

# FerryBox

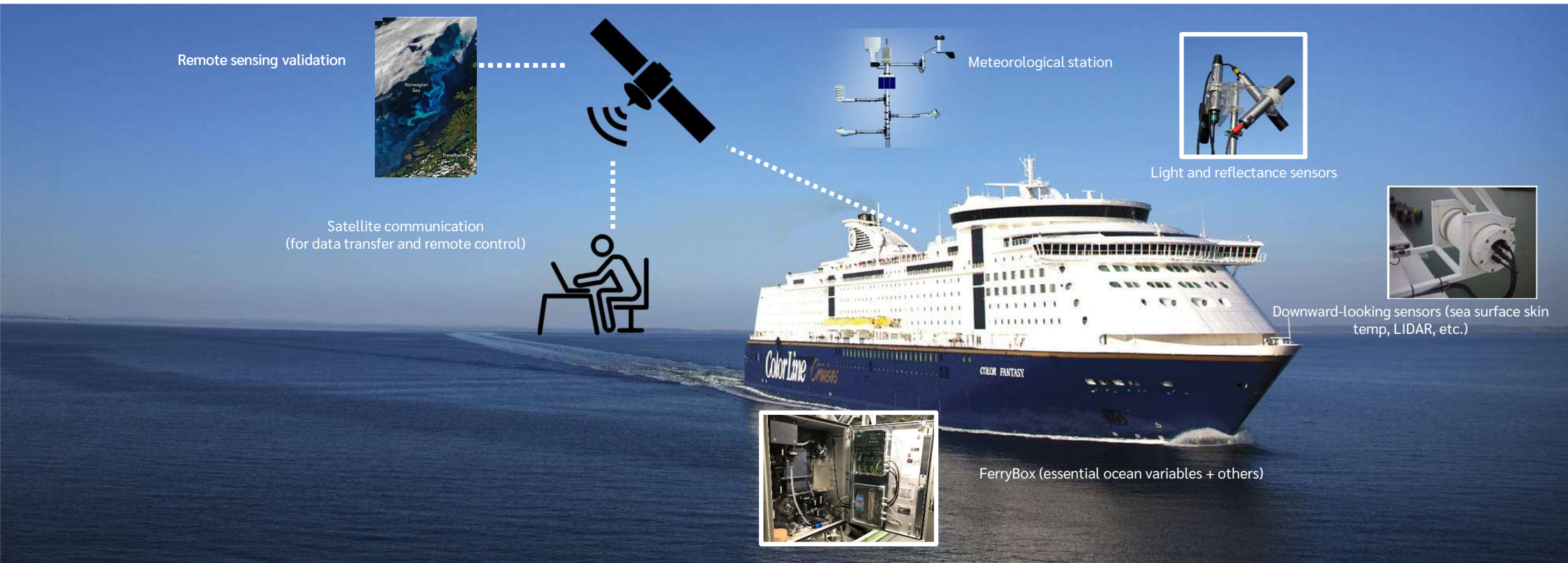
kontinuerlig miljøovervåkning ved bruk av  
sensorer om bord nyttefartøy

