SYKE

NEAR REALTIME FERRYBOX OBSERVATIONS ACROSS THE BALTIC SEA
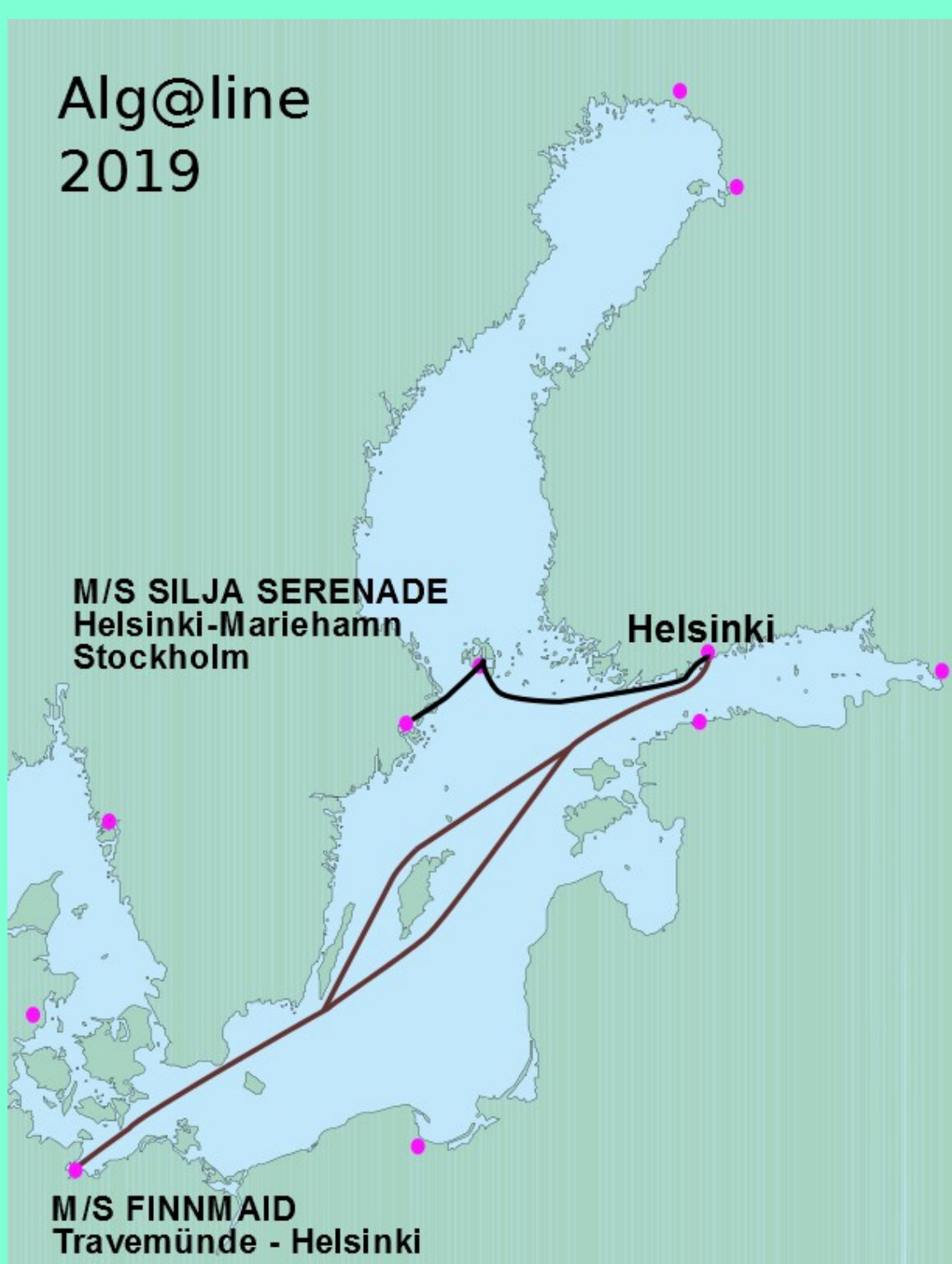## Copernicus Marine Monitoring Service (CMEMS)

