Alg@line:
30+ years of FerryBox measurements in the Baltic Sea

Jukka Seppälä, Finnish Environment Institute
jukka.seppala@syke

With contributions from large amount of current and past Alg@liners

Suomen ympäristökeskus
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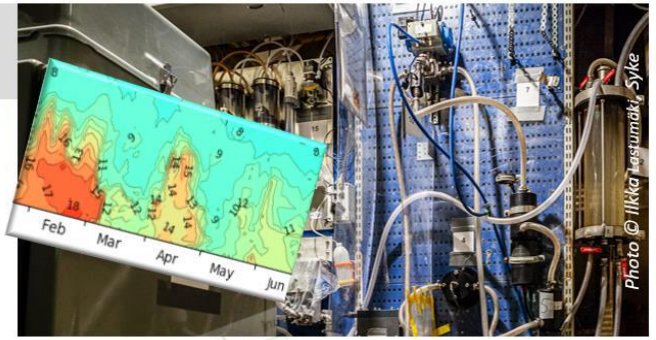
12th FerryBox Workshop

Welcome back to Helsinki with memories of 5th FerryBox Workshop - Celebrating 20 Years of Alg@line in Helsinki 2013!

12th FerryBox Workhop
1.-2. Oct 2024 Helsinki, Finland

Syke FMI FinMARI Finnish Marine Research Infrastructure

FerryBox TaskTeam EuroGOOS European Global Ocean Observing System



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5th Ferrybox Workshop - Celebrating 20 Years of Alg@line

Edited by
- Seppo Kaitala
- Jukka Seppälä

Volume 140, Part A,
Pages 1-72 (December 2014)

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Finlands miljöcentral
Finnish Environment Institute

How did it all start ?

Continental Shelf Research, Vol. 10, No. 4, pp. 329–354, 1990.
Printed in Great Britain.

0278–4343/90 $3.00 + 0.00

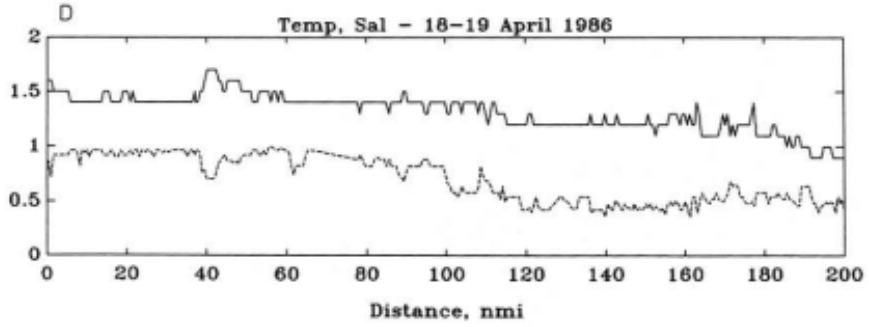
In 1980's

The phytoplankton spring bloom in the Baltic Sea in 1985, 1986: multitude of spatio-temporal scales

M. KAHRU* and S. NÕMMANN*

METHODS AND DATA

Most of the observations that will be discussed were made from R.V. *Arnold Veimer* in the "along-track" mode while the ship was steaming along a straight course at a constant speed from 6 to 12 kn. Underway shipboard measurements of particle concentrations, *in vivo* fluorescence, temperature and salinity were obtained from a depth of 5 m. The "flow-through" system contained a bubble trap and a reservoir tank to maintain a relatively constant flow rate necessary to obtain the particle concentrations from an on-line Hiac-Royco PC-320 particle size analyser (PUGH, 1978). The counter included two



https://mereviki.vta.ee/mediawiki/index.php/LIVONIA

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How did it all start ?

In 1990's

- Collaboration between Finnish and Estonian marine institutes using passanger ship Georg Ots between Helsinki and Tallinn 1990-91,
  - a semi-automatic system consisting of a flow-through fluorometer, a thermosalinograph, a navigator and a PC.

- In 1992 an unattended analyser system was installed by FIMR on board Silja Lines ferry Finnjet crossing the whole Baltic Proper from Travemünde to Helsinki.
  - Soon several other lines evolved: Gulf of Bothnia, Helsinki- St. Petersburg

- In spring 1992 a mass mortality of birds and seals occurred in the eastern Gulf of Finland, possibly due to a toxic phytoplankton bloom. The following year, 1993, was a real kick-off year for Alg@line, when the systematic information compilation and delivery service on phytoplankton blooms were started.

1995 - Alg@line into the web

Baltic Sea Alg@Line

Source: Rantajärvi 2003 Alg@line IN 2003: 10 YEARS OF INNOVATIVE PLANKTON MONITORING AND RESEARCH AND OPERATIONAL INFORMATION SERVICE IN THE BALTIC SEA

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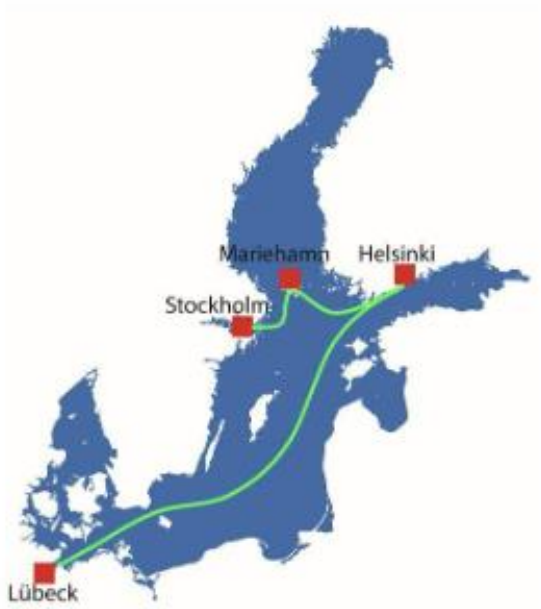
Then it went viral…

