

Validation of in Situ chlorophyll fluorescence in ferrybox systems against laboratory analysis

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Detectors on board FINNMAID

On-the-run measurements on-board

position and time

in vivo fluorescence (440/680 nm) for Chla

in vivo fluorescence (600/640nm, since 2005) for

phycocyanin

salinity (conductivity)

temperature

both inside the bubbling chamber and inside the pipe
prior to the chamber

turbidity (since 2005)

Alg@line highlights



1991: the first recordings on-route Helsinki-Tallinn with Georg Ots

1992: the system installed on-board Finnjet

1993: the "official" launch of Alg@line

1997: Finnish-Estonian operative monitoring system of the state of the Gulf of Finland

- Finnish Institute of Marine Research
- Estonian Marine Institute
- Uusimaa Regional Environment Centre
- City of Helsinki Environment Centre

2003-2005 : Ferrybox EU project

2005- 2008: ESA/MarCoast baseline service

2008: Cooperation with SMHI for Oulu-Göteborg route



Near real time observations on commercial ferries

Time, location, from GPS

Salinity

Temperature

Chlorophyll

Phycocyanin

Turbidity

Water samples

Traspaper in cooperation with SMHI

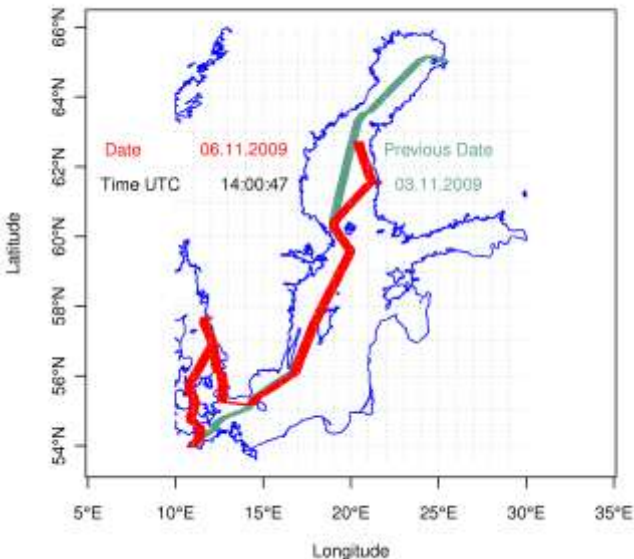
Finnmair in cooperation with IOW

Silja Serenade in cooperation with

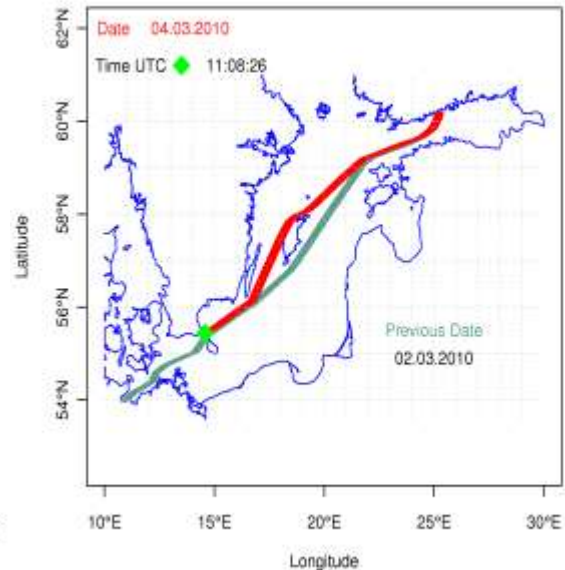
Uusimaan ELY center and Helsinki

Environment Center

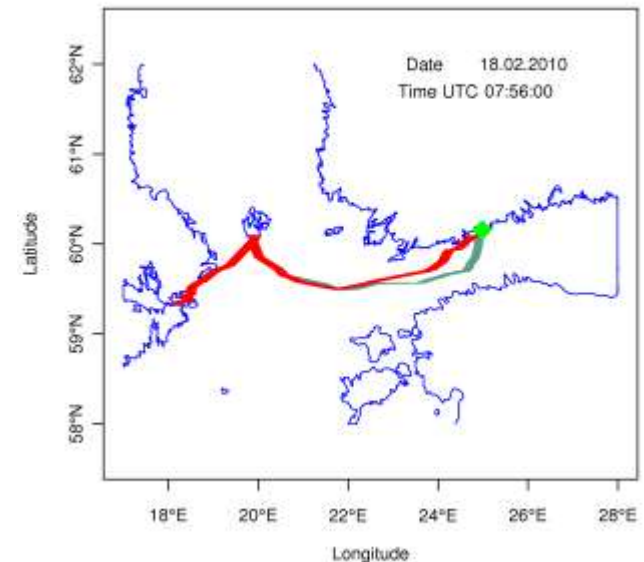
TRANSPAPER Ferry Route



FINNMAID Ferry Route

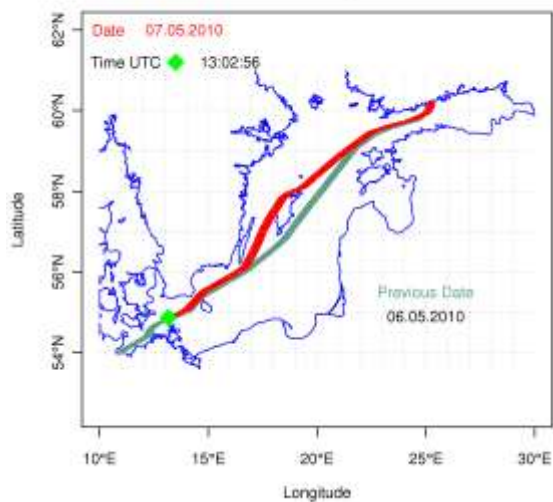


Silja Serenade Ferry Route

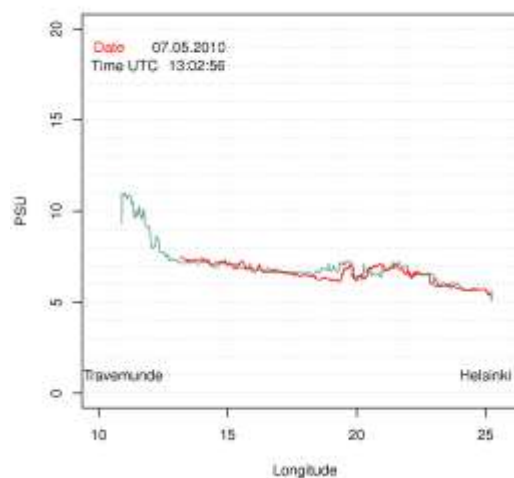


Observations durin the spring bloom on FINNMAID

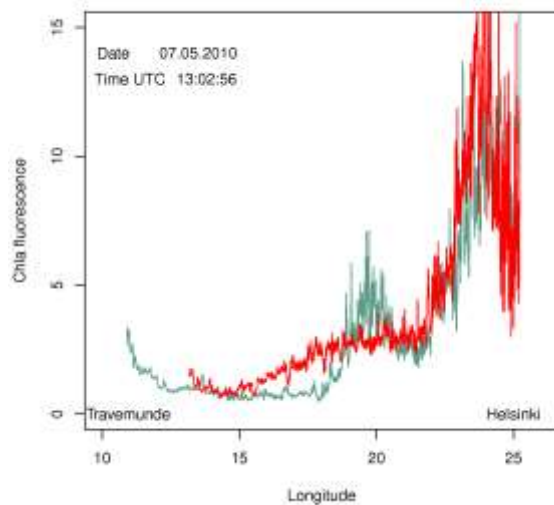
FINNMAID Ferry Route



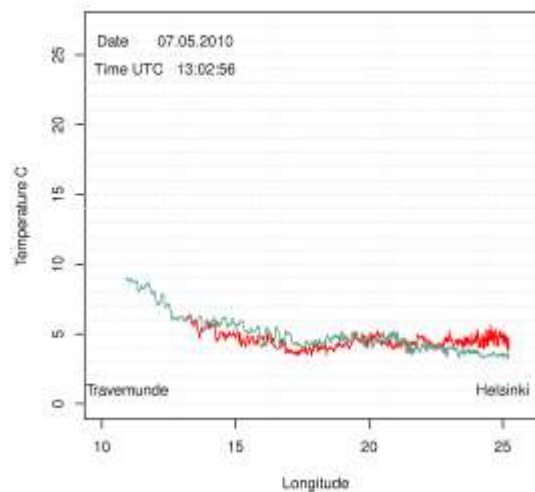
Salinity



Chla fluorescence



Temperature of incoming water



Detectors and the water sampler



Debubler

Fluorometr

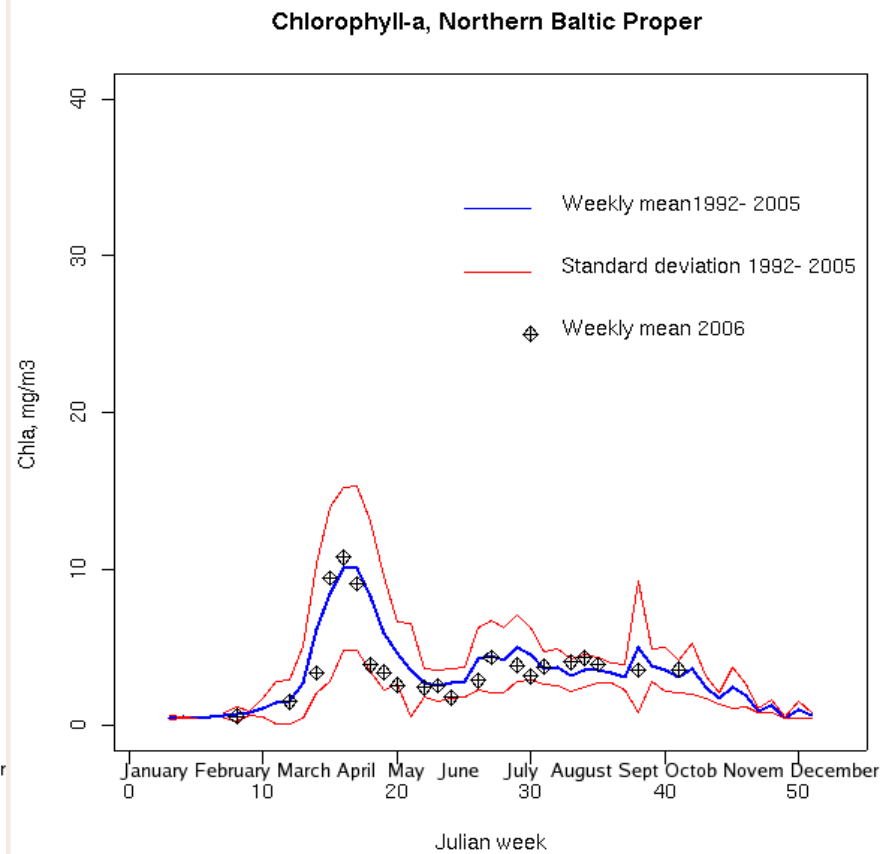
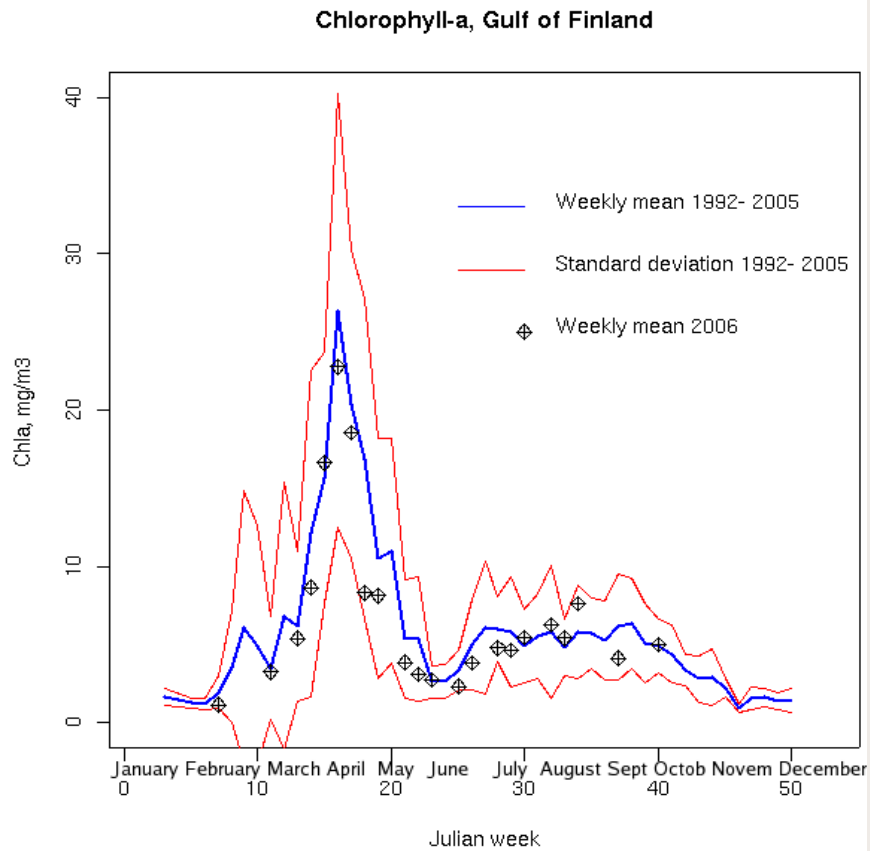
Termo-
salinograph