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Finnish Environment Institute (SYKE), Marine Research Laboratory is operating a ferrybox systems onboard Finnmaid ferry cruising 3 times a week between Helsinki, Finland and Travemünde, Germany and M/S Silja Serenade operating between Helsinki – Stockholm every night. Along the ferry track ferrybox system records salinity, temperature and chlorophyll-*a* fluorescence every 20 seconds form the flow through water with the inlet at 5 meters depth. Ferrybox system includes also a water sampler collecting 24 one liter water samples for nutrient and chlorophyll-a analysis in the laboratory. The flow through records are transferred in near real time to Copernicus Marine Monitoring Service as part of the INSITU BAL NRT OBSERVTIONS available on the Copernicus portal http://marine.copernicus.eu/.
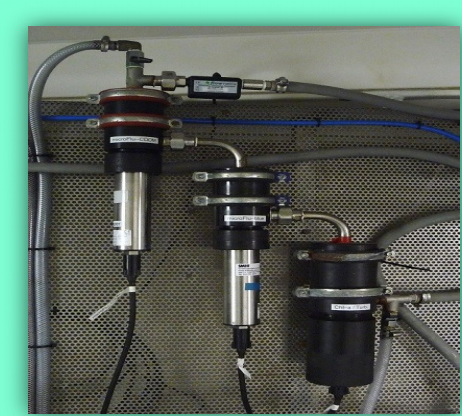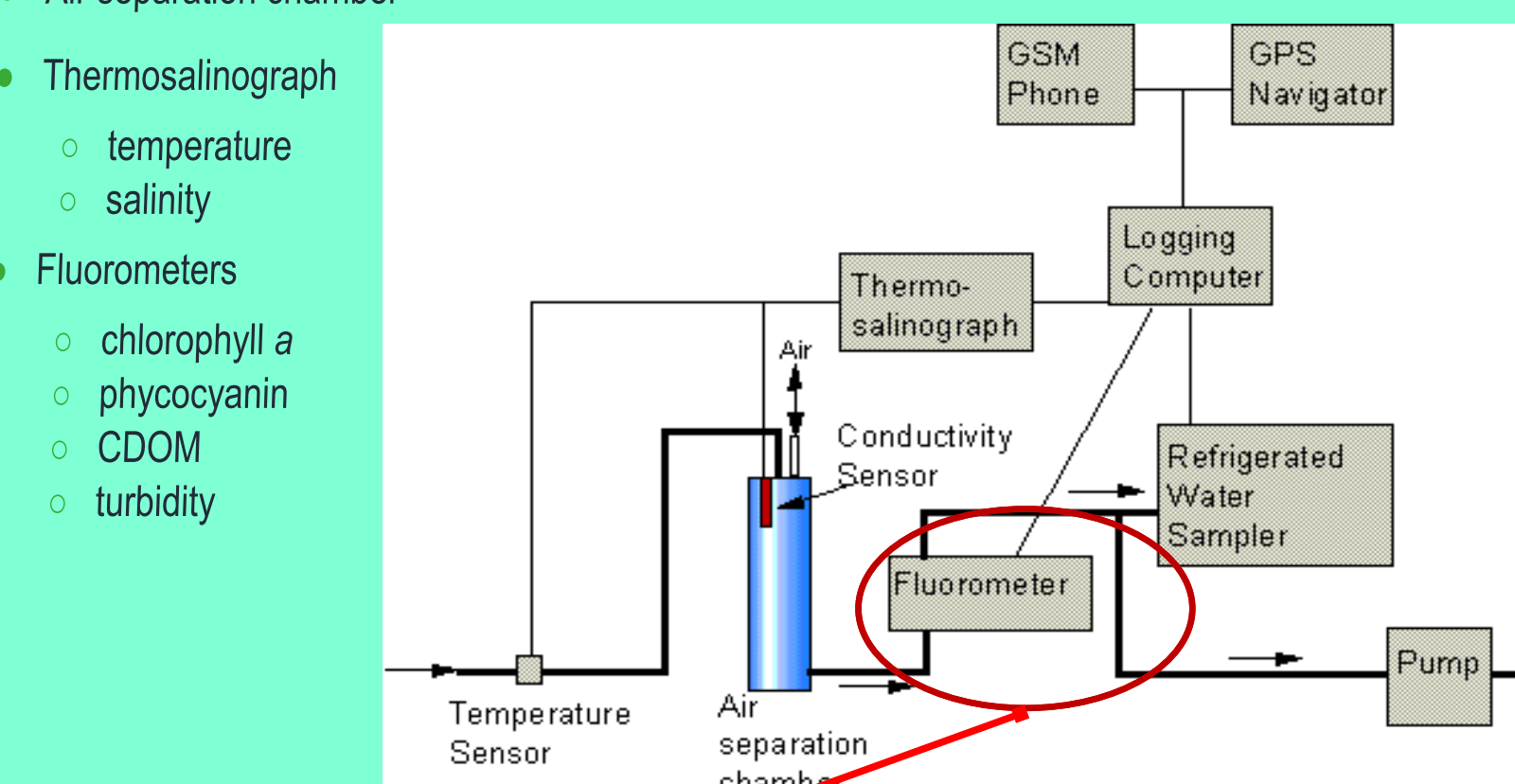
Automated visualization and data quality check tools have been developed for SYKE Alg@line ferrybox data. Ferrybox data from passenger ferry Silja Serenade cruising between Helsinki, Finland and Stockholm, Sweden and Finnmaid ferry cruising between Helsinki and Travemünde, Germany are demonstrated. Tools consist of python and R scripts for data transfer, QC, and visualization. Plots include transect plots and contour plots for last 1 month period and for the current year. Variables include Temperature, Salinity, CDOM, Chlorophyll a, Oxygen, Phycocyanin and Turbidity. Transect data shows also which parts of the data are flagged as bad quality data. A map showing transects and the current location of ship is also included.
Link: www.finmari-infrastructure.fi/ferrybox