Louise Valestrand mfl. 09.02.2024

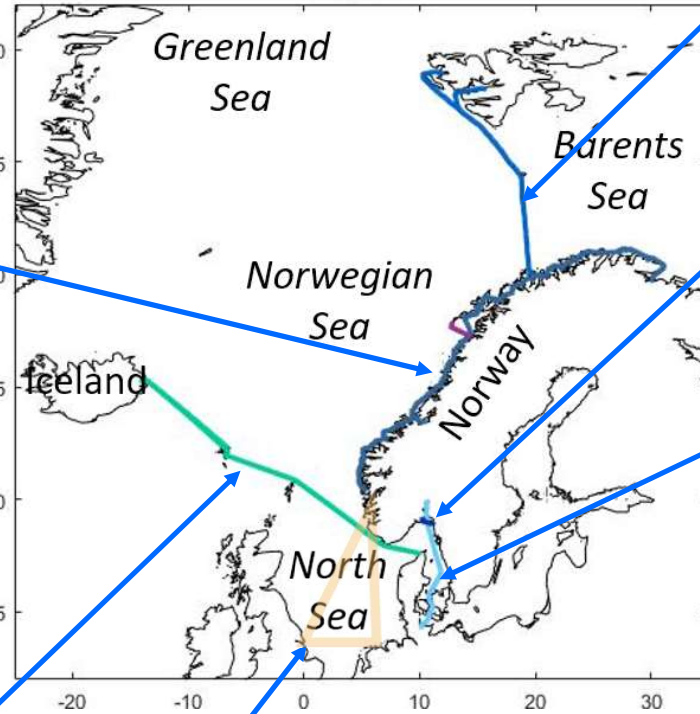
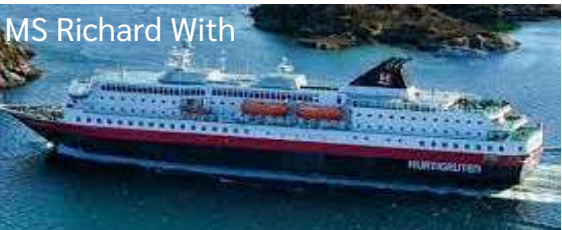