Automatic
Washing



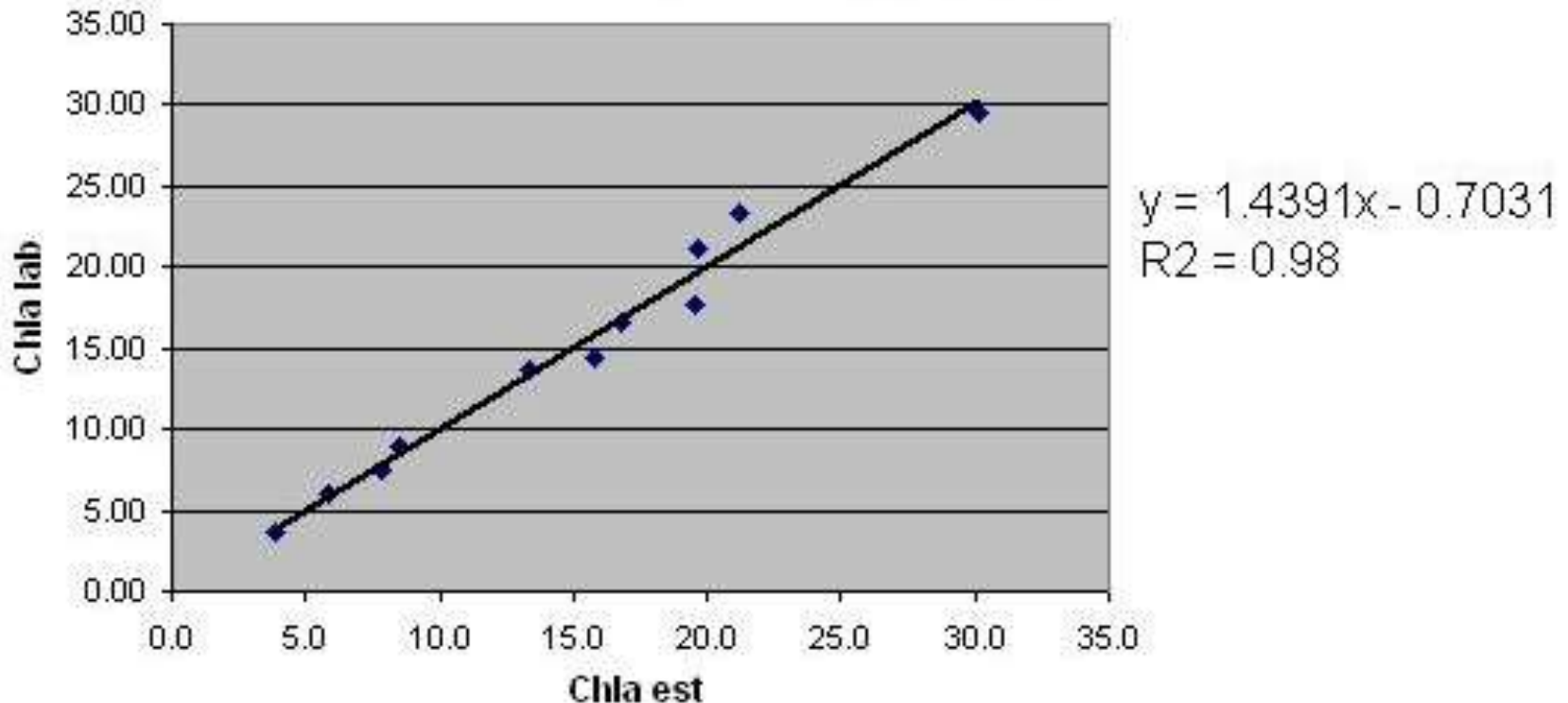
Water Sampler

Annual variation of chlorophyll a (mg m⁻³) in the Western Gulf of Finland and in the Northern Baltic Proper