Data flow: MS Silja Serenade
Automated data synchronization from ferrybox system on the vessel to SYKE server through EUDAT B2DROP. Quality controlled data is transferred to CMEMS In Situ Tac data portal
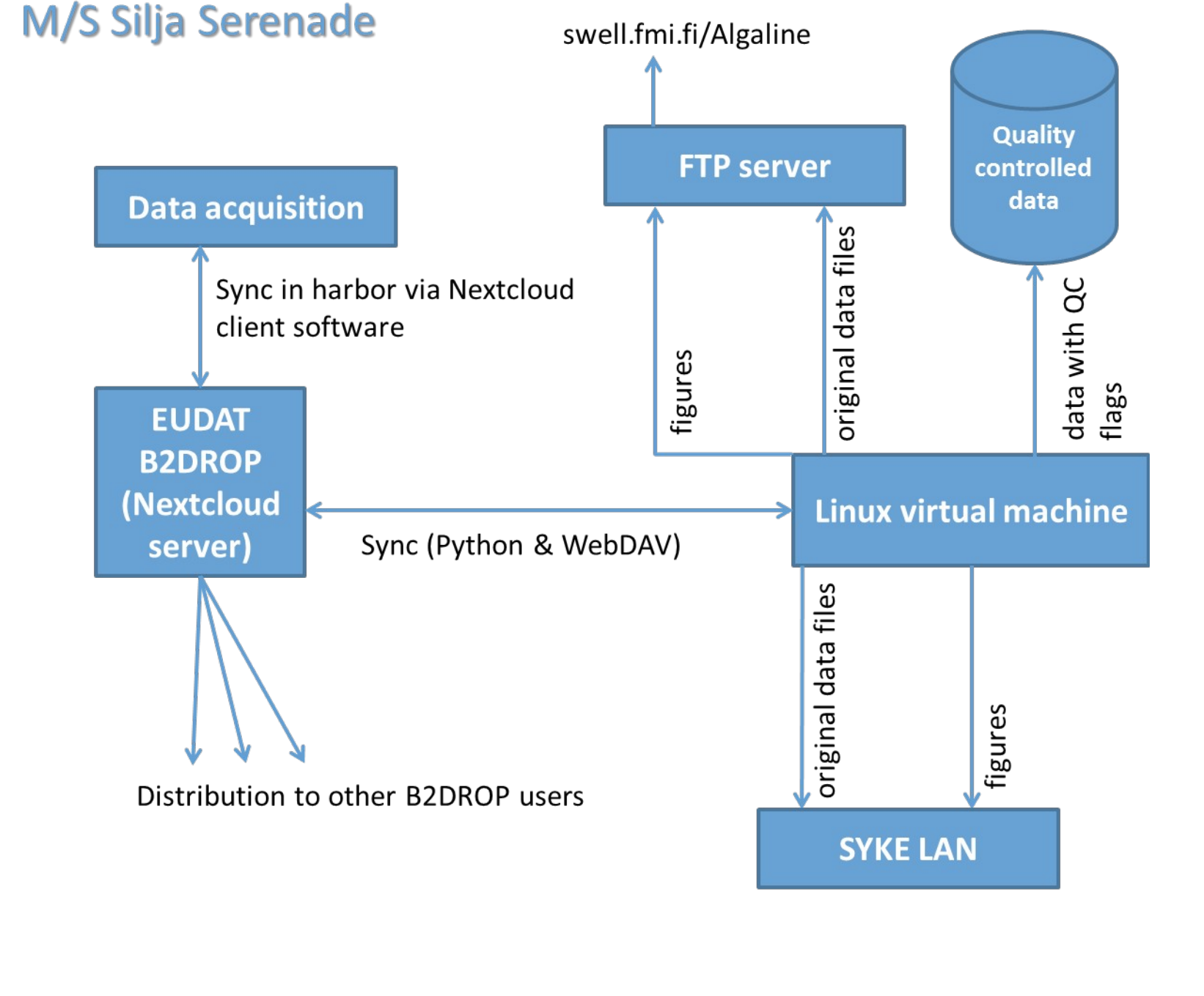
Data folw: MS Finnmaid
Automated data synchronization from ferrybox system on the vessel to SYKE ftp server through Viasat satellite transfer. Quality controlled data is transferred to CMEMS In Situ Tac data portal