# NorSOOP: Norwegian Ships of Opportunity Program for marine and atmospheric research

Partners: NIVA (lead), HI, Akvaplan-niva, Metrologisk institutt,



# NorSOOP skip og ruter



MS Color Hybrid – planned for 2024



MS Color Fantasy



Viking Octantis & Viking Polaris



SC Connector

Antarktis,  
Arktis &  
Great Lakes



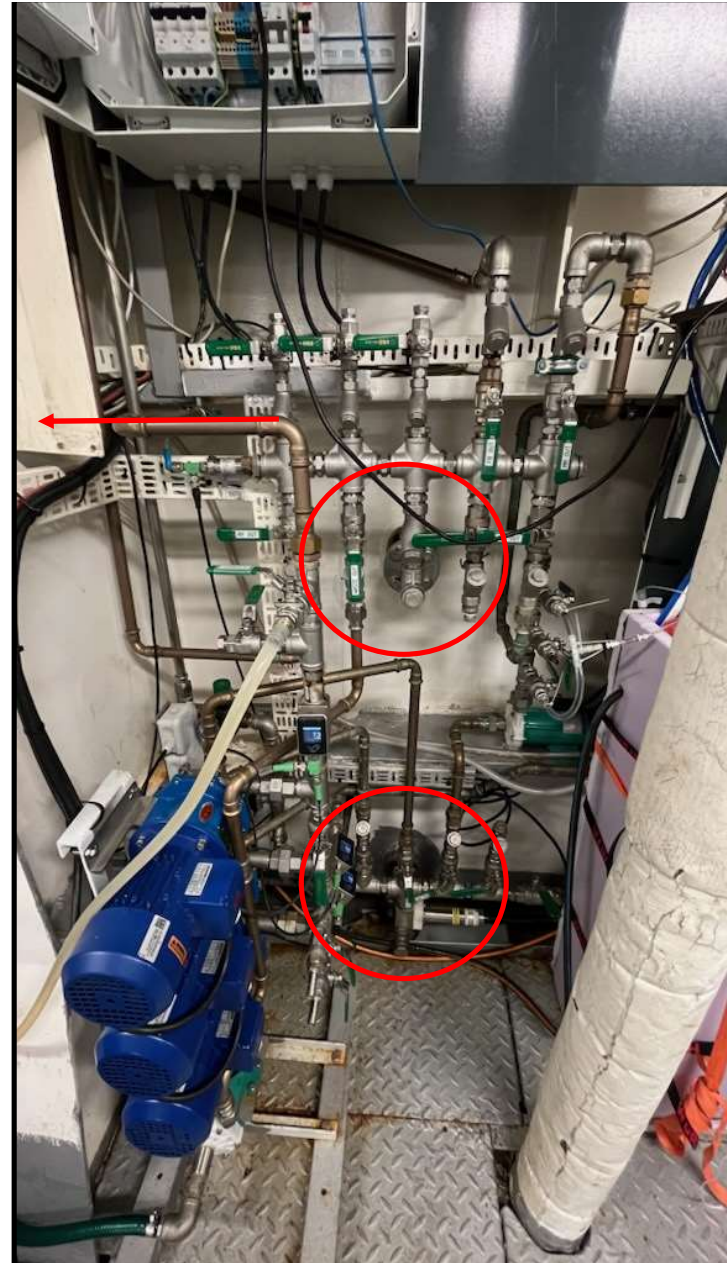
MS Roald Amundsen

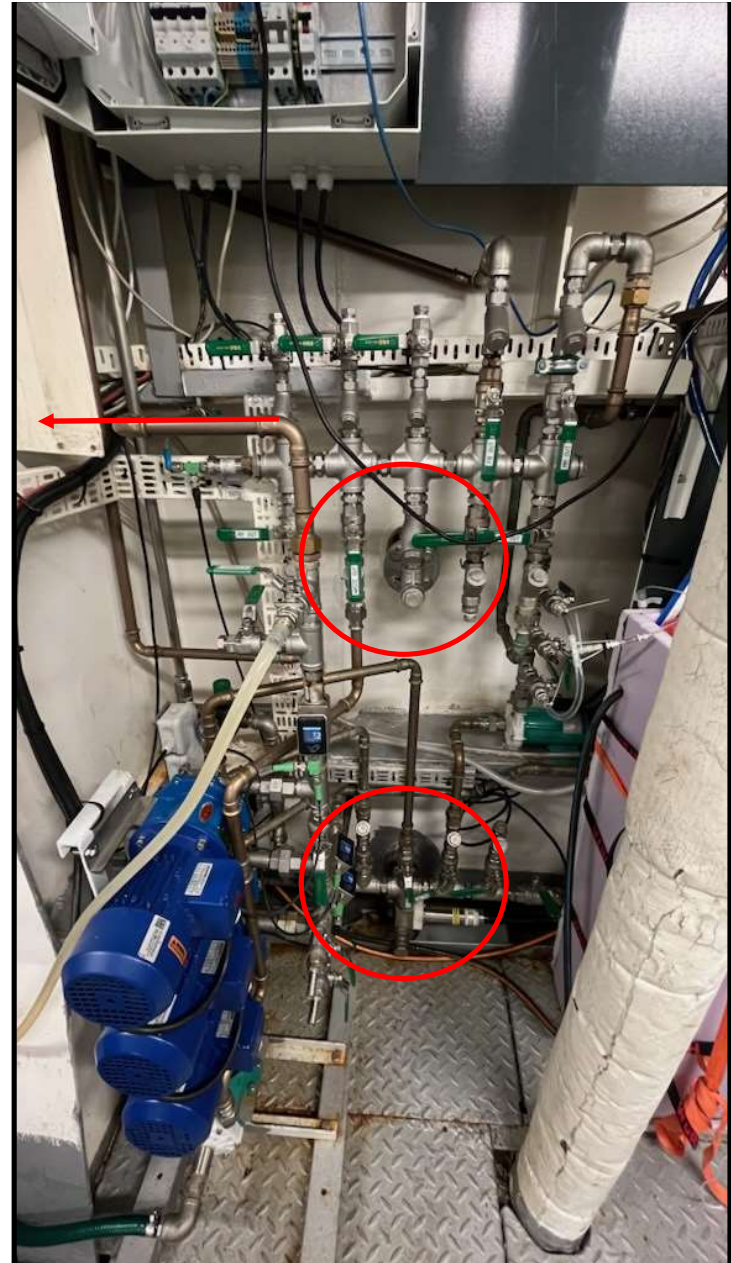
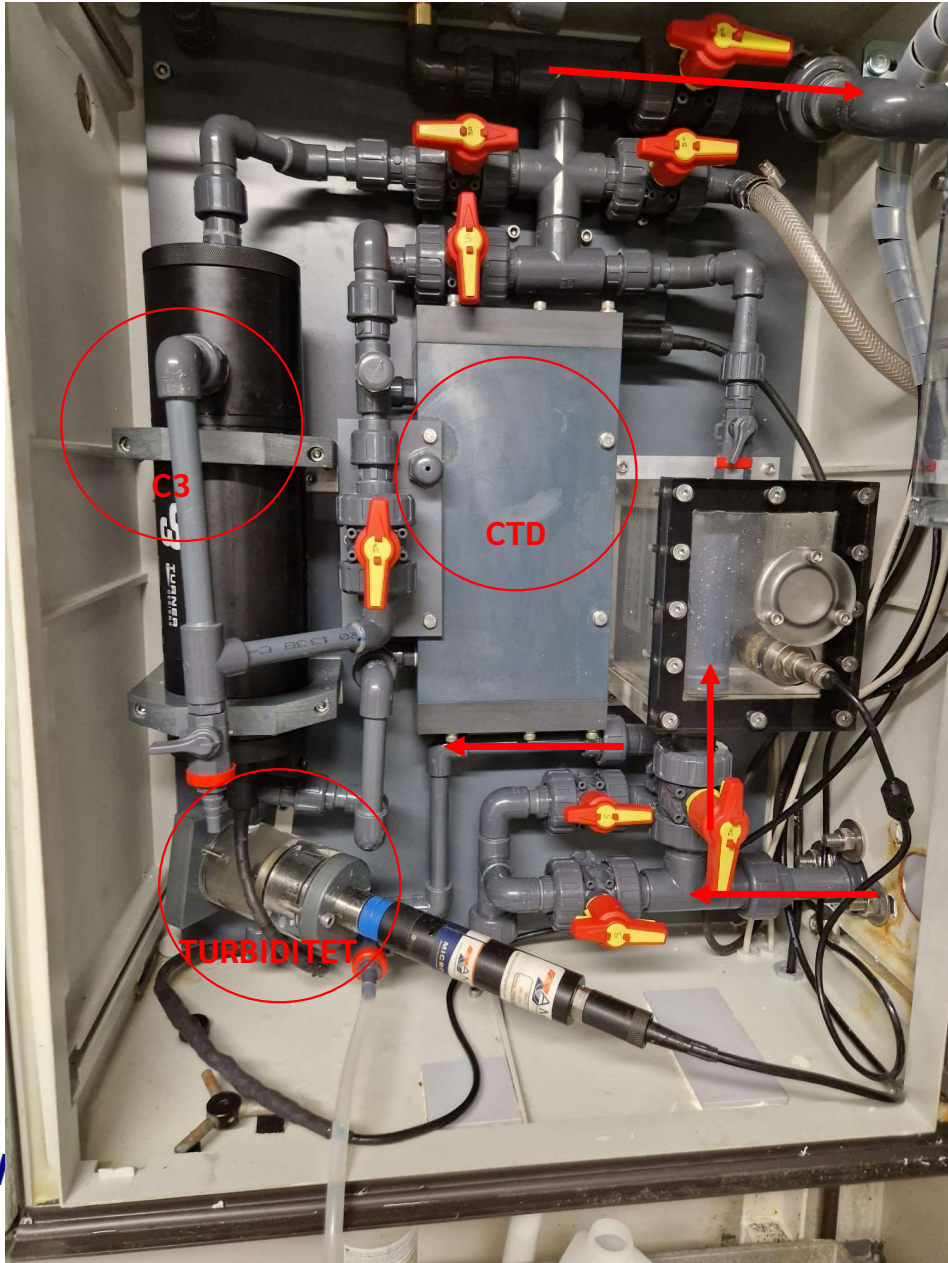