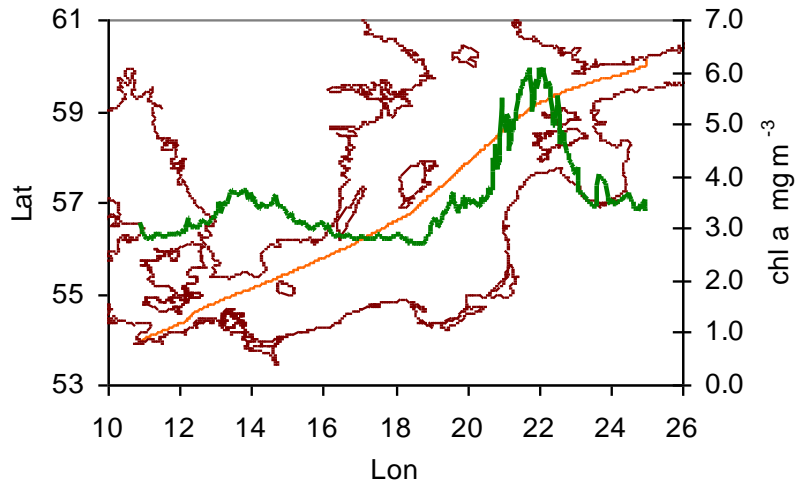
Chlorophyll a validation of chlorophyll-a fluorescence against chlorophyll-a analysis with extraction.

Chla est versus chla lab
Fnnpartner 26.04.2006

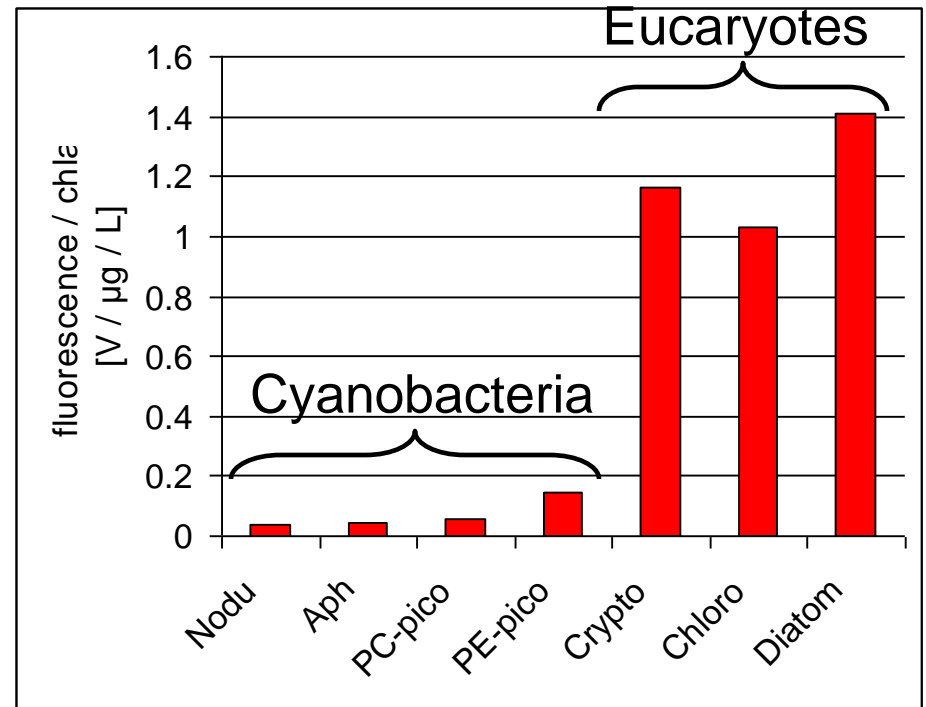


Detection of Baltic Cyanobacteria

Optical detection of phytoplankton typically yields a bulk Chlorophyll *a* signal, no taxonomic information.