Instrumentation

- Water is pumped from 5 m depth, through an opening in the ship's hull
- Air separation chamber
- Thermosalinograph
  - temperature
  - salinity
- Fluorometers
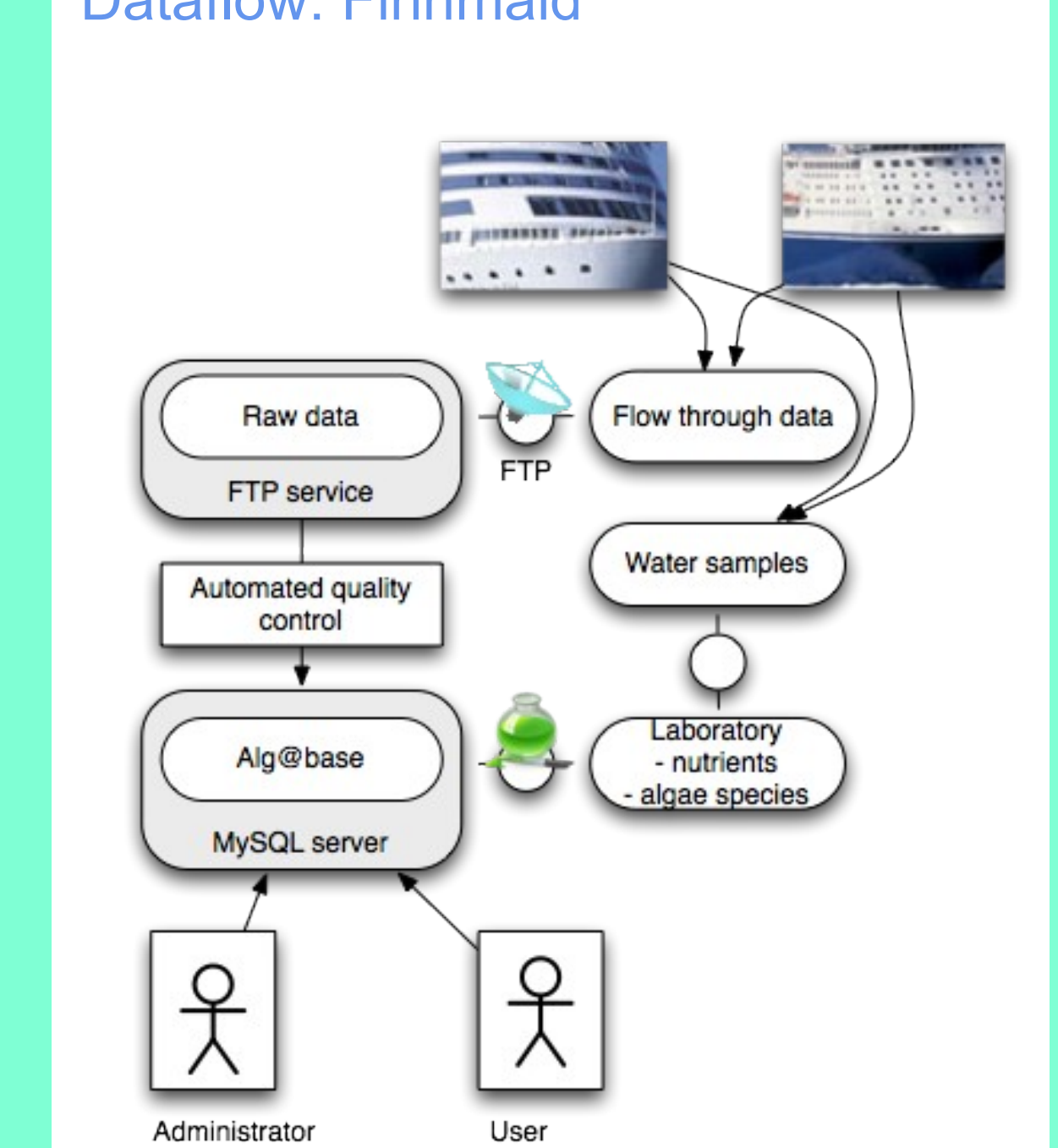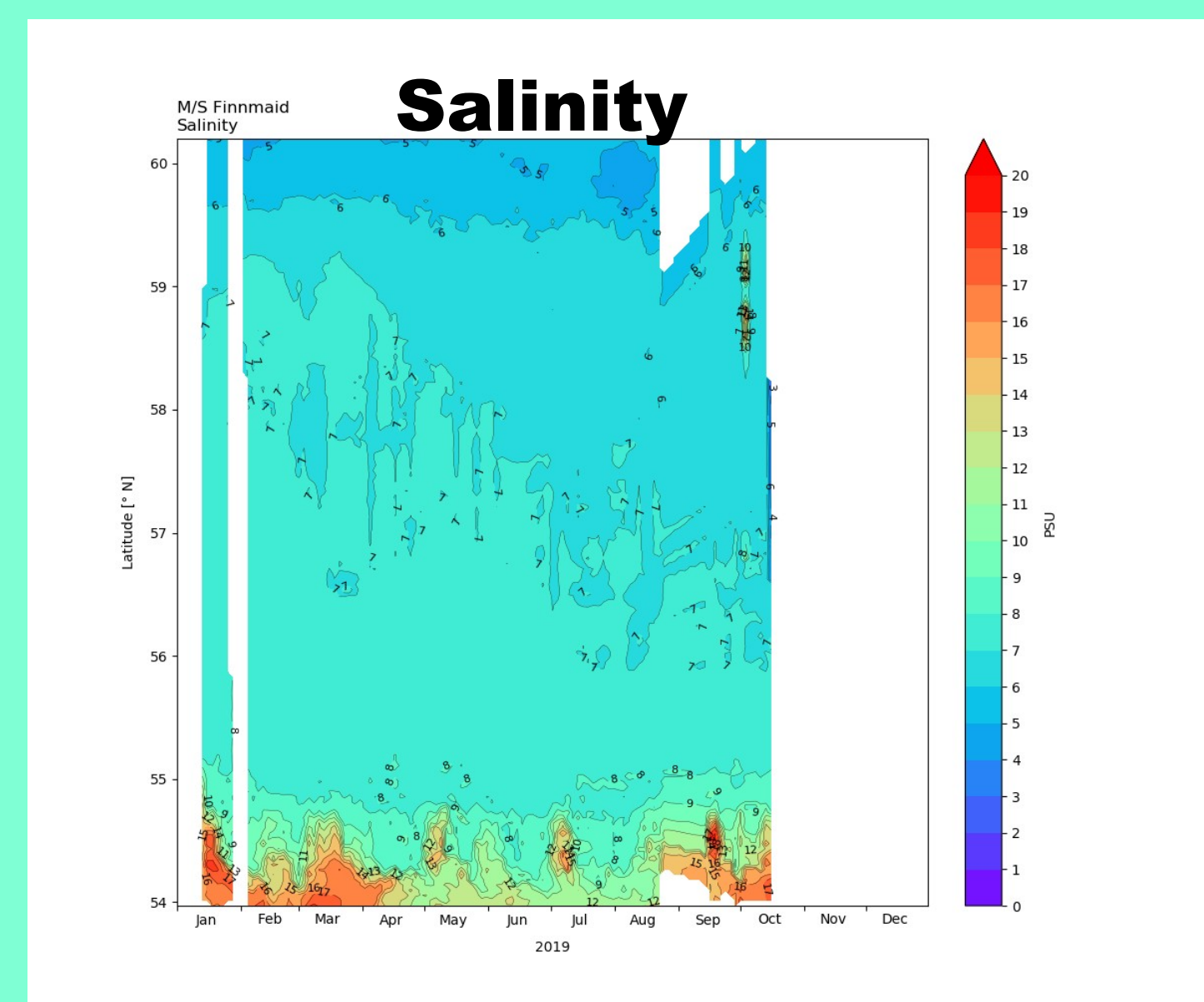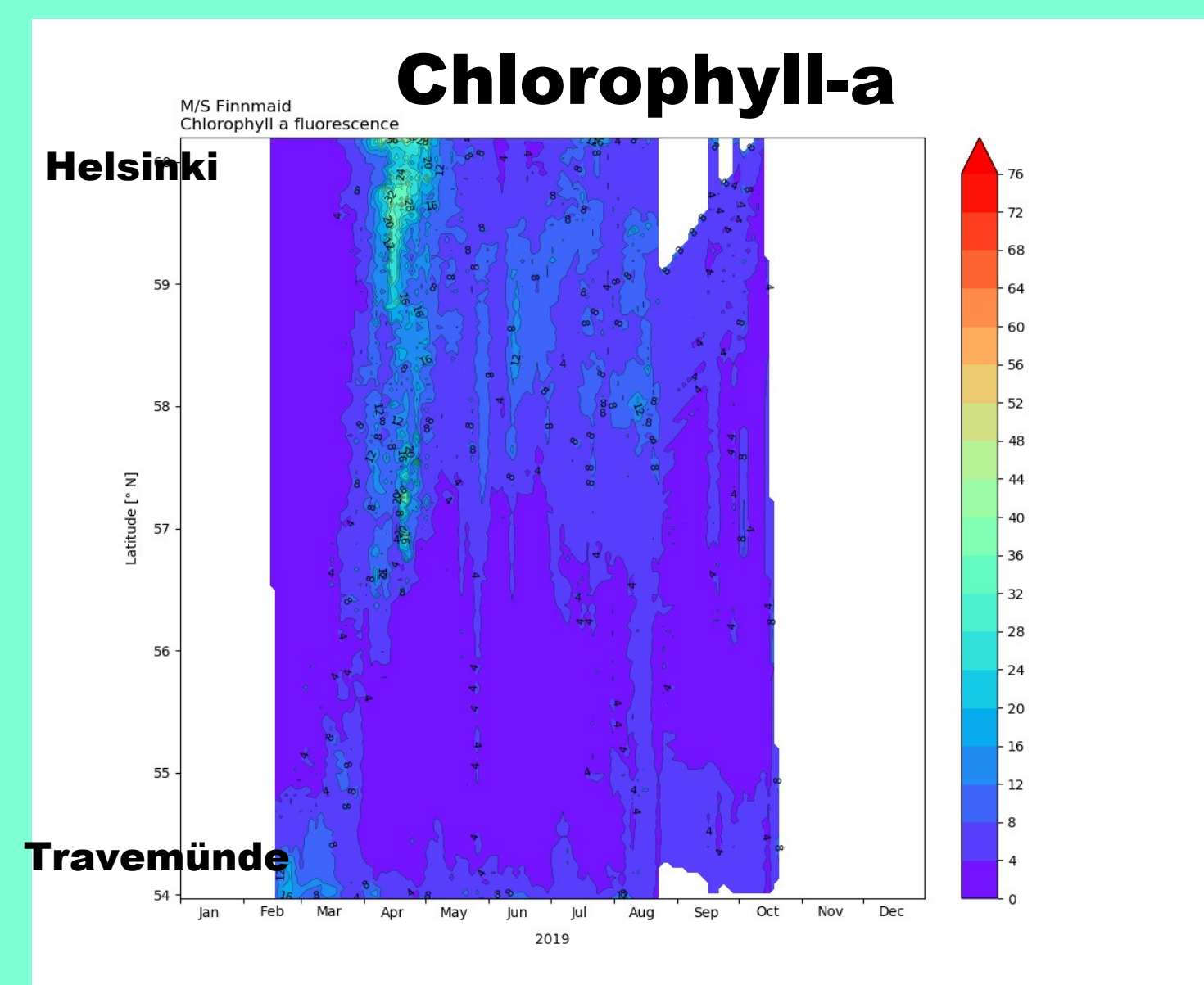