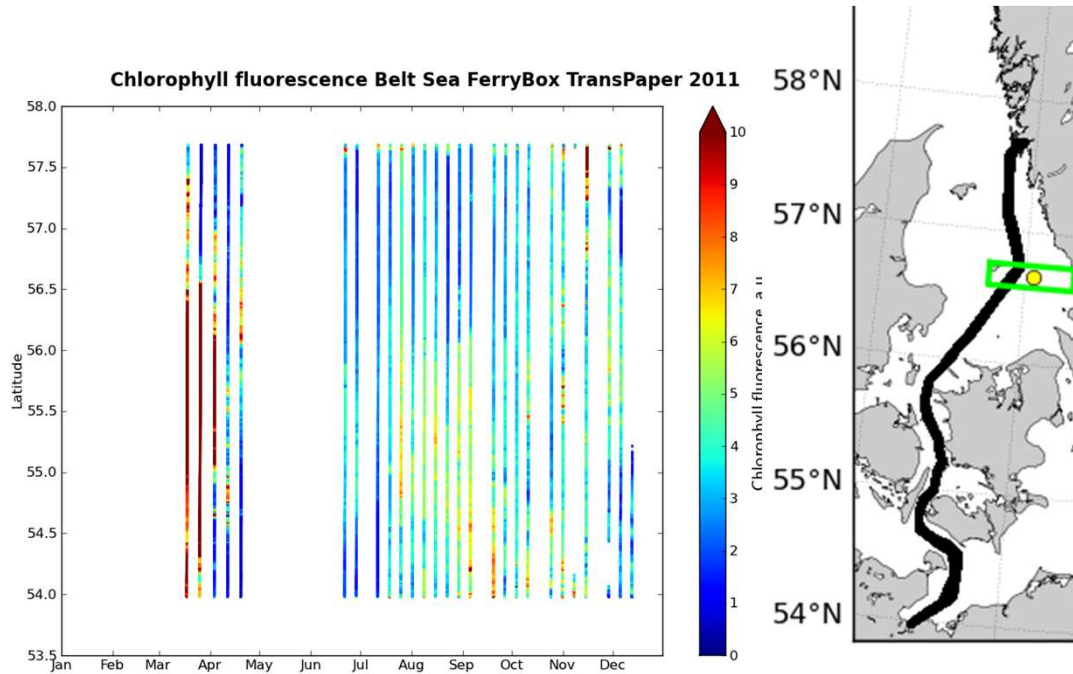


Chlorophyll in The Belt Sea and Kattegat



2011

2012

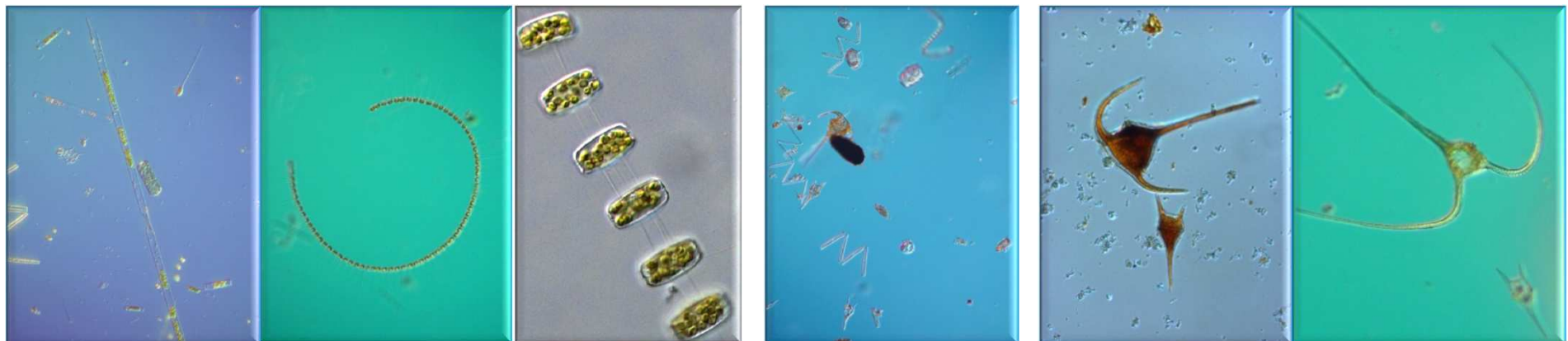


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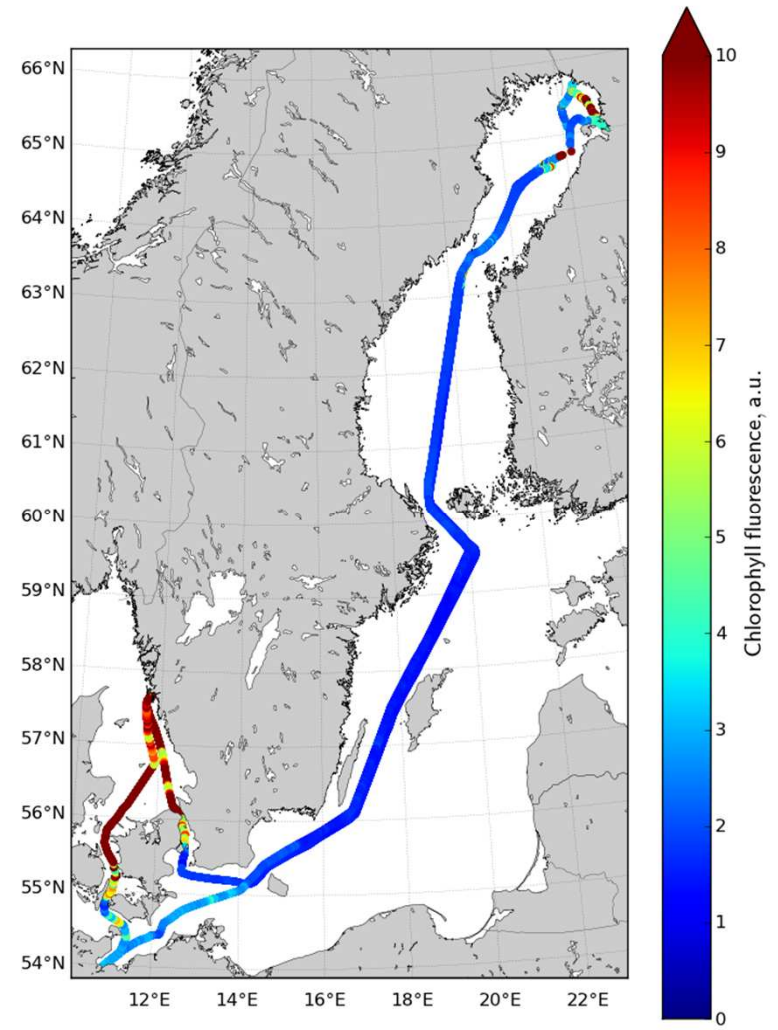
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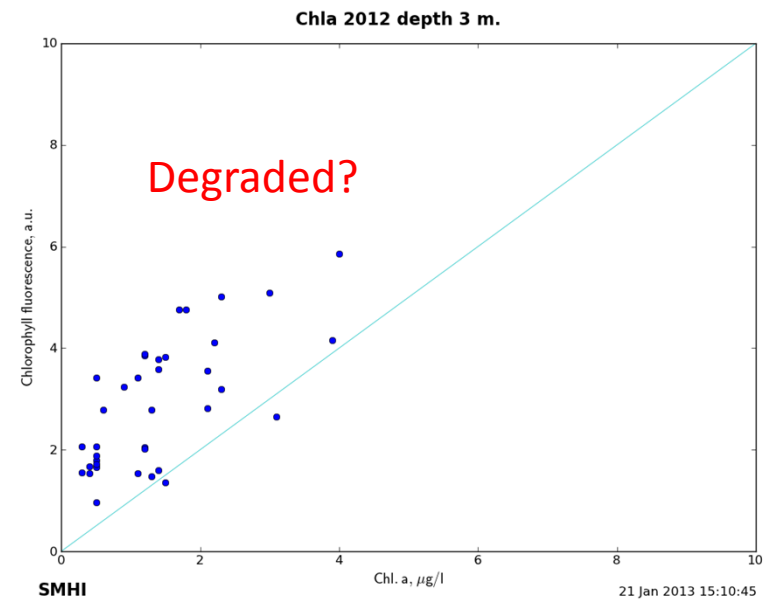
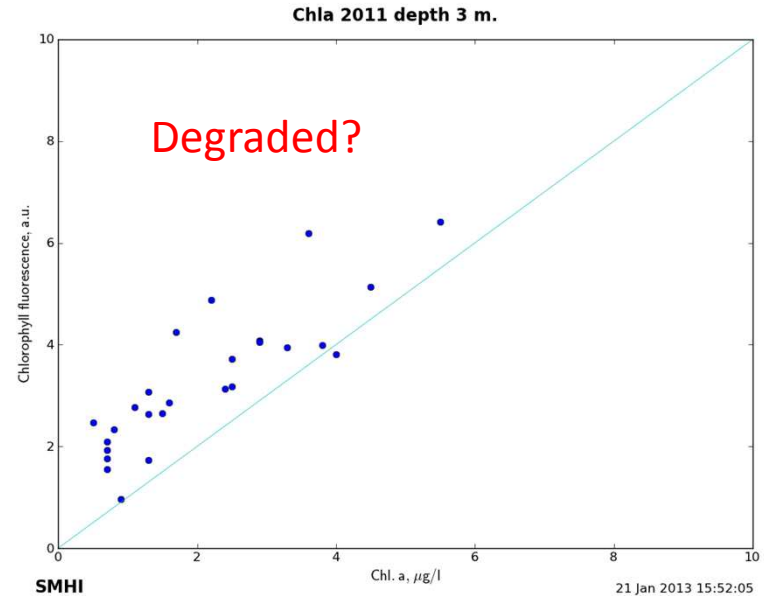
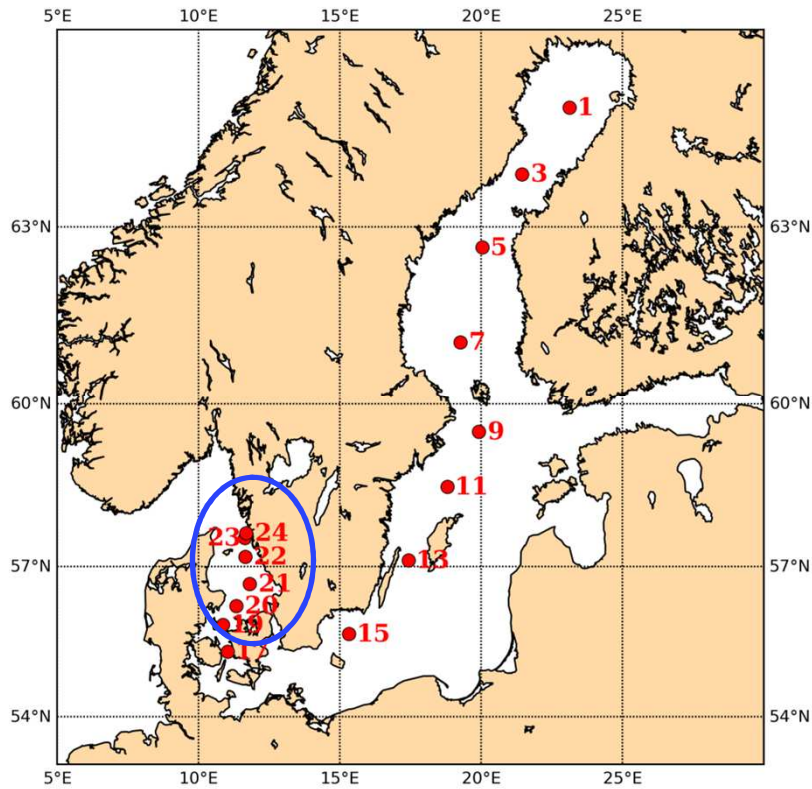
Chlorophyll fluorescence 24 Feb - 02 Mar 2012