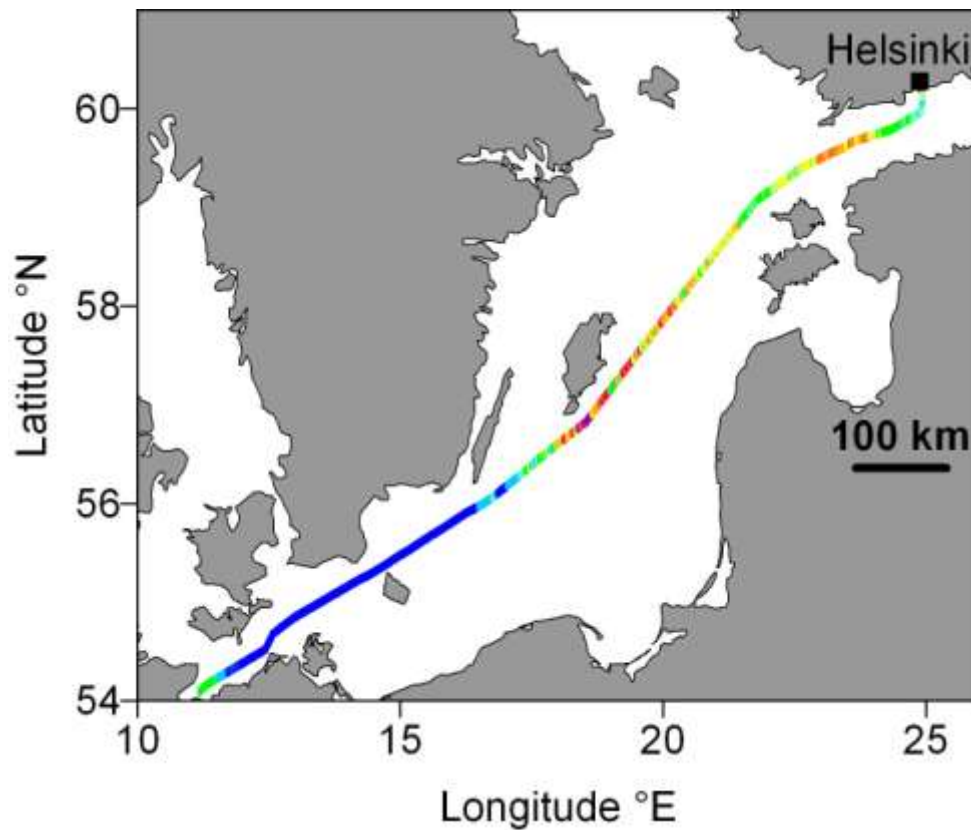


Chl *a* in living cyanobacterial cells fluoresces very weakly.