Andrew King

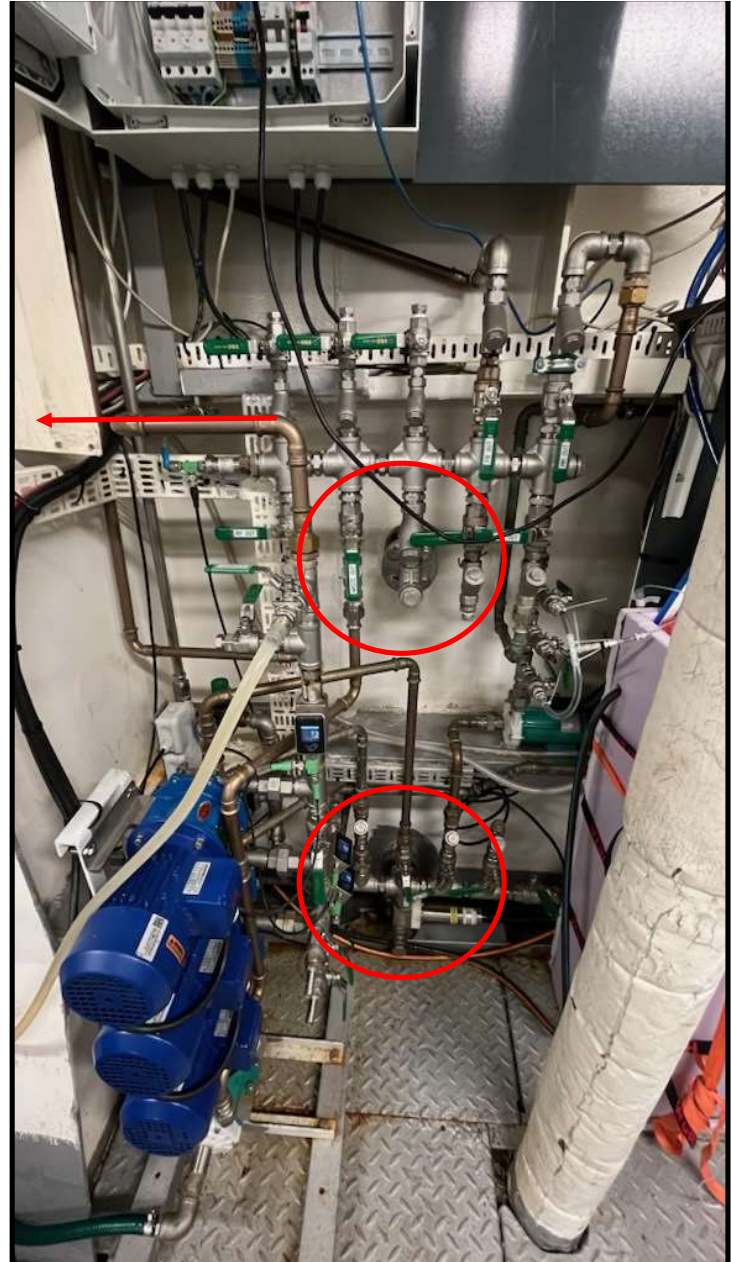


- Hoved vanninntak på ca 4 m dyp
  - Temperatursensor
- Tre pumper
  - En til våtskap med sensorer
    - Salinitet, temperature og oksygen
    - Klorofyll-a fluorescence, cDOM fluoresensce og turbiditet
  - En til pH og pCO<sub>2</sub>
  - En til mikroplast-innsamler