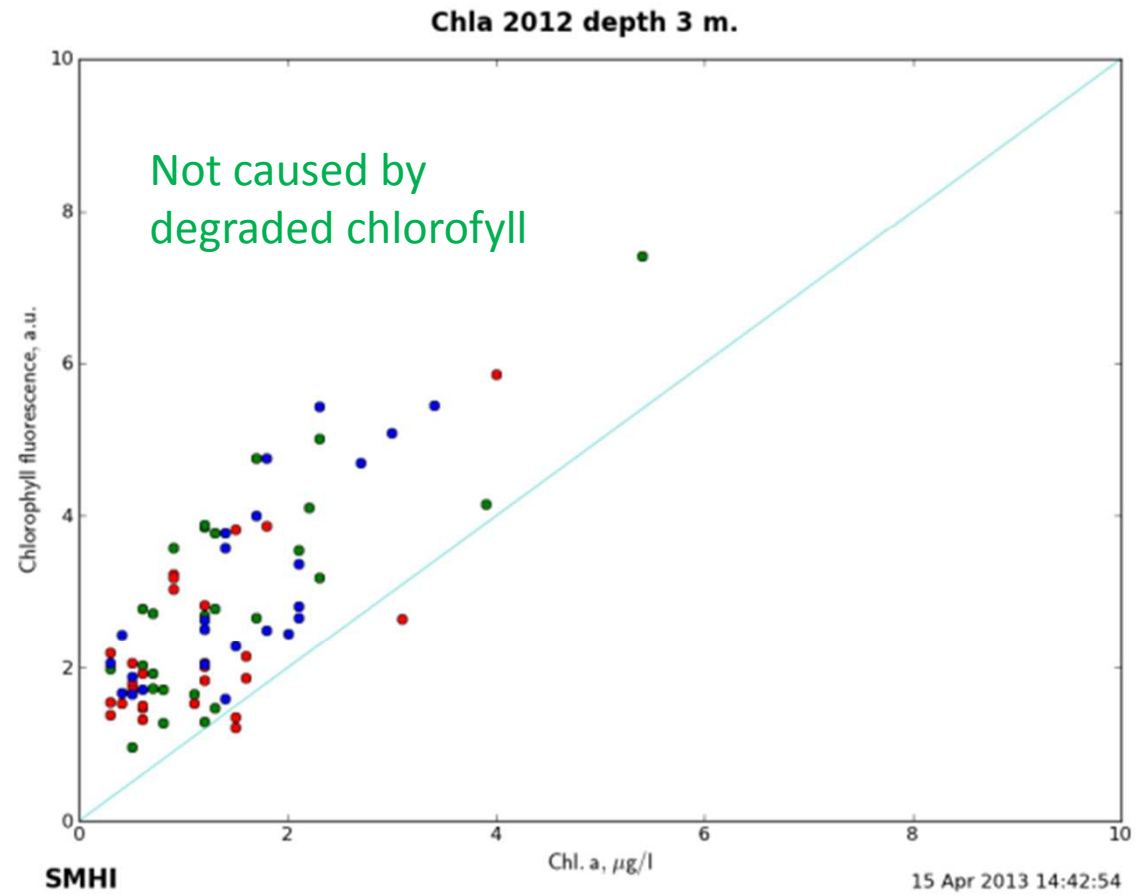
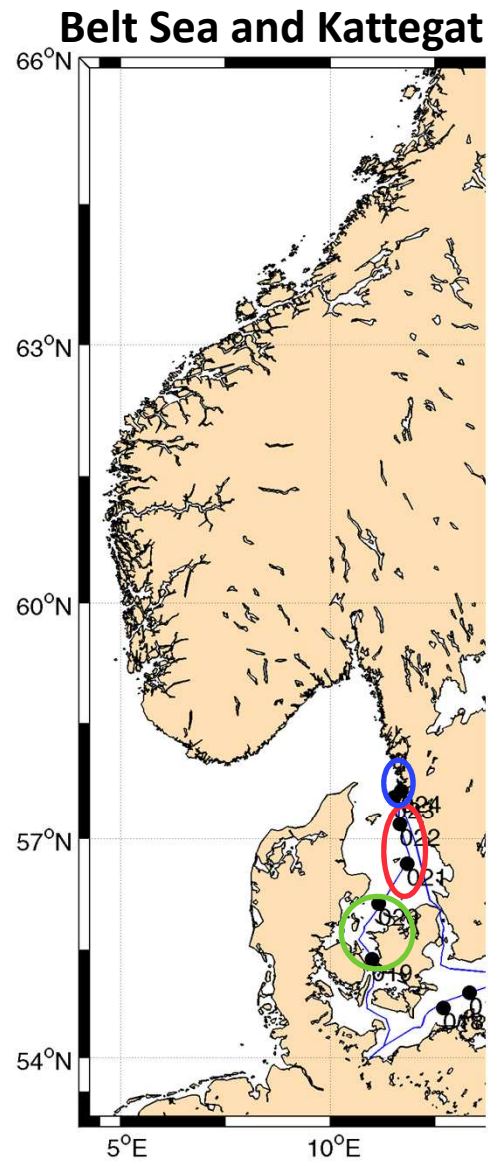
FerryBox TransPaper, depth 3 m.

Chlorophyll fluorescence vs. chlorophyll *a* ($\mu\text{g/l}$) from Bottles **SMHI**