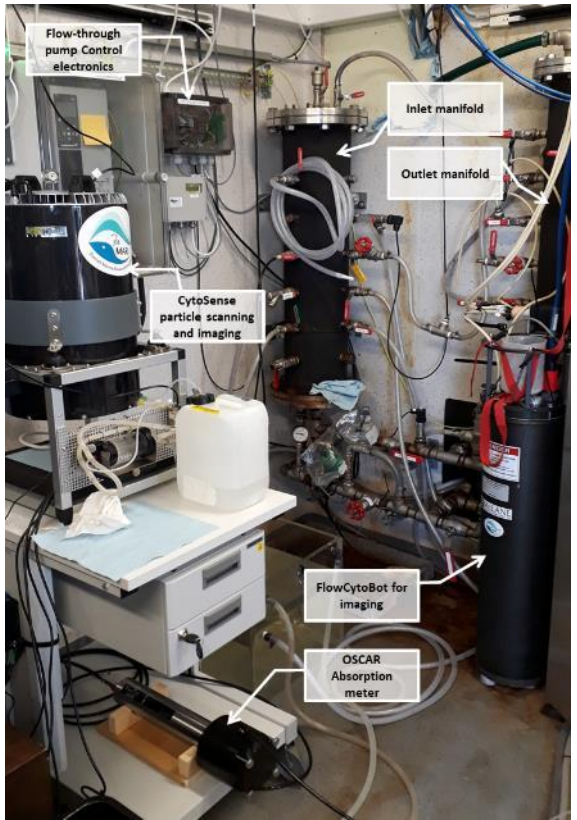
Alg@line today

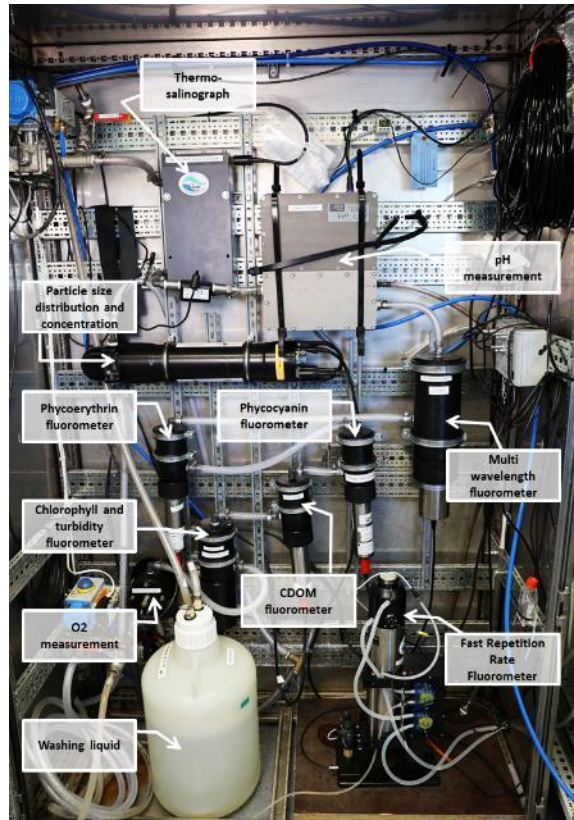
Silja Serenade Helsinki-Stockholm
(Ship operated since 1999)

Finnmaid Helsinki-Travemunde
(Transect operated since 1992)



Utö fixed station
(since 2016)





Alg@line in phytoplankton research

Chlorophyll fluorescence

Hydrobiologia (2006) 554:57–65
J. Kuparinen, E. Sandberg-Kilpi & J. Mattila (eds), Baltic Sea: A Lost System or a Future Treasury
DOI 10.1007/s10750-005-1006-7

Phytoplankton spring bloom intensity index for the Baltic Sea estimated for the years 1992 to 2004

Vivi Fleming* & Seppo Kaitala
Finnish Institute of Marine Research, 33, SF-00931, Helsinki, Finland

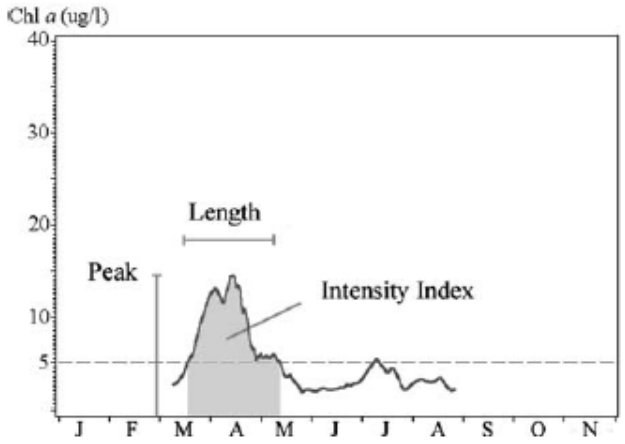


Figure 2. Seven-day running average of chlorophyll *a* in 2003 for the Northern Baltic Proper. The shaded area indicates the spring bloom, for which the intensity index is calculated; the spring bloom threshold is shown with a broken line. The peak and length of bloom are also presented.

Phycocyanin fluorescence

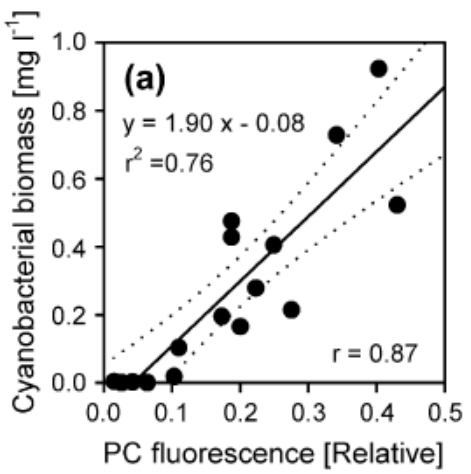
ELSEVIER

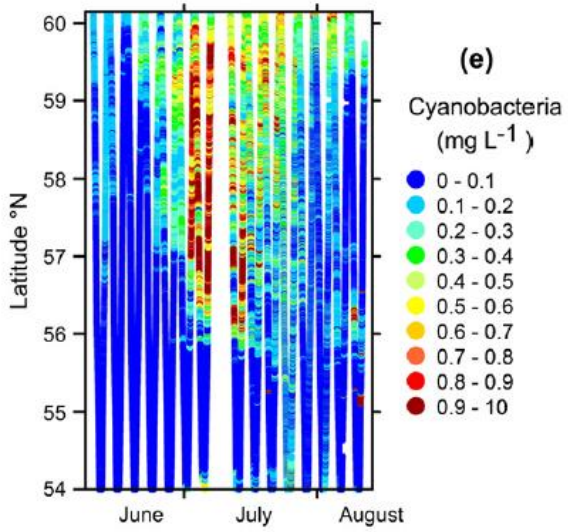
Available online at www.sciencedirect.com
ScienceDirect
Estuarine, Coastal and Shelf Science 73 (2007) 489–500