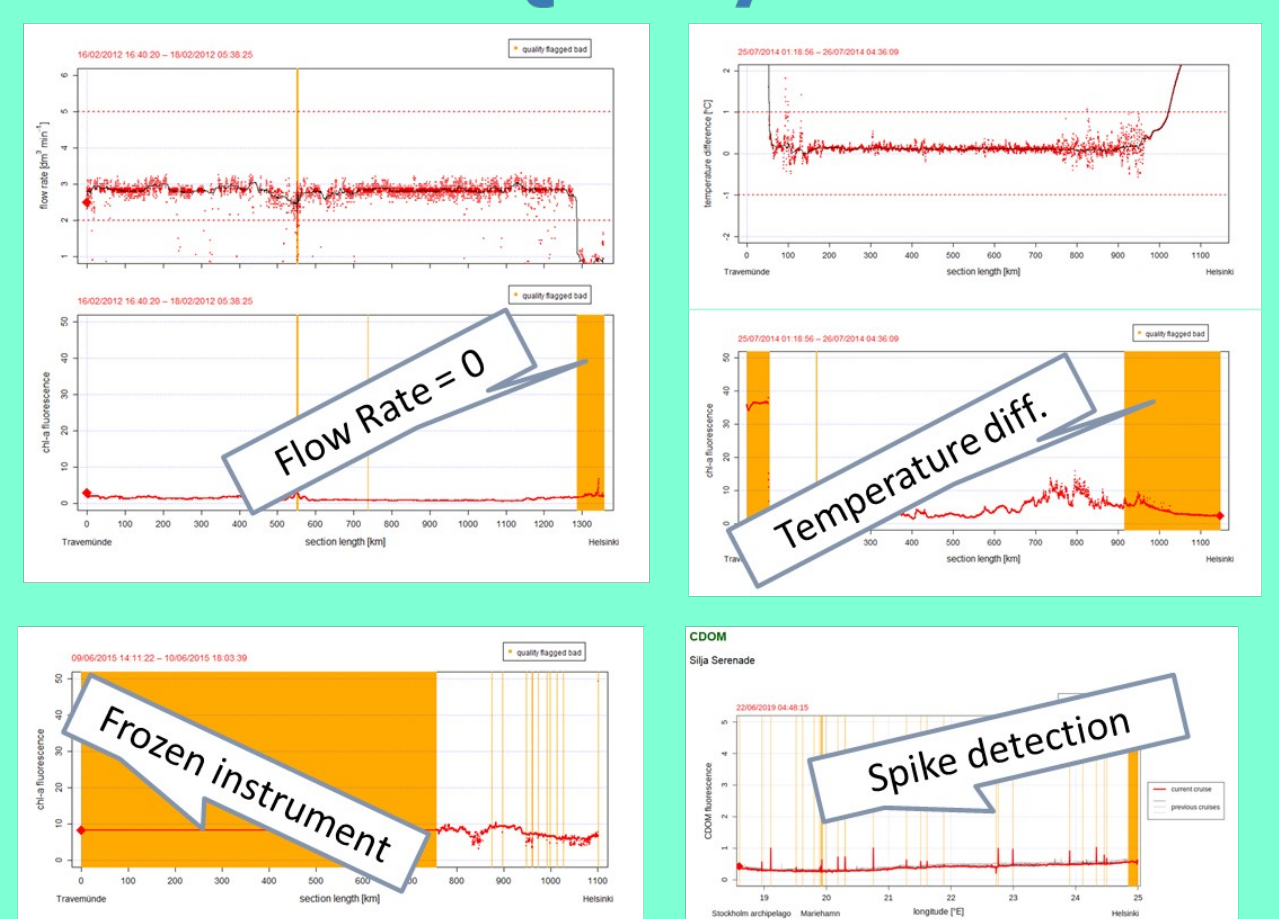 - chlorophyll a
  - phycocyanin
  - CDOM
  - turbidity