Belt Sea and Kattegat



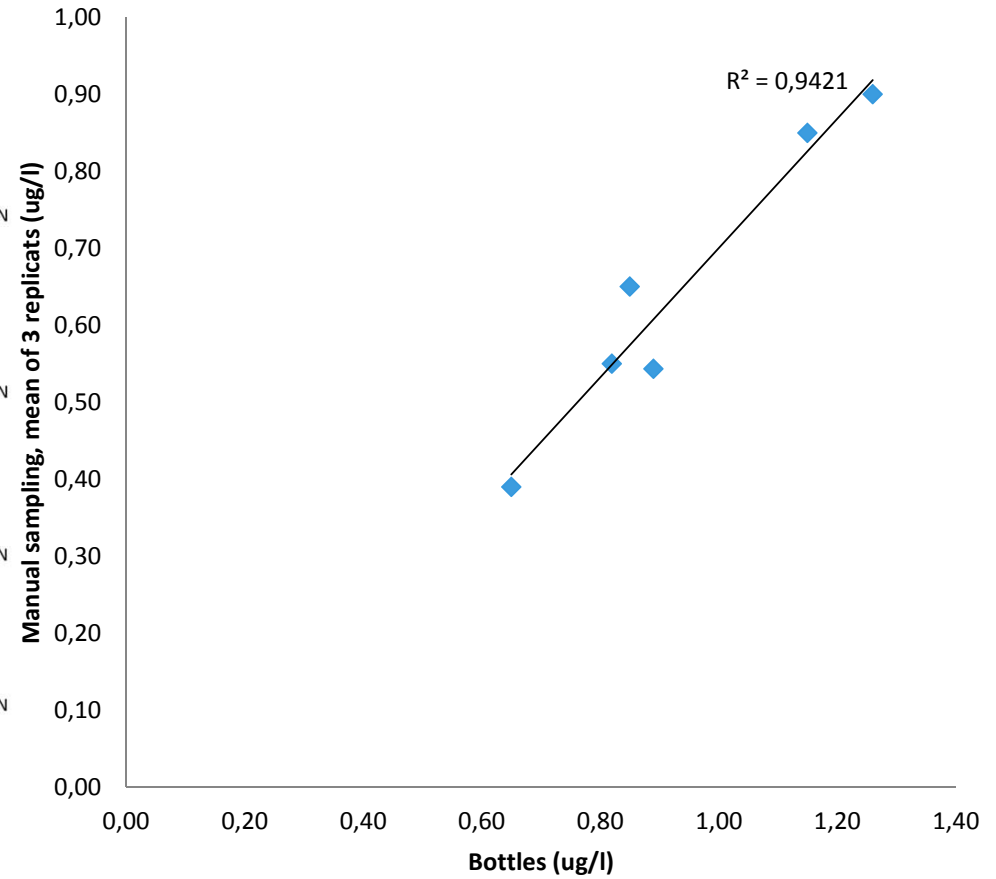
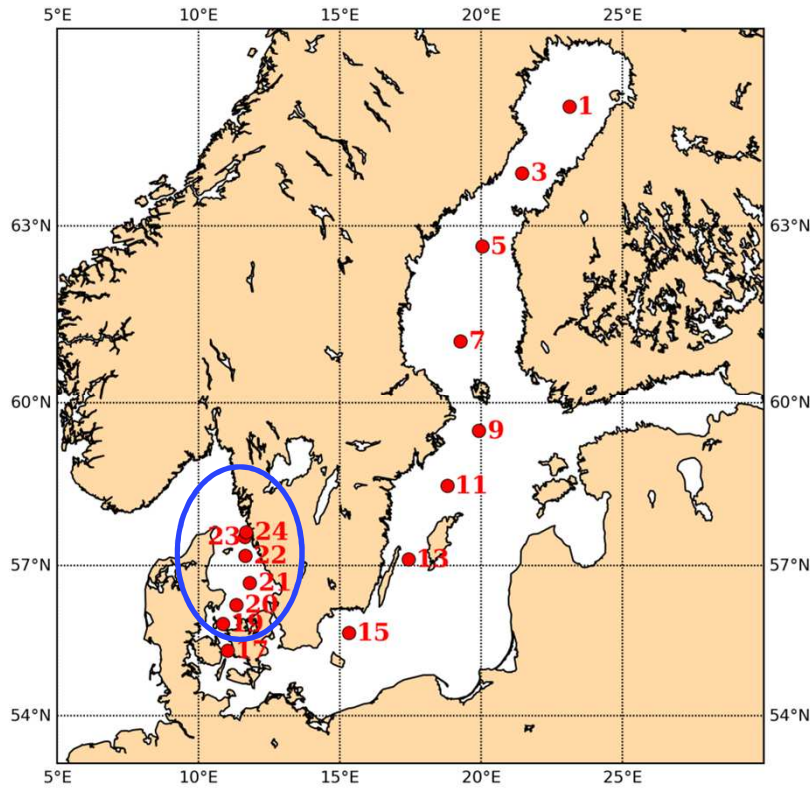
Chlorophyll fluorescence vs. chlorophyll *a* ($\mu\text{g/l}$) from Bottles **SMHI**