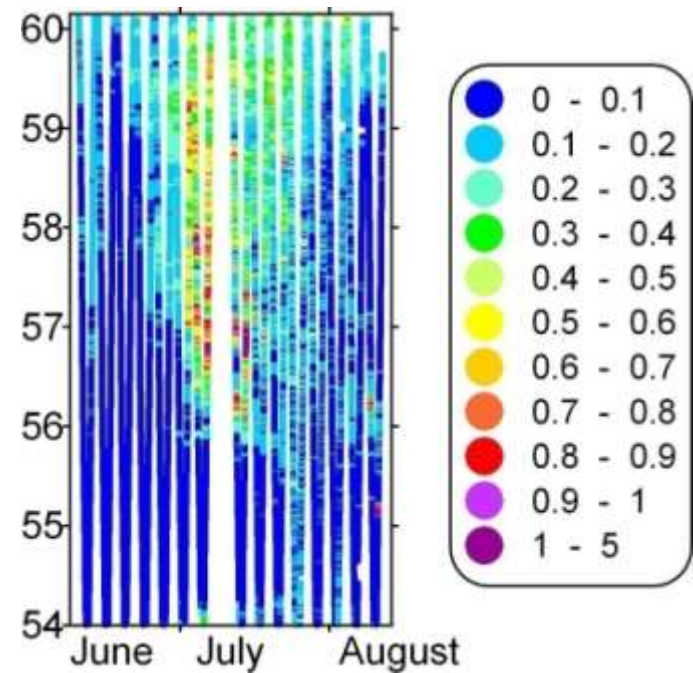


Phycocyanin Fluorescence in the Baltic Sea

Phycocyanin fluorescence,
July 5-7, 2005

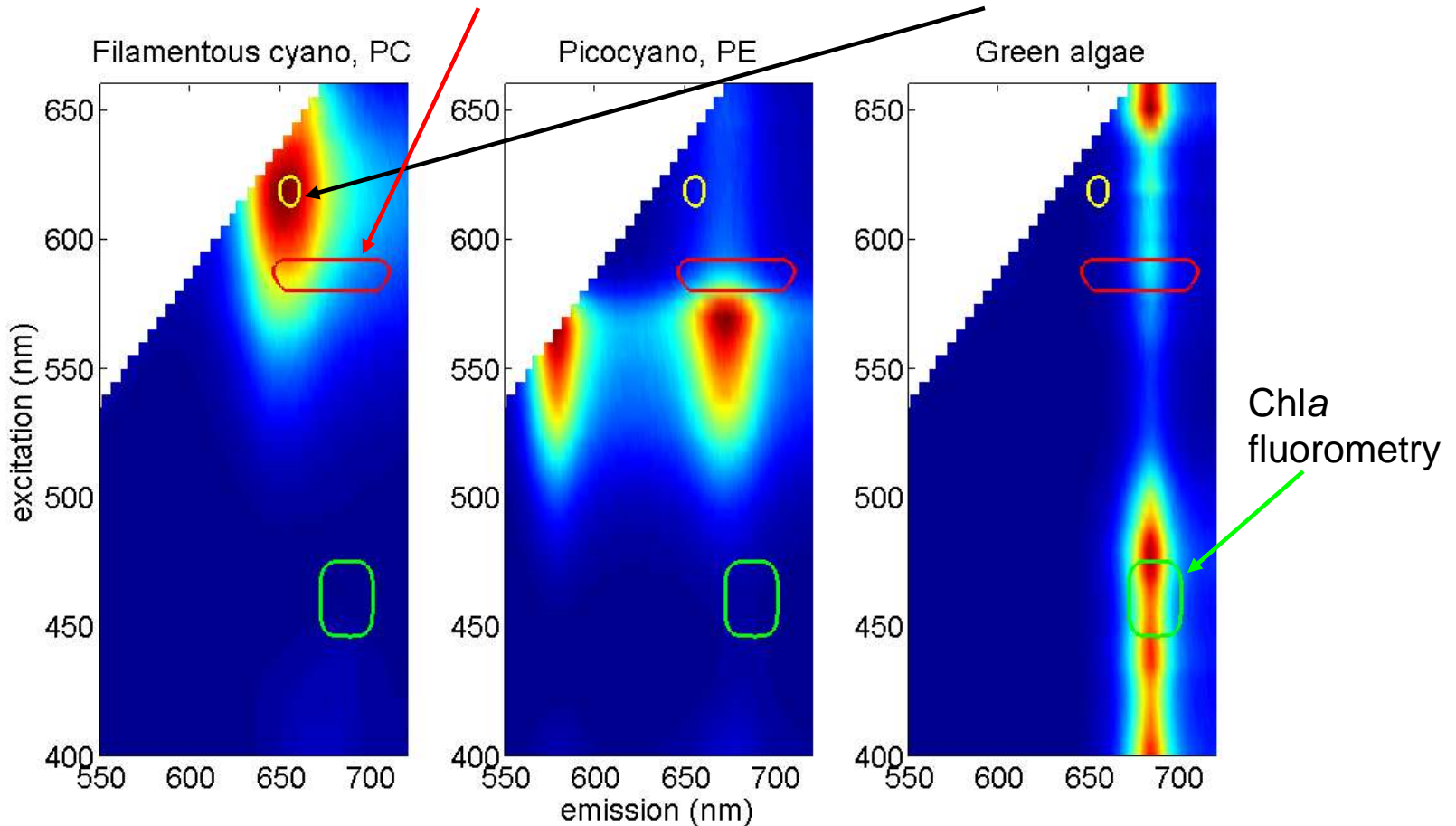


Phycocyanin fluorescence,
Summer 2005



Phycocyanin Fluorometers

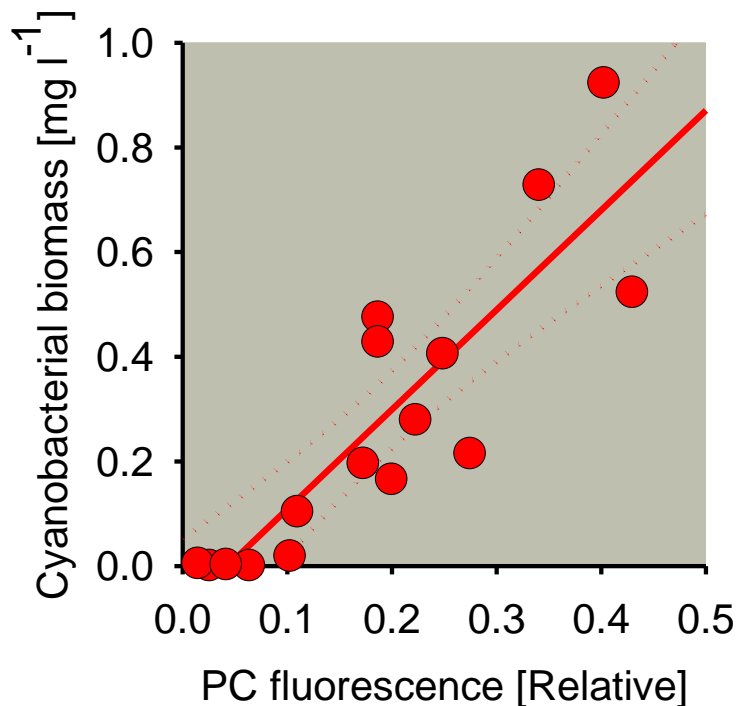
Excitation:	565-605	590	610	610	630	630
Emission:	620-700	645-715	650	685	655	680



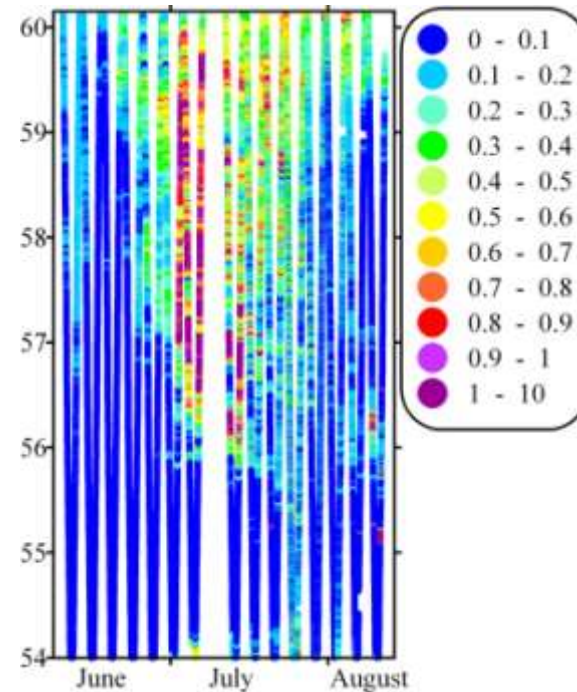
Phycocyanin Fluorescence in the Baltic Sea

Fluorescence measured at relevant units (Volts), while pigment concentrations or cell biomass desired.