Alg@line 2019

M/S SILJA SERENADE
Helsinki-Mariehamn
Stockholm

M/S FINNMAID
Travemünde - Helsinki

Automated annual plots, Finnmaid 2019

Chlorophyll-a

Salinity

Automated and manual QC:
New Script for Ferry for automated data flagging as well as for follow-up manual inspection, with interactive graphical interphase, were created and made available at https://gitlab.com/ruoho/tsdatacheck.
QC is based on *Jaccard, P. et al. 2018. Quality Control of Biogeochemical Measurements, v6. Copernicus Marine Environment Monitoring Service.* http://doi.org/10.13155/36232

Automated Quality Control

Flow Rate = 0
Temperature diff.
Frozen instrument
Spike detection

- Automated detection of frozen instrument, issues with water flow, reoval of obvious spikes.

Alg@line ferrybox data available in Near Real Time at:
http://marine.copernicus.eu/services-portfolio/access-to-products/
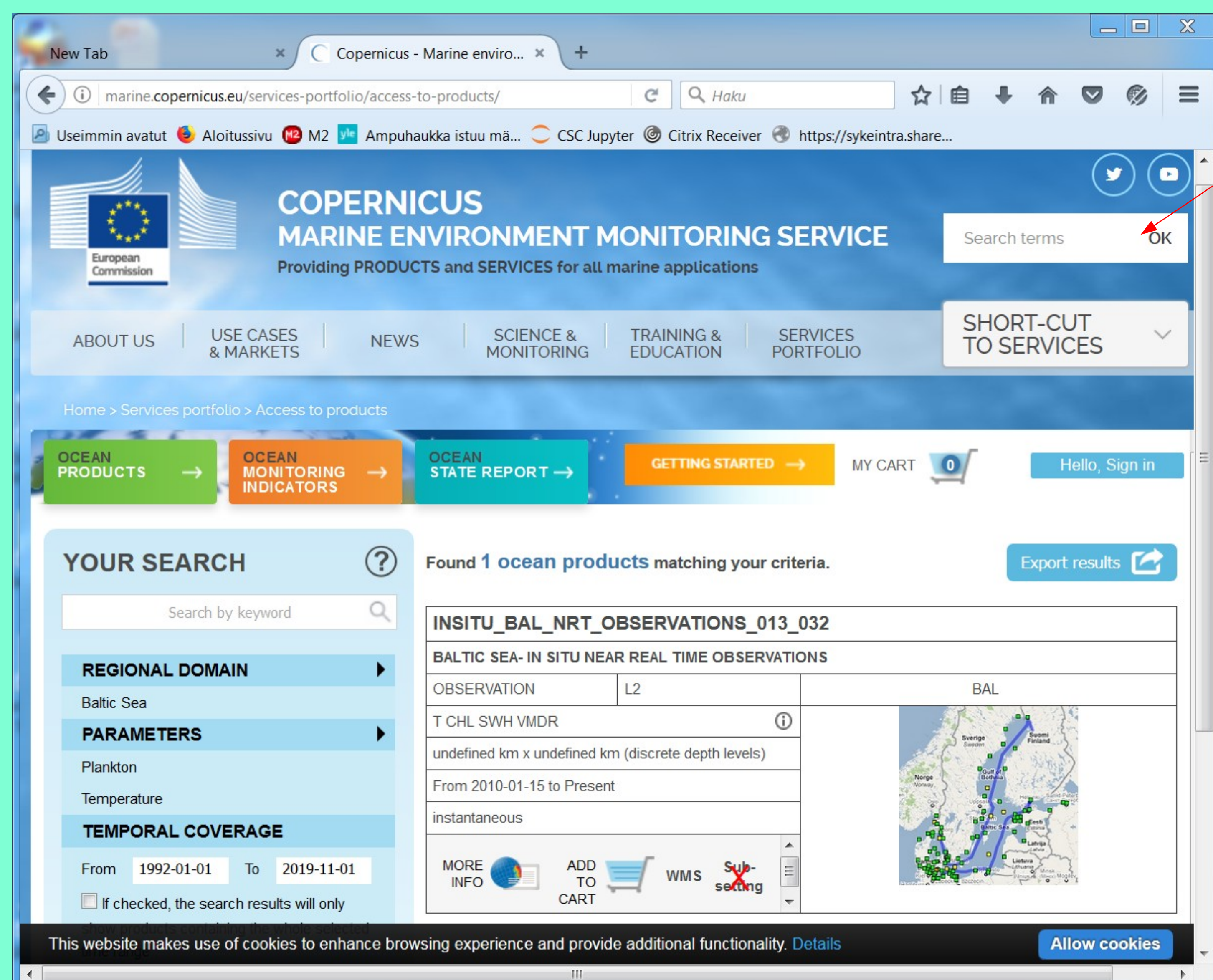
Ferrybox water samples for nutrients, Finnmaid 2015

Automatic sequence water sampler
24x 1000 ml bottles
refrigerated

M/S Finnmaid sample stations 2015

Chl-a [µg l⁻¹]
SiO₄²⁻ [µmol l⁻¹]
N (tot) [µmol l⁻¹]
NO₃⁻ + NO₂⁻ [µmol l⁻¹]
P (tot) [µmol l⁻¹]
PO₄³⁻ [µmol l⁻¹]