Chlorophyll *a* ($\mu\text{g/l}$) in Bottles vs. Manual sampling



Belt Sea and Kattegat



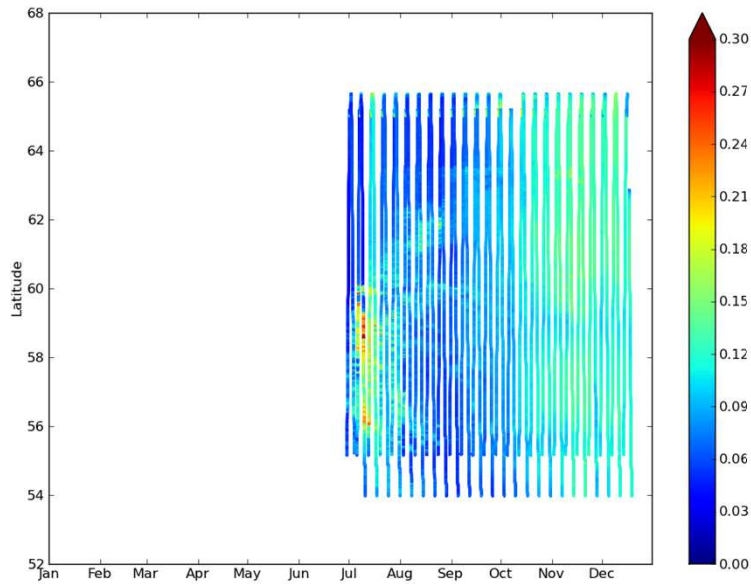
Phycocyanin in The Baltic Sea



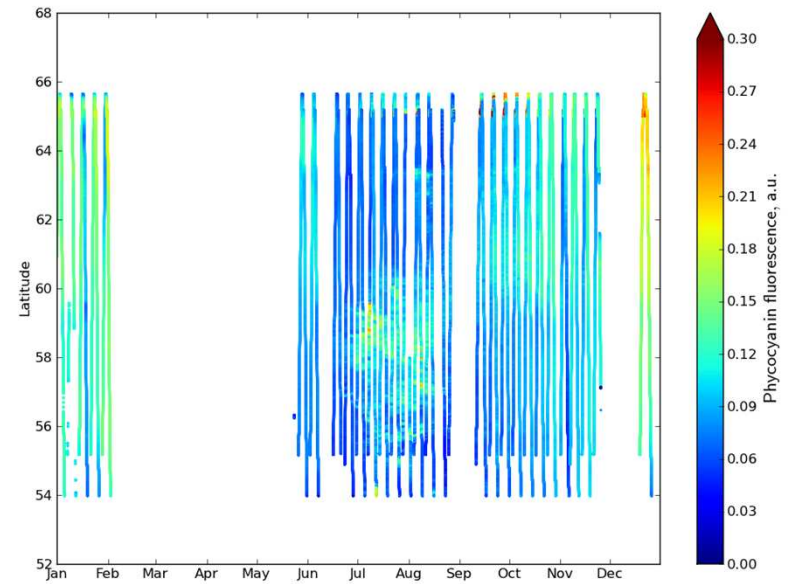
2011

2012

Phycocyanin fluorescence Baltic Sea FerryBox TransPaper 2011

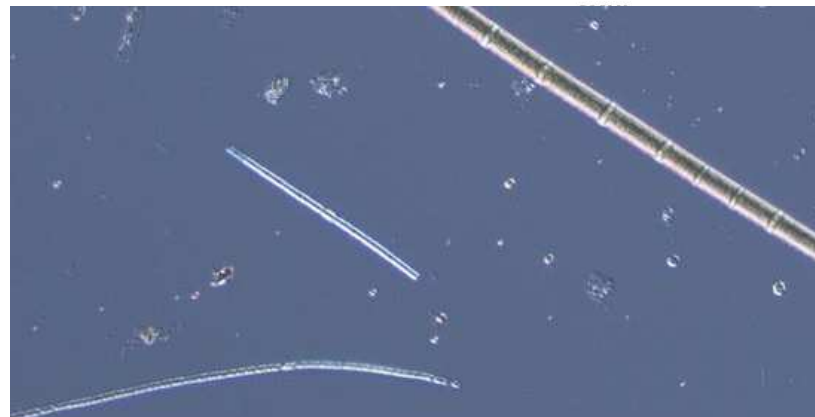


Phycocyanin fluorescence Baltic Sea FerryBox TransPaper 2012

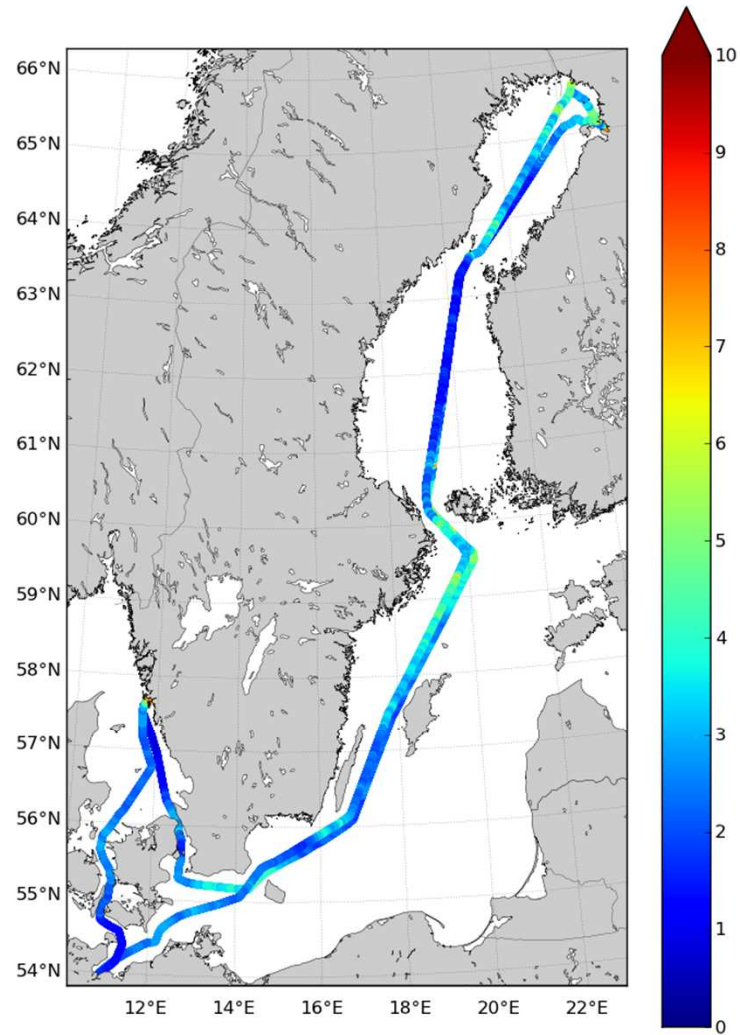


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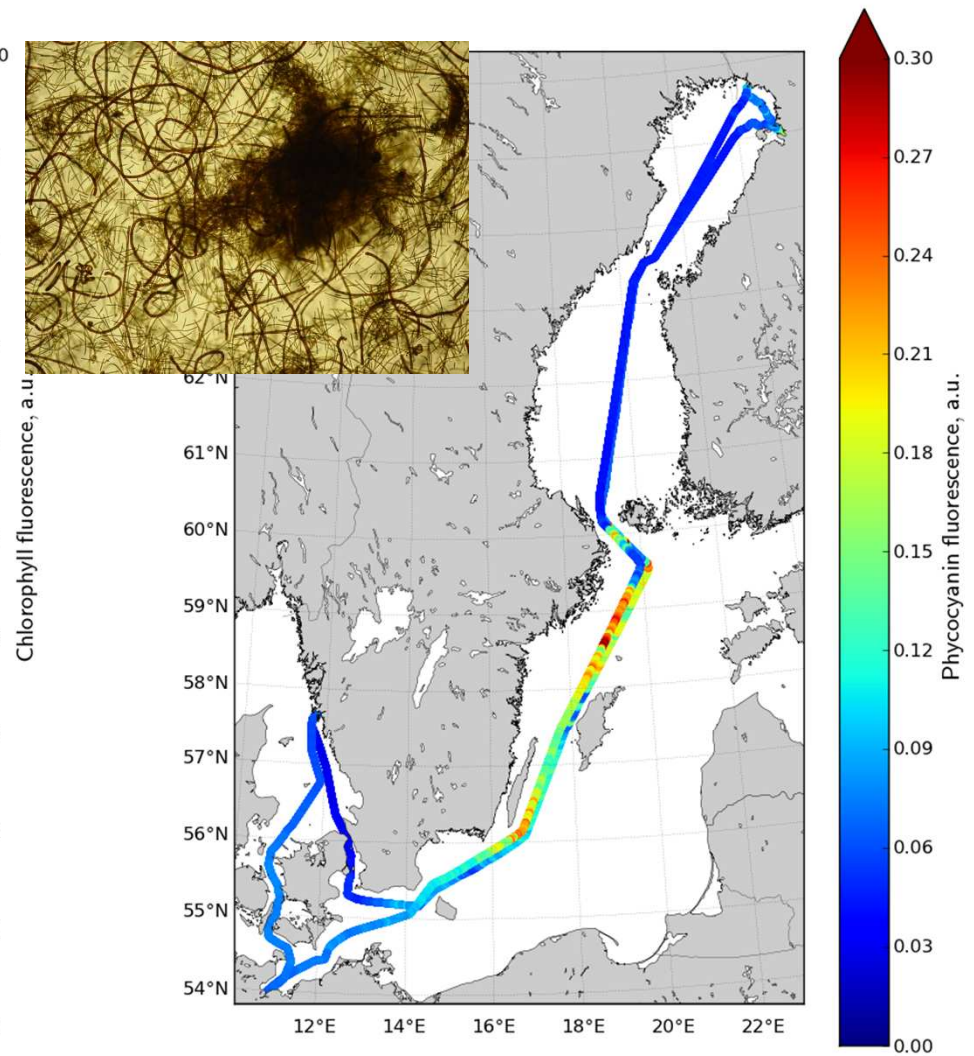


Chlorophyll fluorescence 05 Jul - 12 Jul 2011



FerryBox TransPaper, depth 3 m.

Phycocyanin fluorescence 05 Jul - 12 Jul 2011



FerryBox TransPaper, depth 3 m.

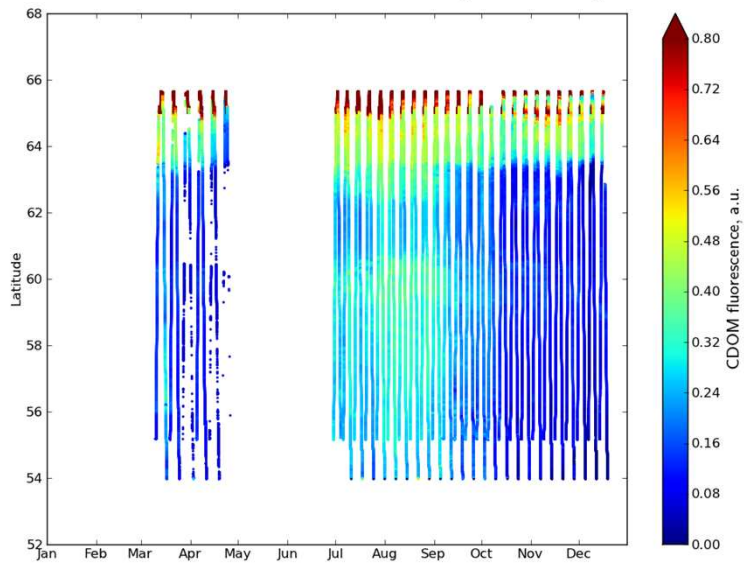
CDOM fluorescence in The Baltic Sea



2011

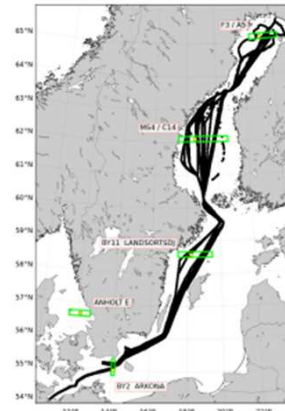
2012

CDOM fluorescence Baltic Sea FerryBox TransPaper 2011

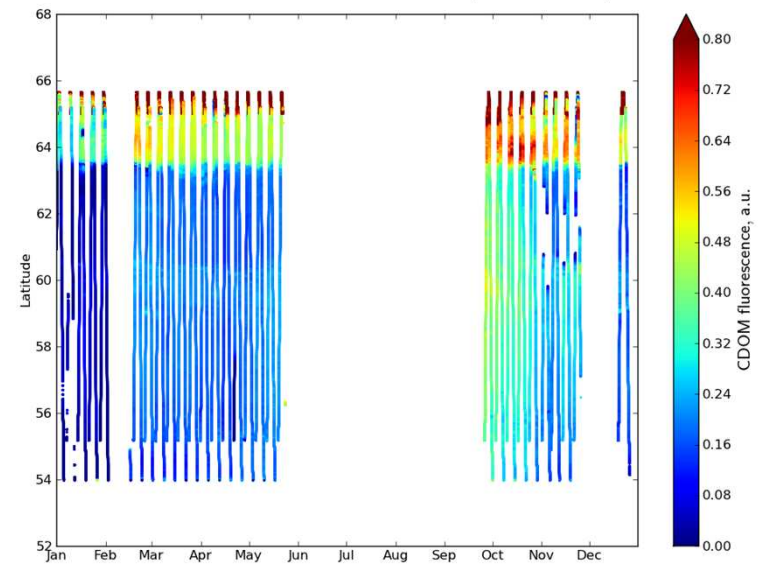


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CDOM fluorescence Baltic Sea FerryBox TransPaper 2012



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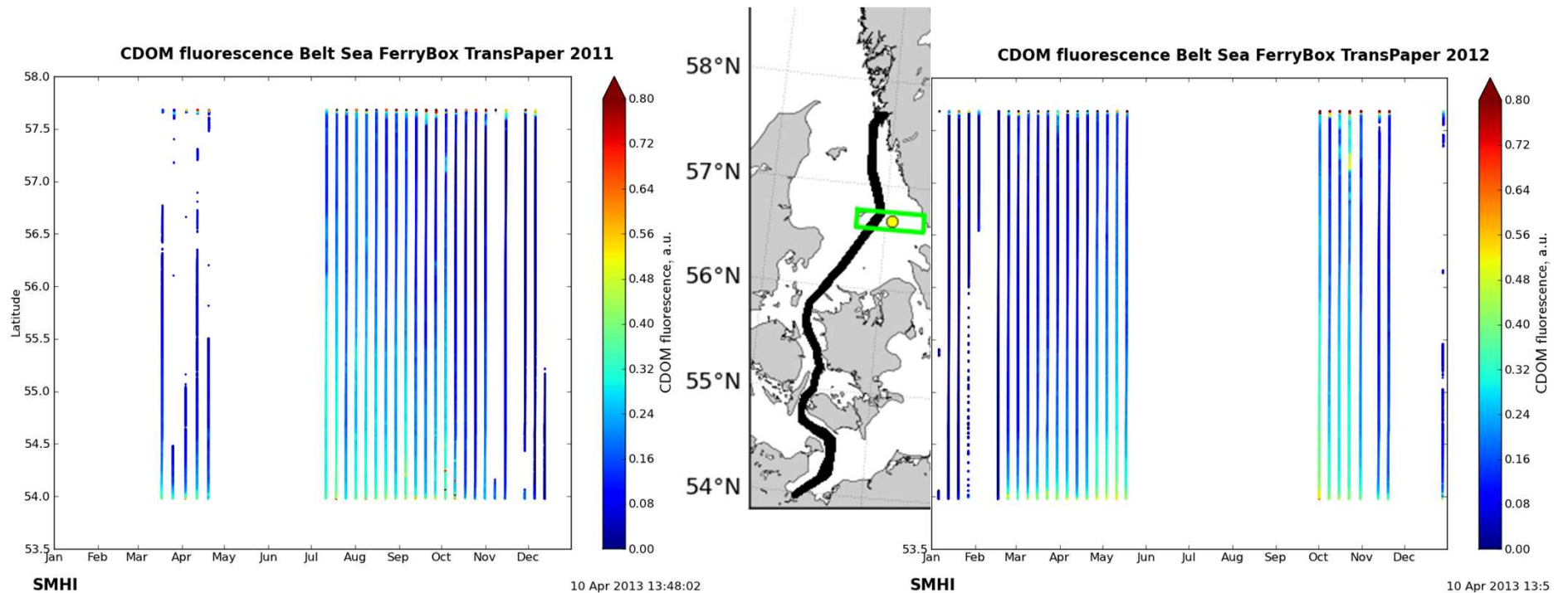
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CDOM fluorescence in The Belt Sea and Kattegat