ESTUARINE COASTAL AND SHELF SCIENCE
www.elsevier.com/locate/ecss

Ship-of-opportunity based phycocyanin fluorescence monitoring of the filamentous cyanobacteria bloom dynamics in the Baltic Sea

J. Seppälä*, P. Ylöstalo, S. Kaitala, S. Hällfors, M. Raateoja, P. Maunula





Alg@line in phytoplankton research

Trends in phytoplankton communities

Hydrobiologia
DOI 10.1007/s10750-012-1414-4

PRIMARY RESEARCH PAPER

The northern Baltic Sea phytoplankton communities in 1903–1911 and 1993–2005: a comparison of historical and modern species data

Heidi Hällfors · Hermanni Backer · Juha-Markku Leppänen · Seija Hällfors · Guy Hällfors · Harri Kuosa

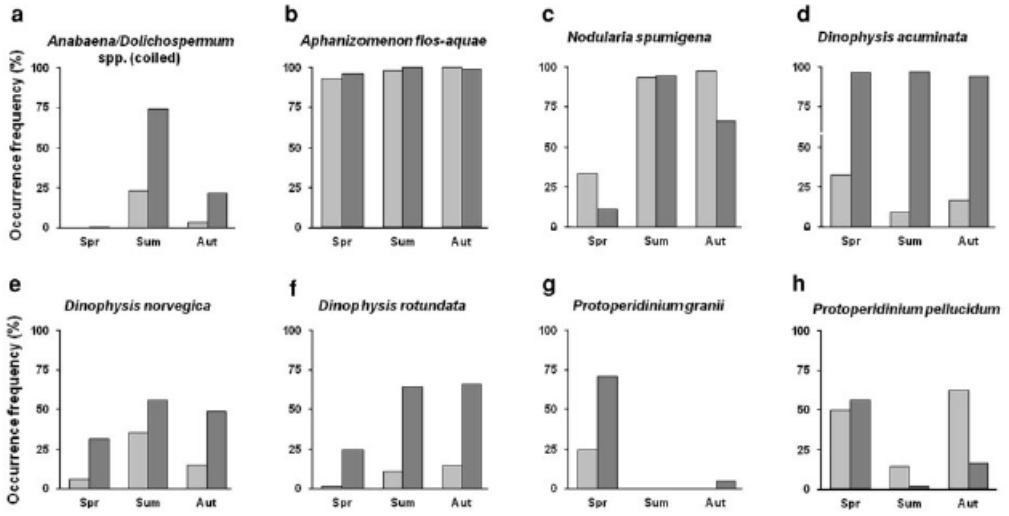
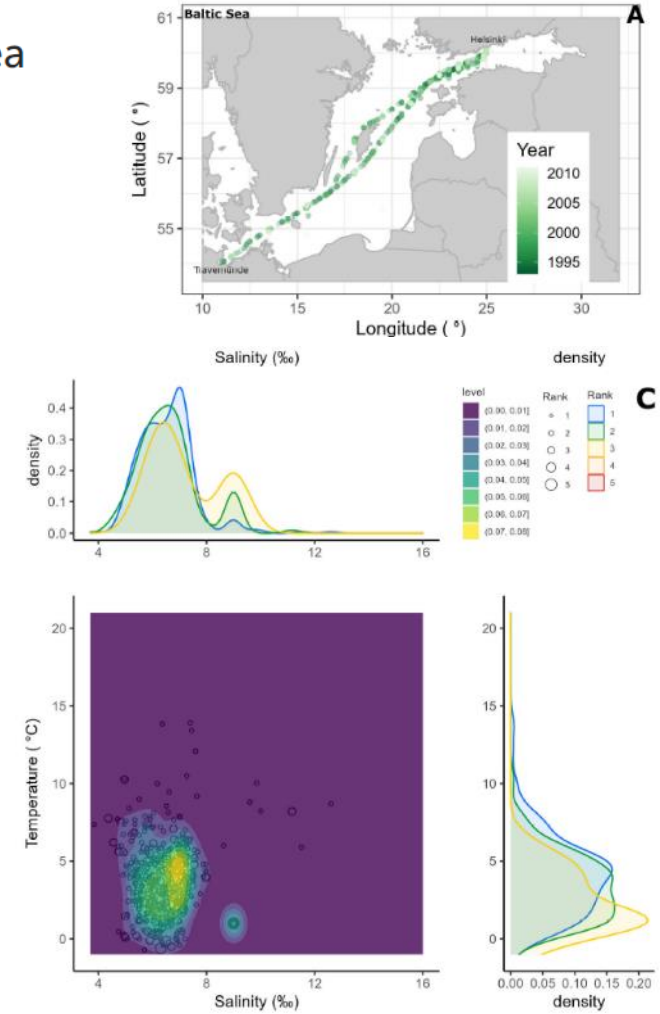


Fig. 3 Seasonal mean occurrence frequencies of the 20 taxa which occurred in both 1903–1911 (left hand columns, in *pale grey*) and 1993–2005 (right hand columns, in *dark grey*), in spring (*Spr*), summer (*Sum*) and autumn (*Aut*)

Phytoplankton responses to environment

Trait response of three Baltic Sea spring dinoflagellates to temperature, salinity, and light gradients

Lumi Haraguchi*, Kaisa Kraft, Pasi Ylöstalo, Sami Kielosto, Heidi Hällfors, Timo Tamminen and Jukka Seppälä



Semi-quantitative phytoplankton data (as abundance ranks) from samples collected in 1993-2011 onboard ships-of-opportunity transversing the Baltic Sea (A), depicting the occurrence of Heterocapsa arctica subsp. frigida (C) over environmental temperature and salinity gradients.