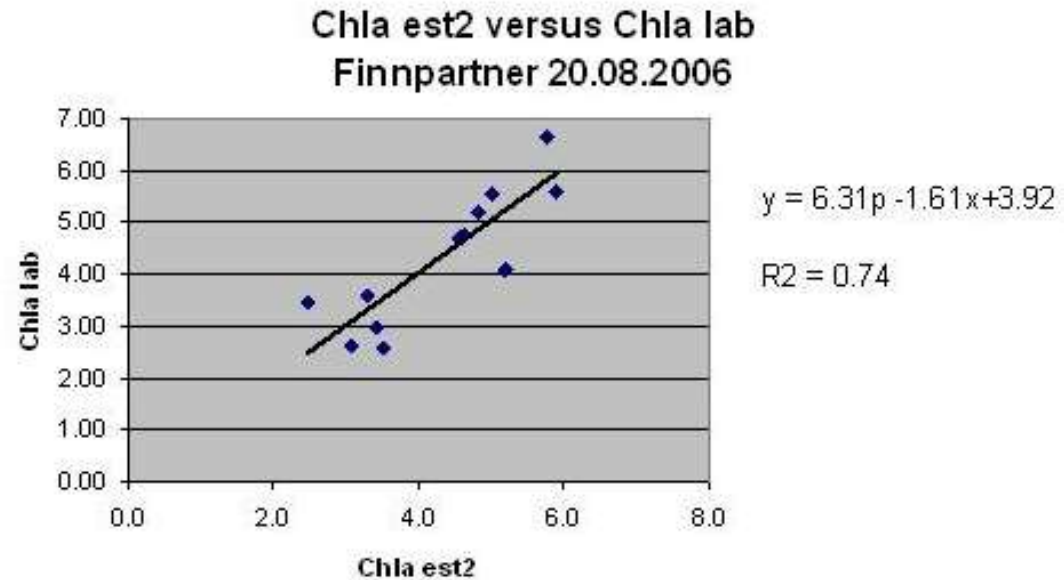
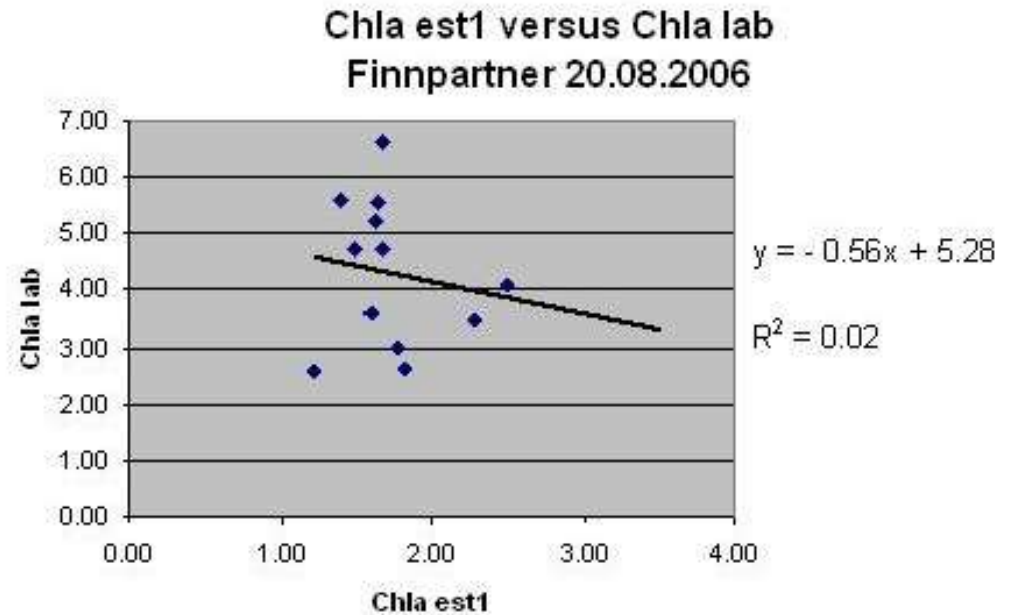
- no reliable methods for quantification of phycobilin pigments
- typically fluorescence related to biomass



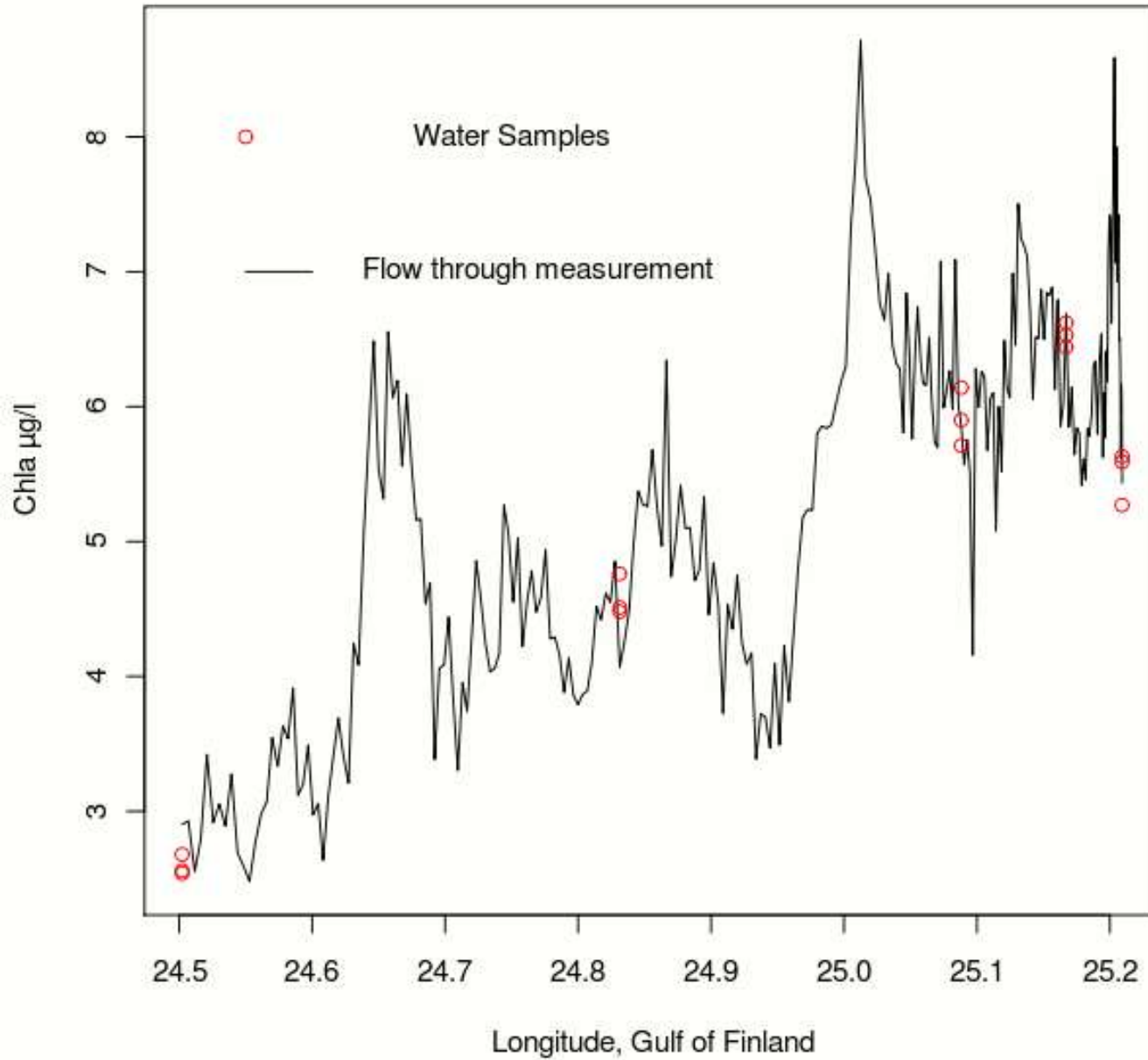
Biomass of filamentous Cyanobacteria (mg L^{-1}), summer 2005