2011

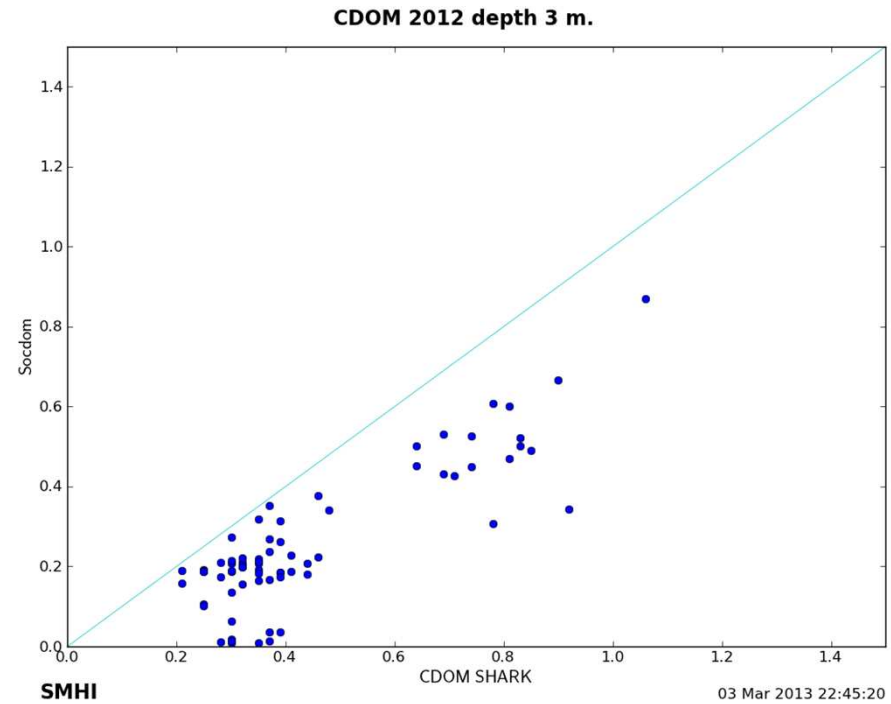
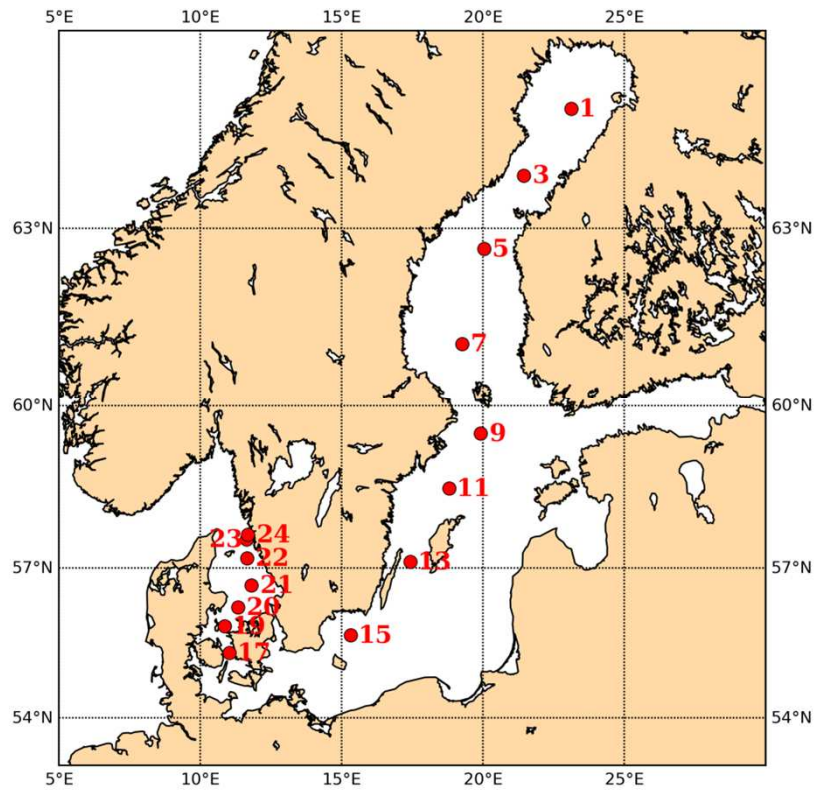
2012



CDOM fluorescence vs. CDOM from Bottles

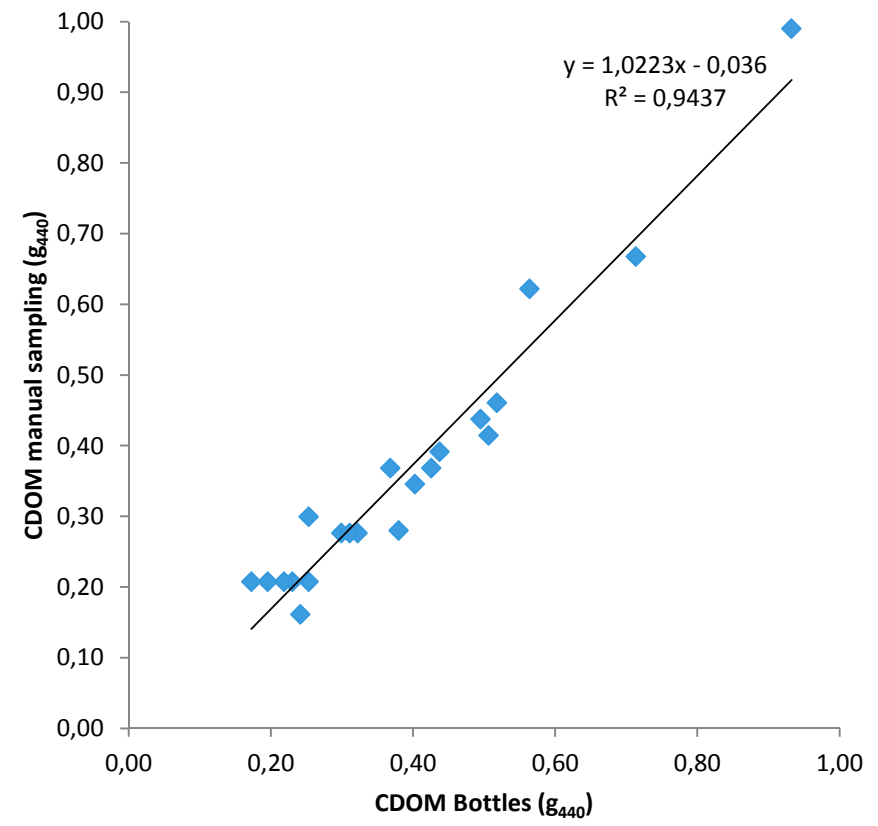
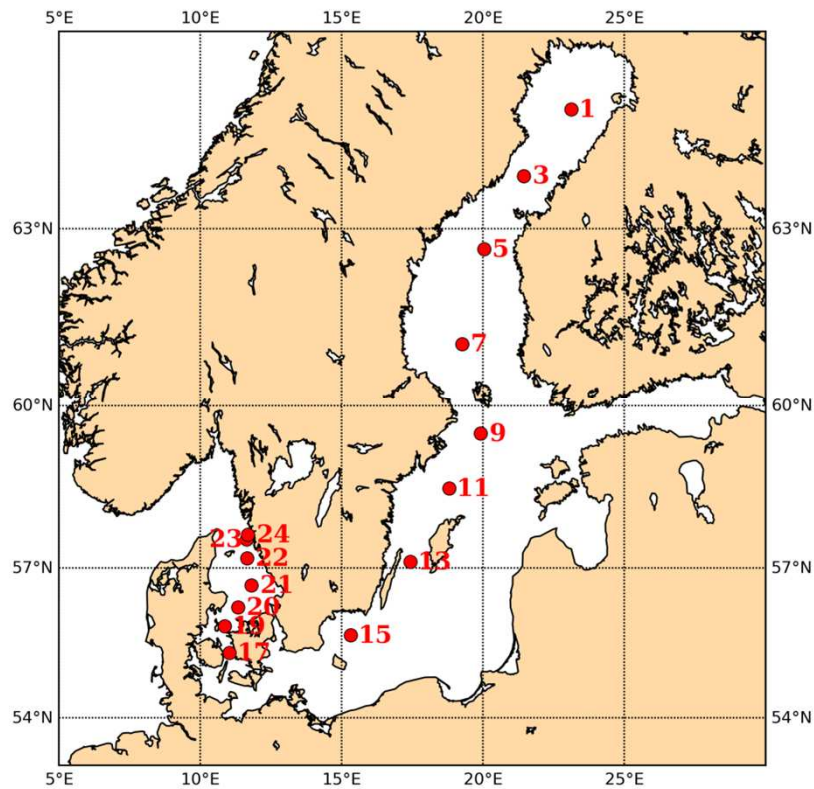


Baltic Sea 2012



$$g_{440} = \ln(10) \times (A_{440} - A_{750}) / L$$

CDOM from Bottles vs. CDOM Manual sampling



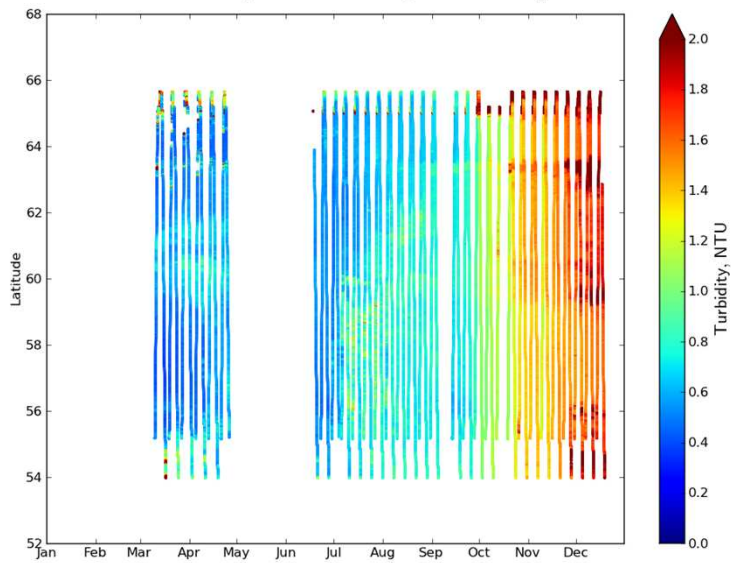
$$g_{440} = \ln(10) \times (A_{440} - A_{750}) / L$$