Alg@line in phytoplankton research

New technologies for productivity

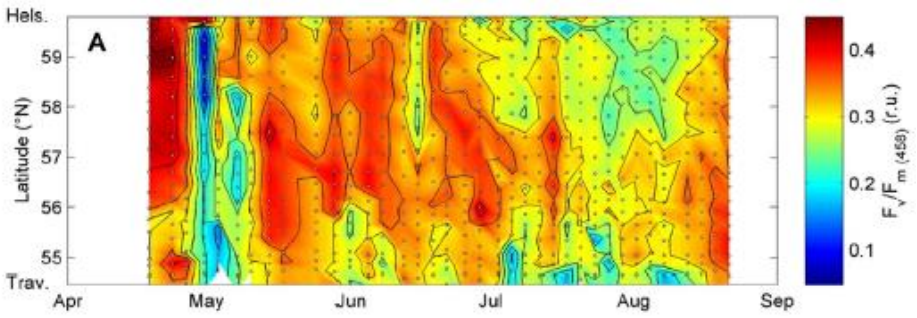
Contents lists available at ScienceDirect

Journal of Marine Systems

journal homepage: www.elsevier.com/locate/jmarsys

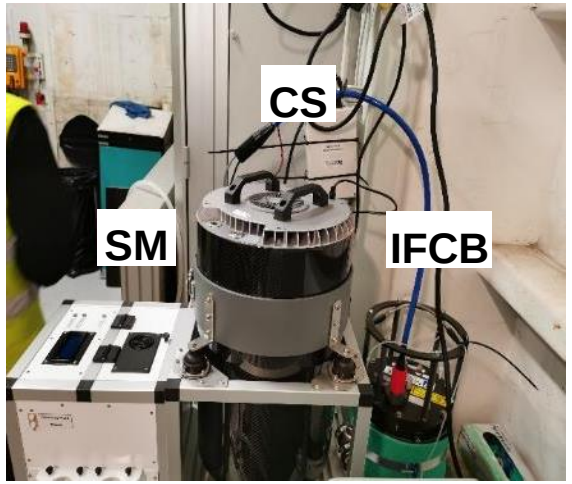
Basin-scale spatio-temporal variability and control of phytoplankton photosynthesis in the Baltic Sea: The first multiwavelength fast repetition rate fluorescence study operated on a ship-of-opportunity

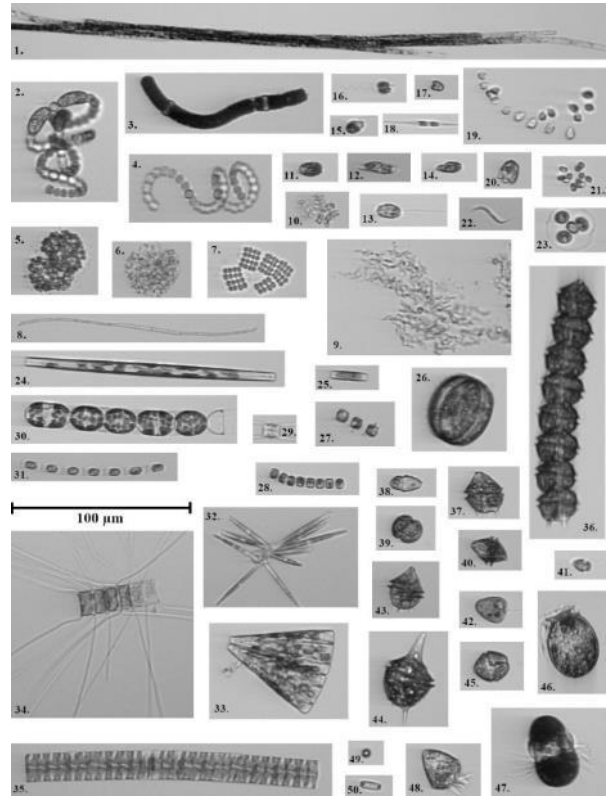
Emilie Houliez [a,*], Stefan Simis [a,b], Susanna Nenonen [a], Pasi Ylöstalo [a], Jukka Seppälä [a]



Spatio-temporal dynamics of the maximum photochemical efficiency measured at 458nm

…and imaging & cytometry





Talks

Detection of filamentous cyanobacteria blooms using imaging and pulse shape flow cytometry, and optical sensors
Kaisa Kraft, Finnish Environment Institute

Spatio-temporal development of cyanobacteria bloom in the Baltic Sea during summer 2023
Lumi Haraguchi, Finnish Environment Institute

Poster

Spatial and temporal dynamics of spring phytoplankton functional traits in Baltic sea
Lescroart E, Finnish Environment Institute & Ifremer