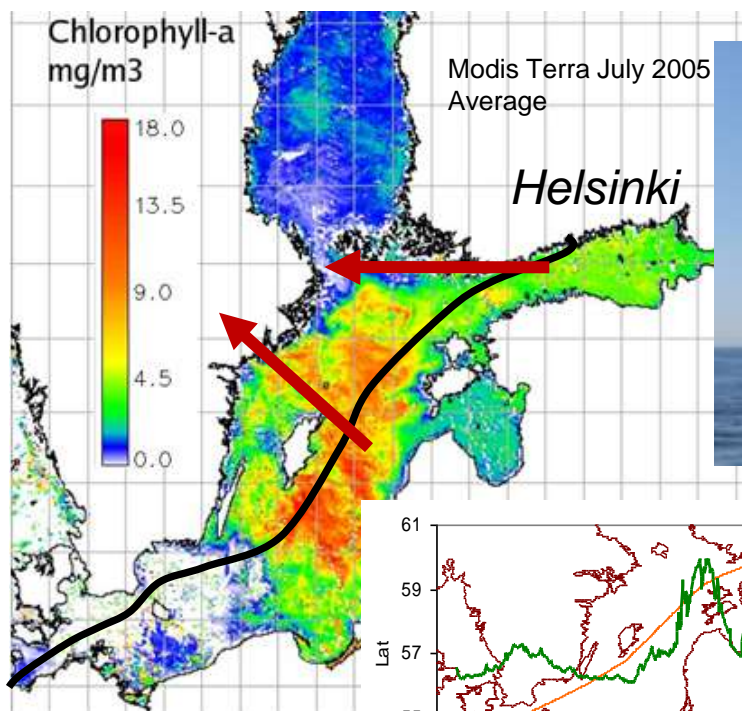
**Chlorophyll-a
validation of
chlorophyll-a
fluorescence
against chlorophyll-
a analysis with
extraction (upper)
and validation of
same
records with
phycocyanin as
auxiliary parameter**



Spatial variation of Chlorophyll-a along Longitude



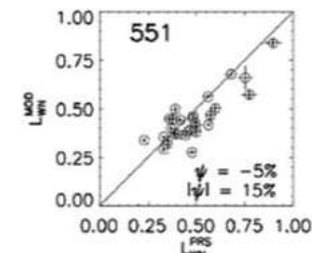
Combination of different sources are used for Ocean Colour validation



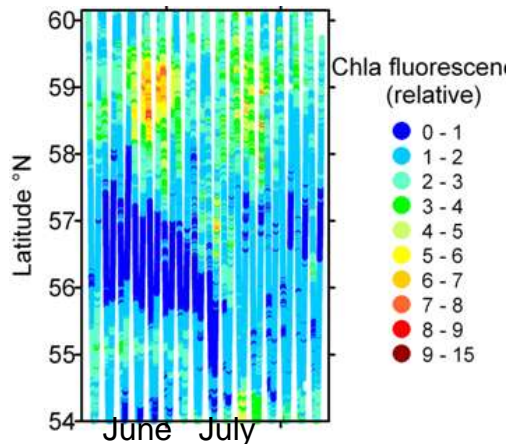
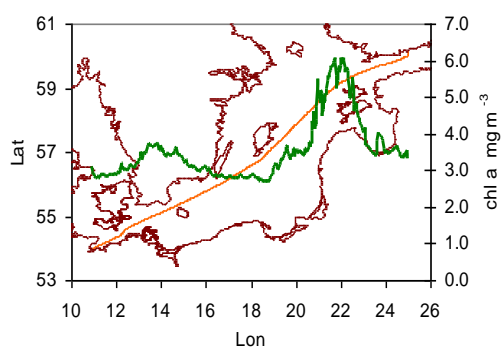
Helsinki Lighthouse



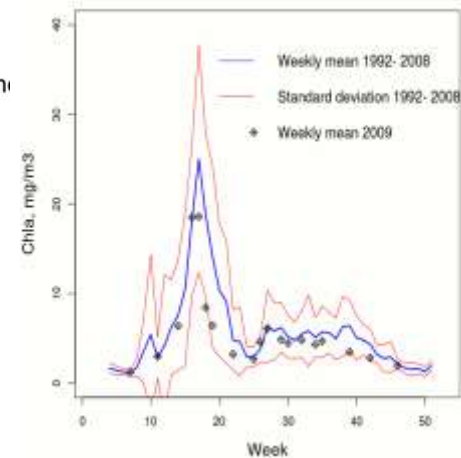
SeaPrism/Aeronet
with EU-JRC



Algaline monitoring
on FINNMAID
biweekly



Chlorophyll-a, Gulf of Finland



Conclusions

To correct in vivo chlorophyll-a fluorescence to correspond chlorophyll-a concentration in presence of filamentous cyanobacteria, phycocyanin fluorescence should be used for correction as auxiliary parameter

Presence of filamentous cyanobacteria can be detected with the phycocyanin fluorescence