Turbidity in The Baltic Sea



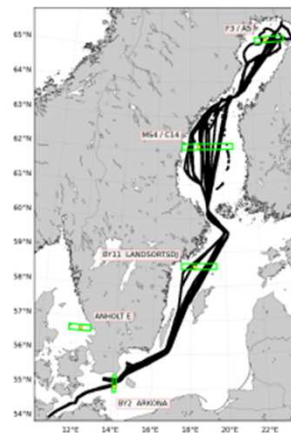
2011

Turbidity Baltic Sea FerryBox TransPaper 2011



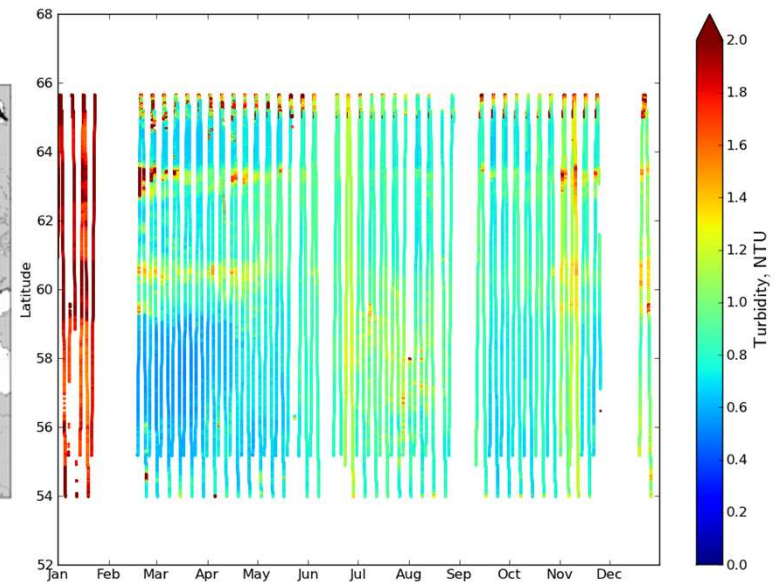
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10 Apr 2013 12:19:14



2012

Turbidity Baltic Sea FerryBox TransPaper 2012



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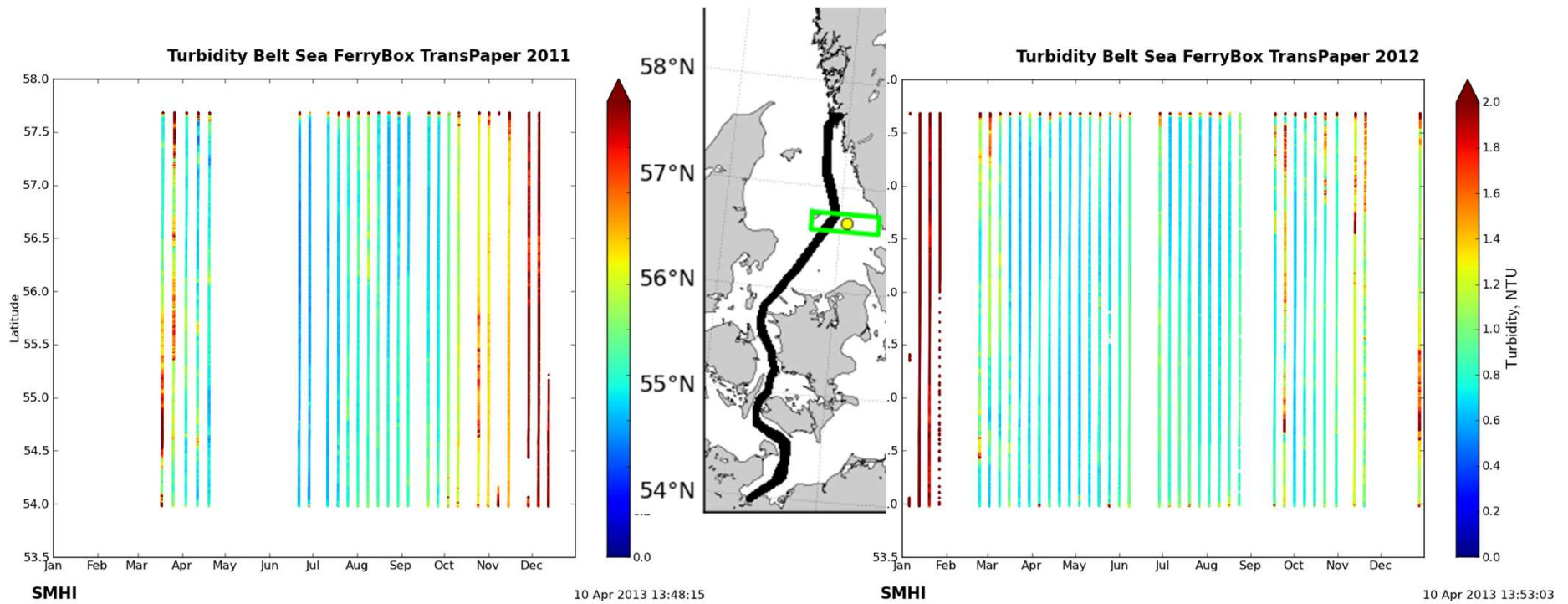
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Turbidity in The Belt Sea and Kattegat



2011

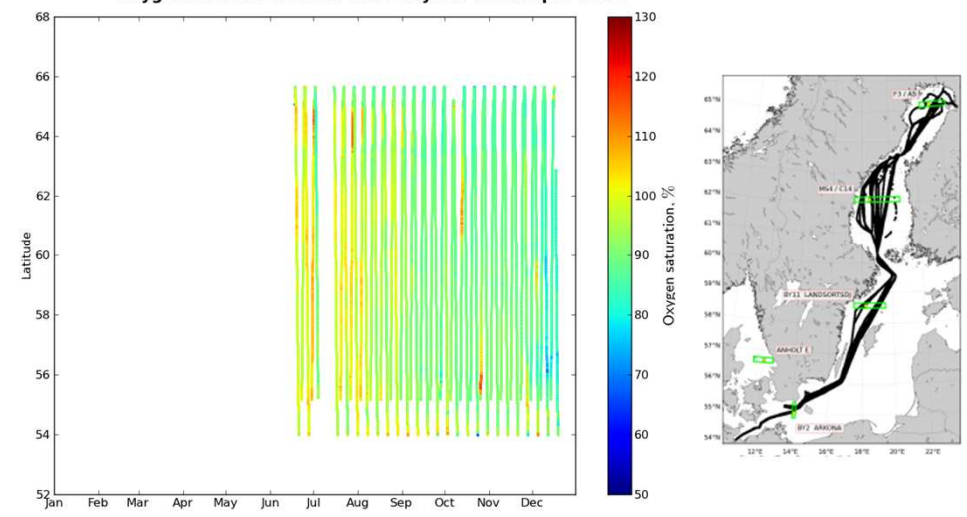
2012



Oxygen in The Baltic Sea



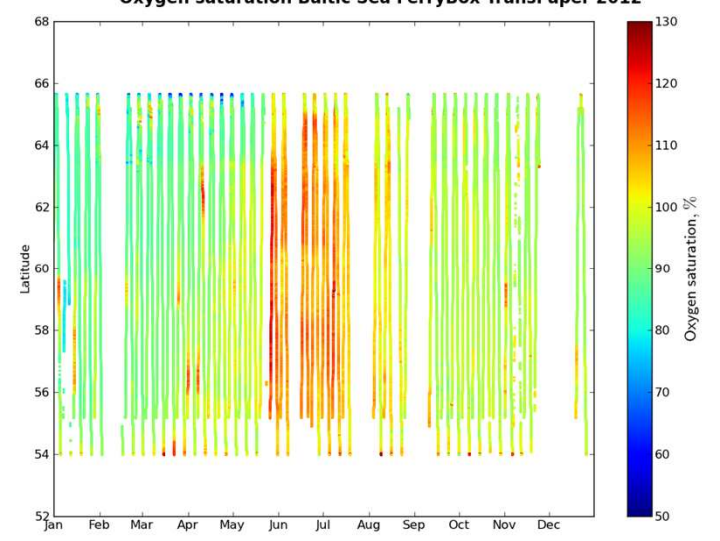
Oxygen saturation Baltic Sea FerryBox TransPaper 2011



SMHI

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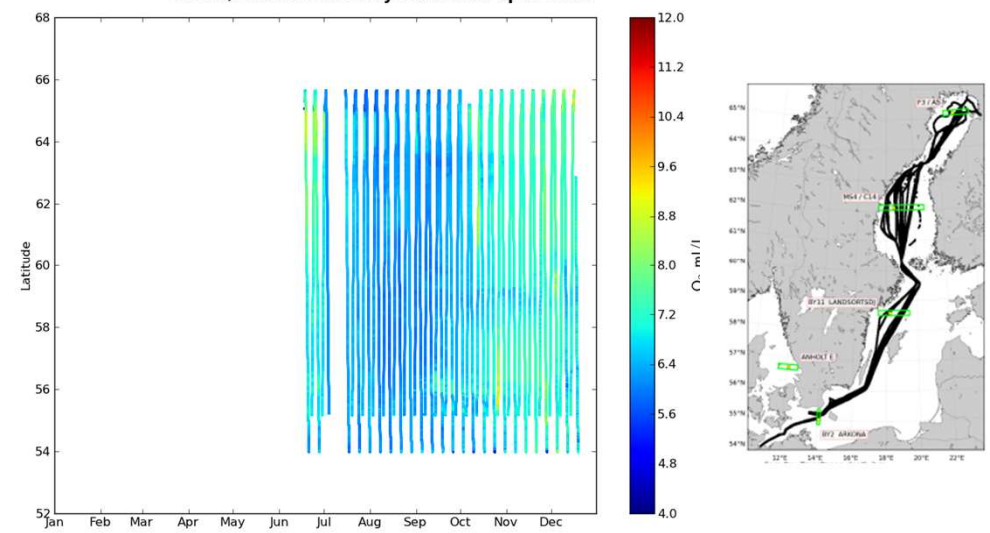
Oxygen saturation Baltic Sea FerryBox TransPaper 2012