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Alg@line in biogeochemistry

Climatology and trends in Chl-a and nutrients

Loading from river Neva

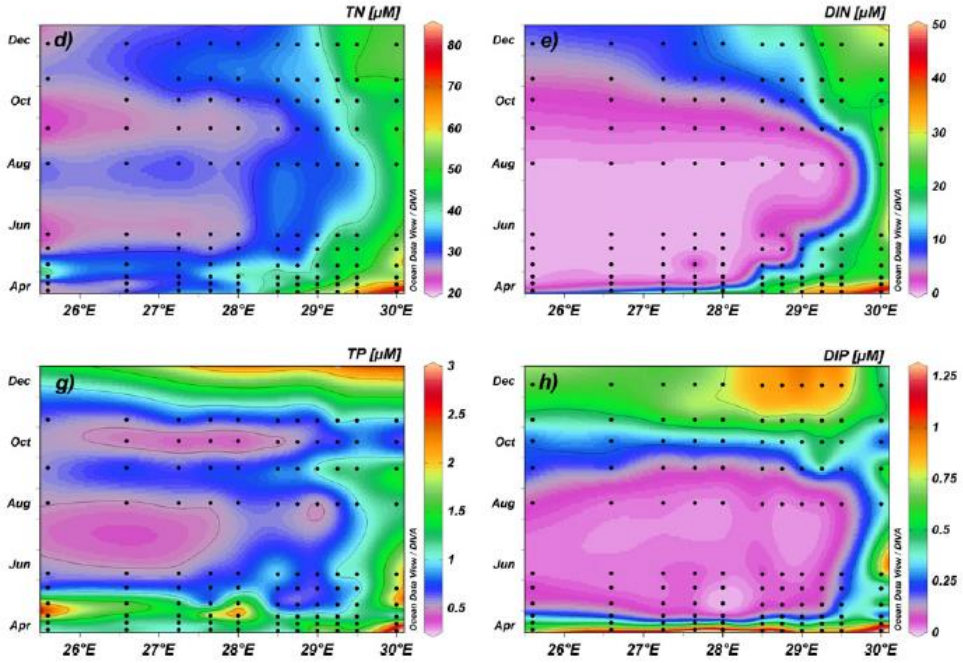
Contents lists available at ScienceDirect

Marine Chemistry

journal homepage: www.elsevier.com/locate/marchem

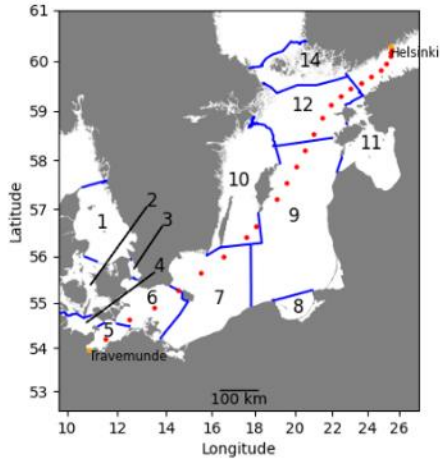
Loadings of dissolved organic matter and nutrients from the Neva River into the Gulf of Finland – Biogeochemical composition and spatial distribution within the salinity gradient

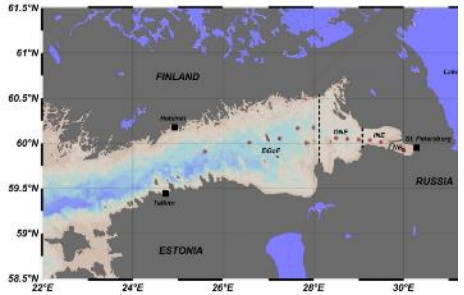
Pasi Ylöstalo [a,*], Jukka Seppälä [a], Seppo Kaitala [a], Petri Maunula [a], Stefan Simis [a,b]

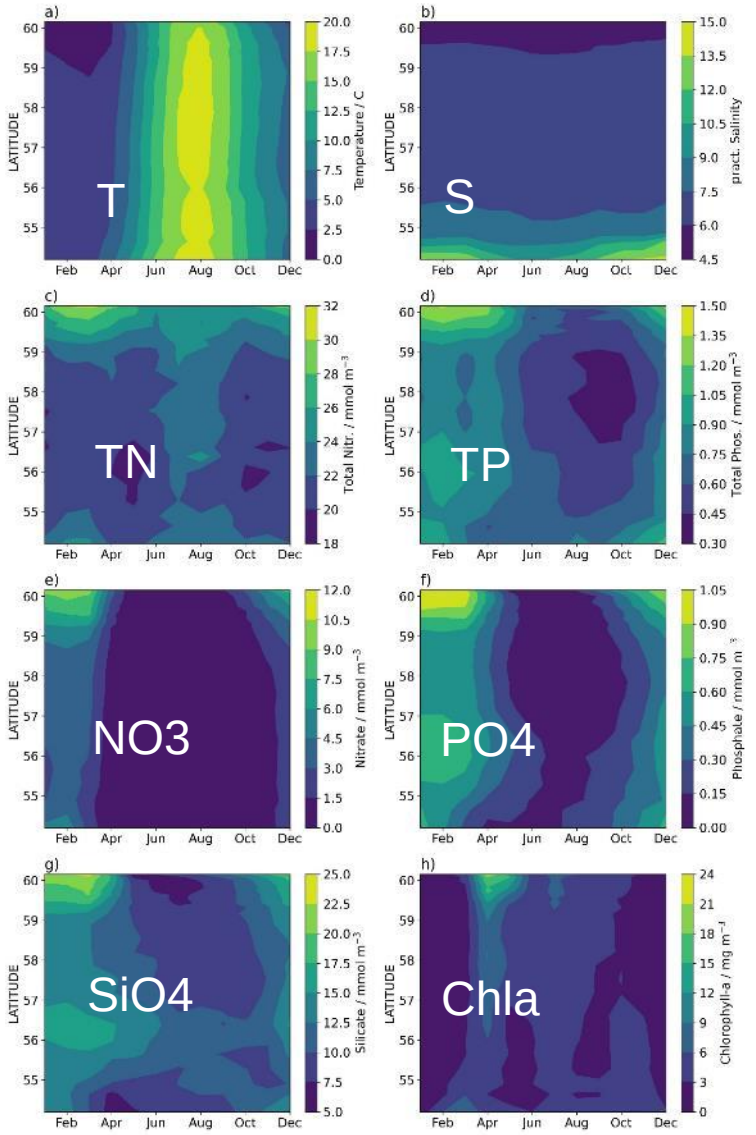


Section 3.2. Trends in nutrient and chlorophyll *a* concentrations from FerryBox transect time series in the Baltic Sea

Authors: Samu Elovaara, Sebastian Ehrhart, Seppo Kaitala, Petri Maunula, Jukka Seppälä