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10 Apr 2013 12:35:53

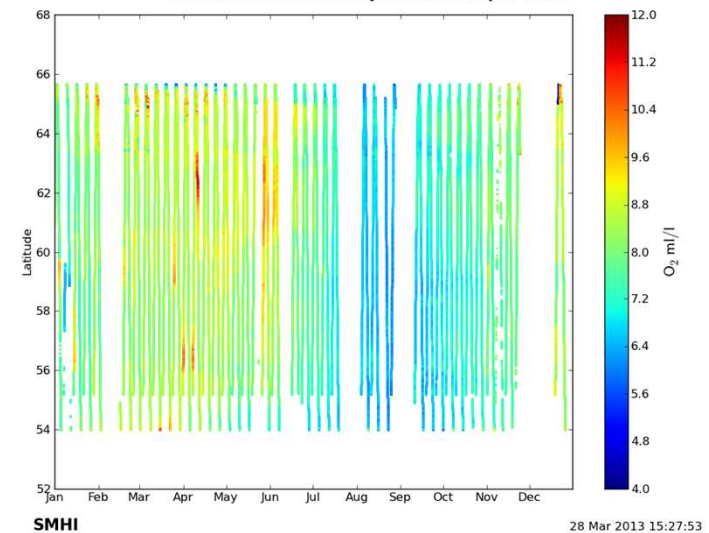
O2 ml/l Baltic Sea FerryBox TransPaper 2011



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28 Mar 2013 15:14:22

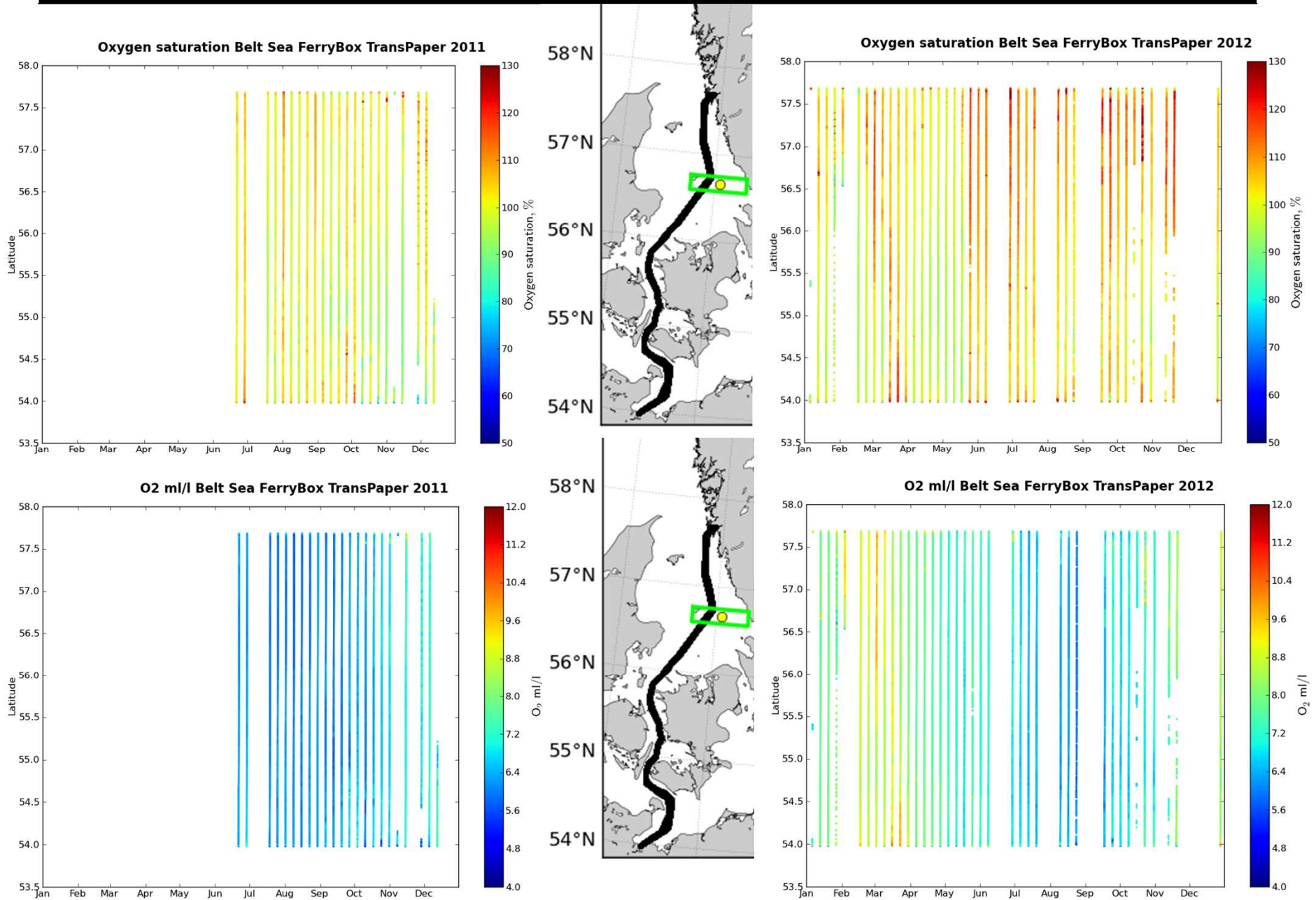
O2 ml/l Baltic Sea FerryBox TransPaper 2012



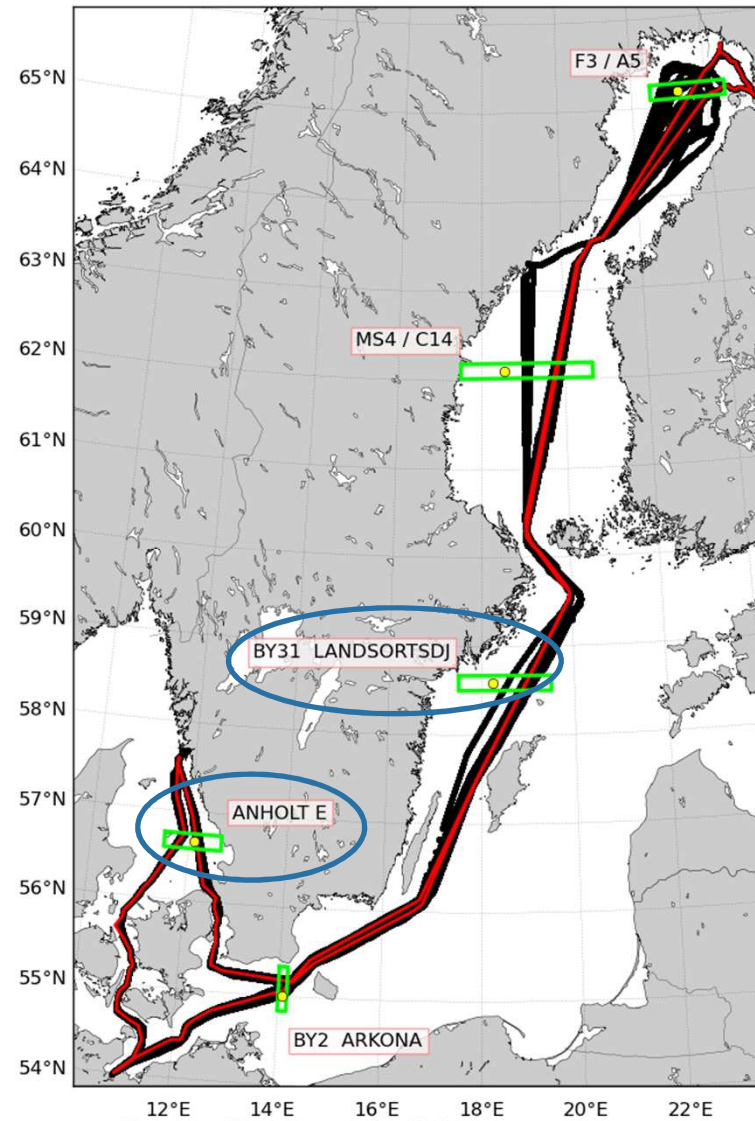
SMHI

28 Mar 2013 15:27:53

Oxygen in The Belt Sea and The Kattegat



FerryBox vs research vessel



FerryBox vs research vessel

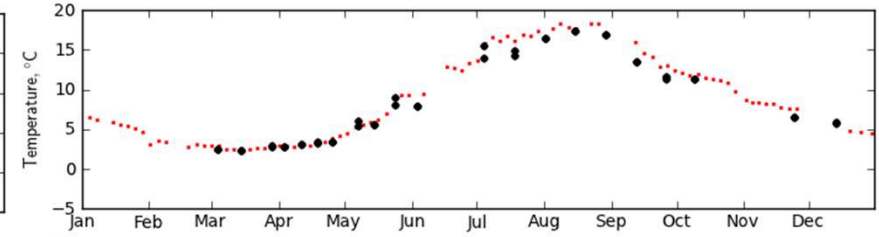
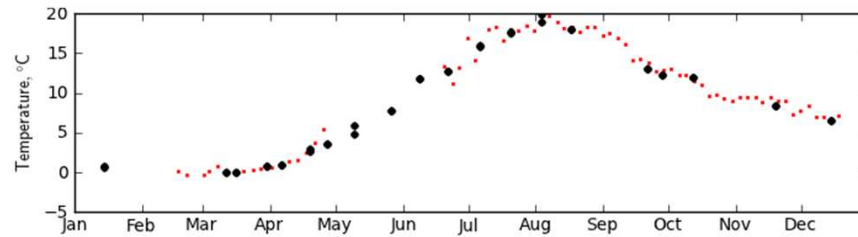


Station Landsort deep in the Baltic Proper

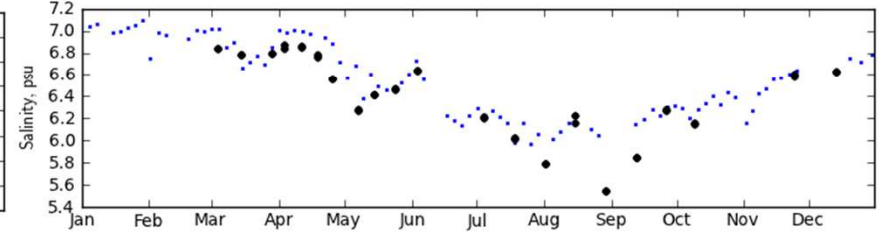
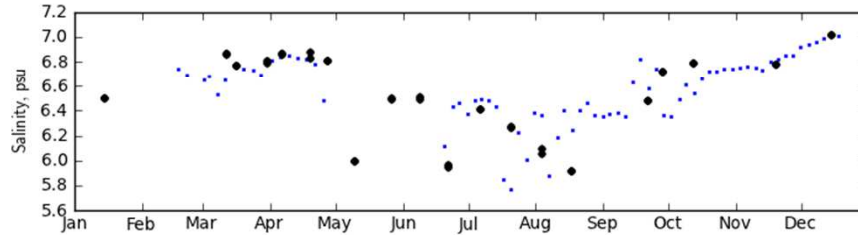
2011

2012

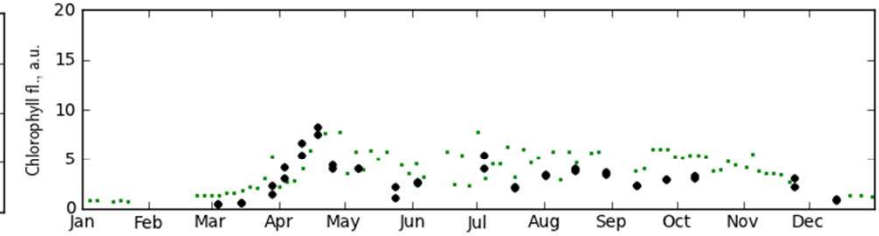
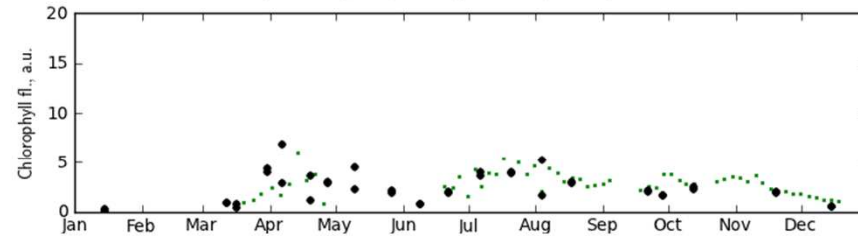
Temp.



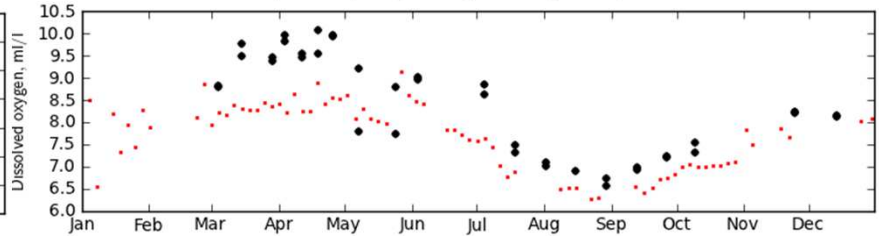
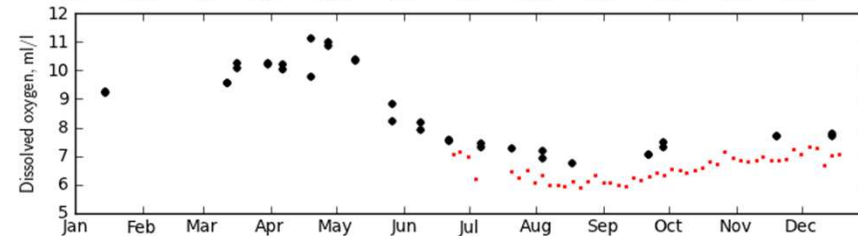
Salin.



Chl. *a*

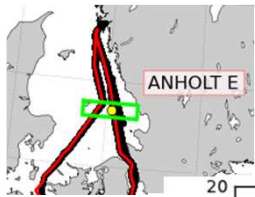


O₂

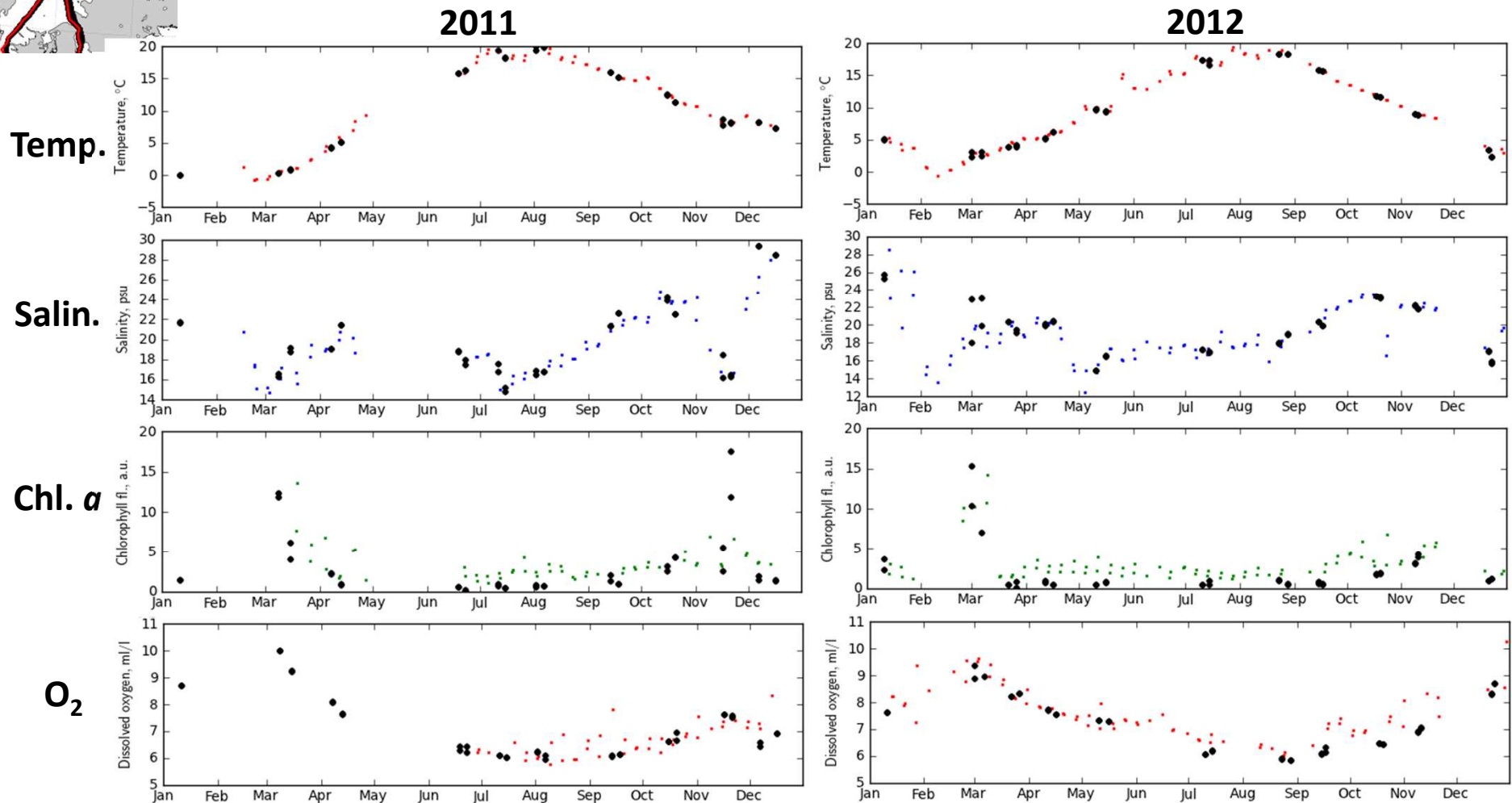


Coloured dots represent FerryBox data from 3 m
Black dots represent samples from 0 and 5 m

FerryBox vs. research vessel



Station Anholt E in the Kattegat



Coloured dots represent FerryBox data from 3 m
Black dots represent samples from 0 and 5 m

Other data that will be presented elsewhere

- Phytoplankton in 2011
- pCO₂ part of 2011 and 2012
- pH part of 2011 and part of 2012

Acknowledgements

Thanks to:

TransAtlantic AB

The captains, chief engineers and the crew of TransPaper

The staff of the SMHI oceanographic laboratory in Gothenburg

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The Swedish Agency for Marine and Water Management

Umeå University, Umeå Marine Sciences Centre

University of Stockholm, Department of Ecology, Environment and Plant Sciences