Alg@line supporting remote sensing

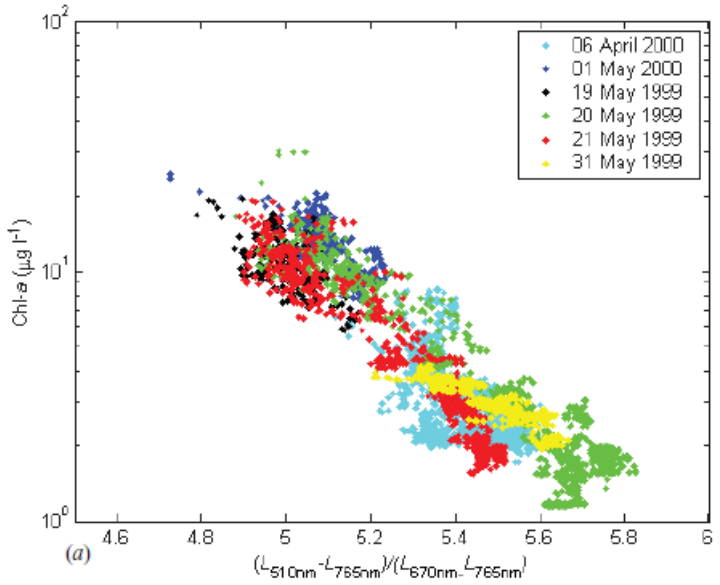
Remote sensing vs. fluorometry

International Journal of Remote Sensing
Vol. 26, No. 2, 20 January 2005, 261–282

Taylor & Francis
Taylor & Francis Group

The combined use of optical remote sensing data and unattended flow-through fluorometer measurements in the Baltic Sea

J. VEPSÄLÄINEN*†, T. PYHÄLAHTI†, E. RANTAJÄRVI‡, K. KALLIO†, S. PERTOLA‡, T. STIPA‡, M. KIIRIKKI†, J. PULLIAINEN§ and J. SEPPÄLÄ‡

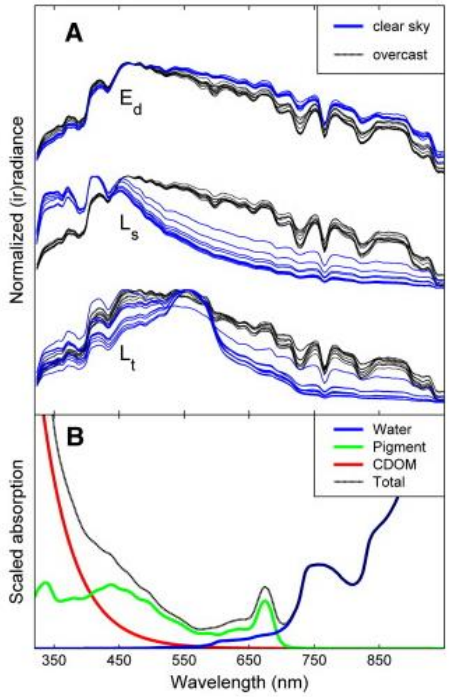


Hyperspectral radiometry

ELSEVIER
Remote Sensing of Environment
Volume 135, August 2013, Pages 202-212

Unattended processing of shipborne hyperspectral reflectance measurements

Stefan G.H. Simis ✉, John Olsson ✉



www.monocle-h2020.eu/

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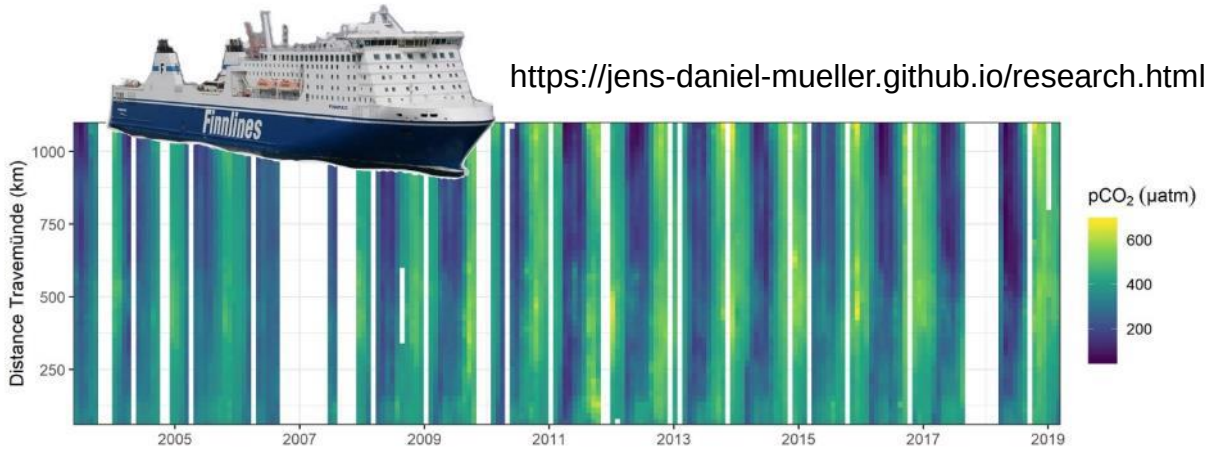
Alg@line measuring greenhouse gases

Leibniz Institute for Baltic Sea Research Warnemünde

Continuous measurements of trace and greenhouse gases on the ferry Finnmaid

The Leibniz Institute for Baltic Sea Research Warnemünde (IOW) has been operating a system for measuring trace gases on the ferries Finnpartner/ Finnmaid since 2003.

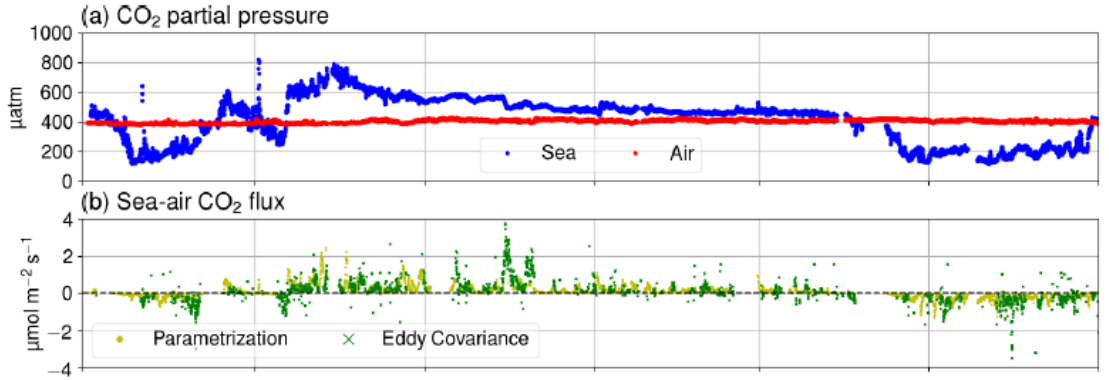


https://jens-daniel-mueller.github.io/research.html

Developments at Utö and Silja Serenade

The diurnal cycle of pCO_2 in the coastal region of the Baltic Sea

Martti Honkanen[1], Jens Daniel Müller[2,4], Jukka Seppälä[3], Gregor Rehder[4], Sami Kielosto[1,3], Pasi Ylöstalo[3], Timo Mäkelä[5], Juha Hatakka[5], and Lauri Laakso[1,6]



Talks

Development of a Gas-Equilibrium – Membrane-Inlet Mass spectrometer (GE-MIMS) for continuous N2, Ar and O2 measurements on a voluntary observing ship to quantify nitrogen fixation in the Baltic Sea
Sören Iwe, Leibniz-Institute for Baltic Sea Research

Air-sea CO2 exchange at Utö in the Baltic Sea
Martti Honkanen, Finnish Meteorological Institute

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Finlands miljöcentral
Finnish Environment Institute

Alg@line in EU JERICO Research Infrastructure

Providing Transnational Access

JERICO TNA Project MultiFluoro – Testing new multi-parameter fluorometer in optically complex environments

DATE 2019-04-02

TEMPORAL EXTENT 2019-04-02 - 2019-05-15

AUTHORS Kirkbride James [1], Attridge John [1], Kirby Sam [1], Seppälä Jukka [2]

AFFILIATIONS 1. Chelsea Technologies, 55 Central Avenue, West Molesey, Surrey, KT8 2QZ, UK
2. SYKE, Agnes Sjobergin katu 2, Helsinki, Finland

DOI 10.17882/62725

PUBLISHER SEANOE

The project installed a newly developed multi-parameter algal fluorescence sensor (Chelsea Technologies VLux) in the FerryBox system on the ro-ro ferry Finnmaid. Algal fluorescence measurments were taked along the journey through the Baltic sea between Helsinki and Travemunde. The VLux data were compared with several other sensors installed in the FewrryBox system. Further laboratory work was performed to characterise the response of the Chelsea Technologies VLux to various different algal species.

SYKE

During the last week of January, Brandon, Luke and Nathan visited the Finnish environmental institute, SYKE, to meet Jukka Seppälä and his team and do initial tests on our solid state pH sensor for Oceanographic monitoring.

During our stay we were able to undertake testing and calibration of our sensor using the local brackish Baltic water from the ferry that crosses from Finland to Germany.

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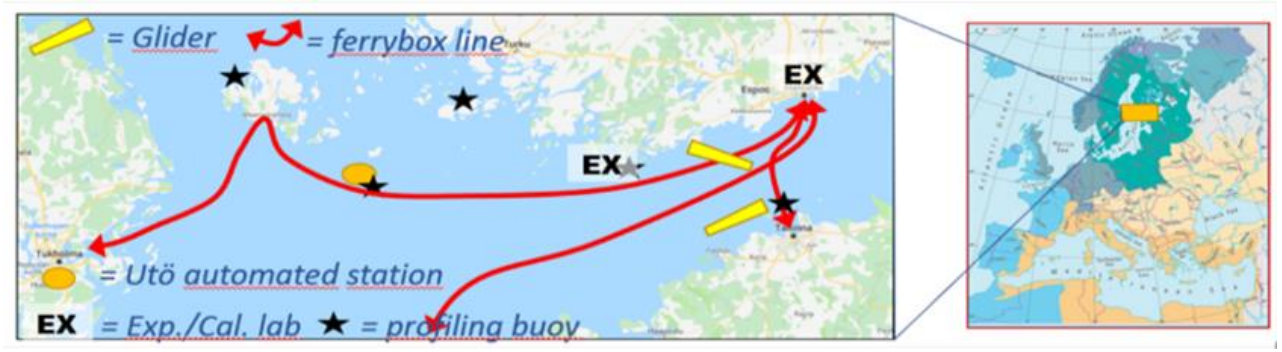
as a distributor of c
sensors

Component of multiplatform Pilot Supersites



JERICO-RI coastal observatory network

Supersites

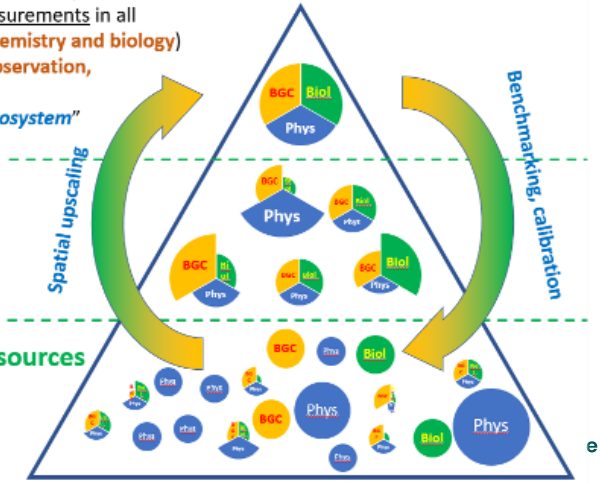
- Contribution to local, national, regional and global scale requirements
- Comprehensive and top-level, high-frequency measurements in all required scientific areas (**marine physics, biogeochemistry and biology**)
- Integrated, multiplatform strategy for **long-term observation, process measurements, and experimentation**
- Key platforms for **J3 integration** in "***European RI ecosystem***"
- Organization of regular joint campaigns
- Observation R&D, benchmarking, calibration lead

Advanced Observatories

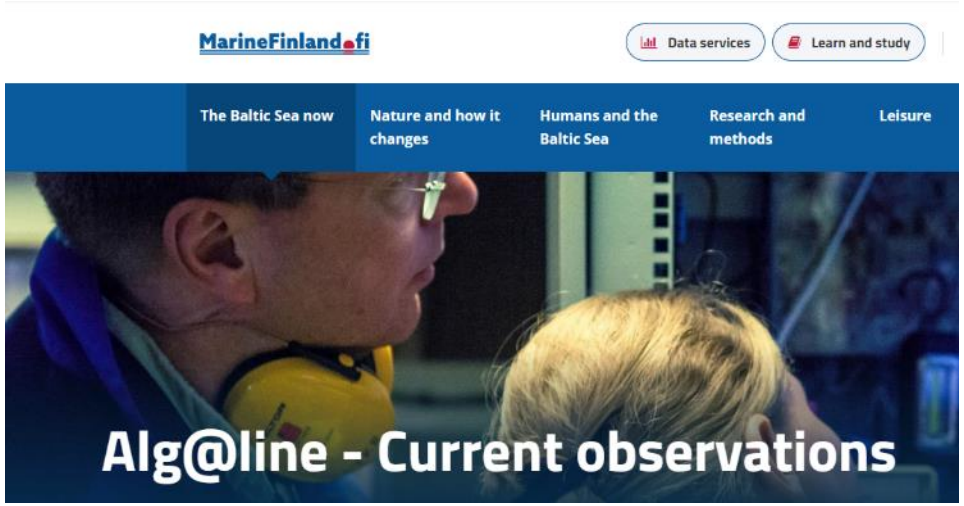
- Comprehensive and top-level measurements in **specific scientific areas or services**
- Capability for hosting campaigns, intercalibrations

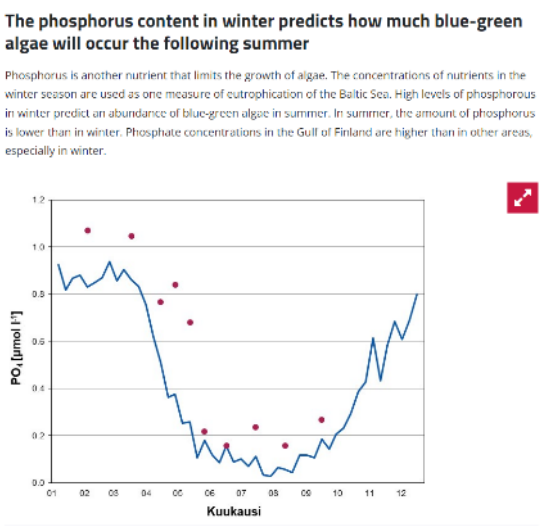
Standard Observatories; collaboratory data sources

- Continuous measurement of key parameters
- Local and regional collaboration in regular acquisition of multisource coastal data (e.g. monitoring programs)



Alg@line data and users





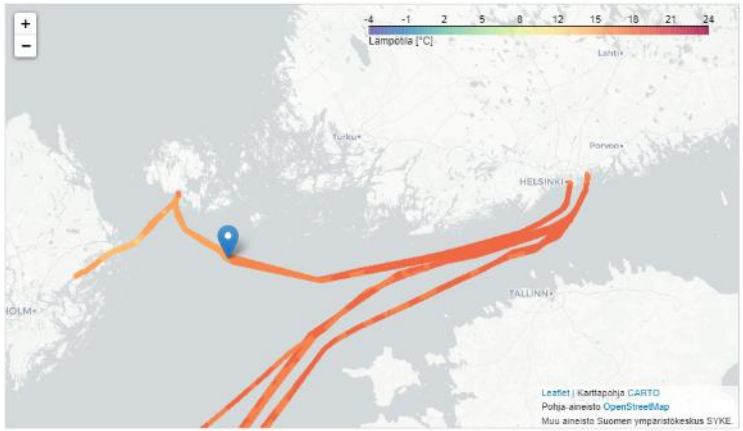
Algaline transect measurement API

Service endpoint: https://geoserver2.ymparisto.fi/geoserver/algaline

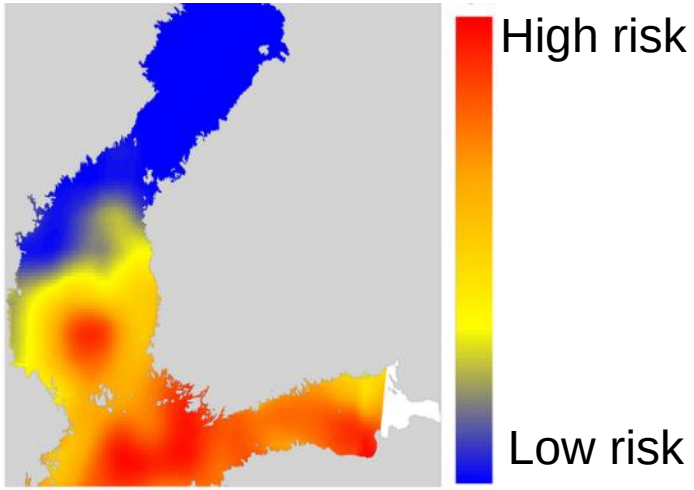
Service layer: algaline:transect_measurements

Water temperature

Temperature observations measured on ferries during the last week between Helsinki-Travemunde. Map is showing the current position of the ship making the measurements and the latest observations. The color of the route indicates the temperature on the shipping route.



Risk of cyano-HABs: Summer 2024



Talk
Utilizing of FerryBox data in combination with other information sources for forecasting of cyanobacterial blooms
Heikki Peltonen, Finnish Environment Institute

Suomen ympäristökeskus
Finlands miljöcentral
Finnish Environment Institute

KIITOS!
Warm thanks to all current and past Alg@liners

FMI Syke EuroGOOS European Global Ocean Observing System FerryBox TaskTeam FinMARI Finnish Marine Research Infrastructure

MINKE

EUROPEAN COMMISSION

Project funded by the European Commission within the Horizon 2020 Programme (2014-2020)
Grant Agreement No. 101008724

JERICO RI SCIENCE - SERVICES - SUSTAINABILITY

ICOS Integrated Carbon Observation System

Finnish way of celebrating 30 years of successful project work