NIA



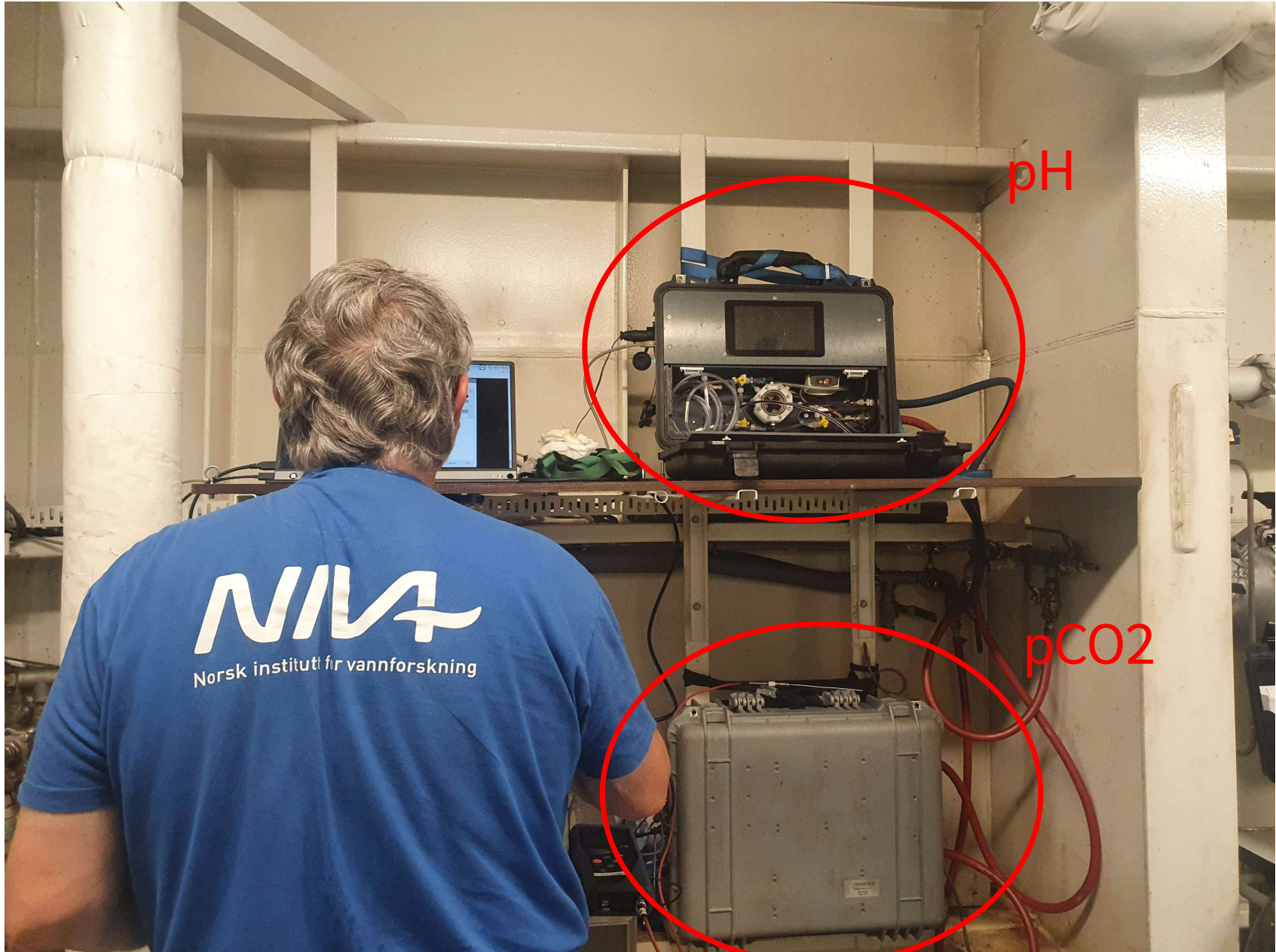


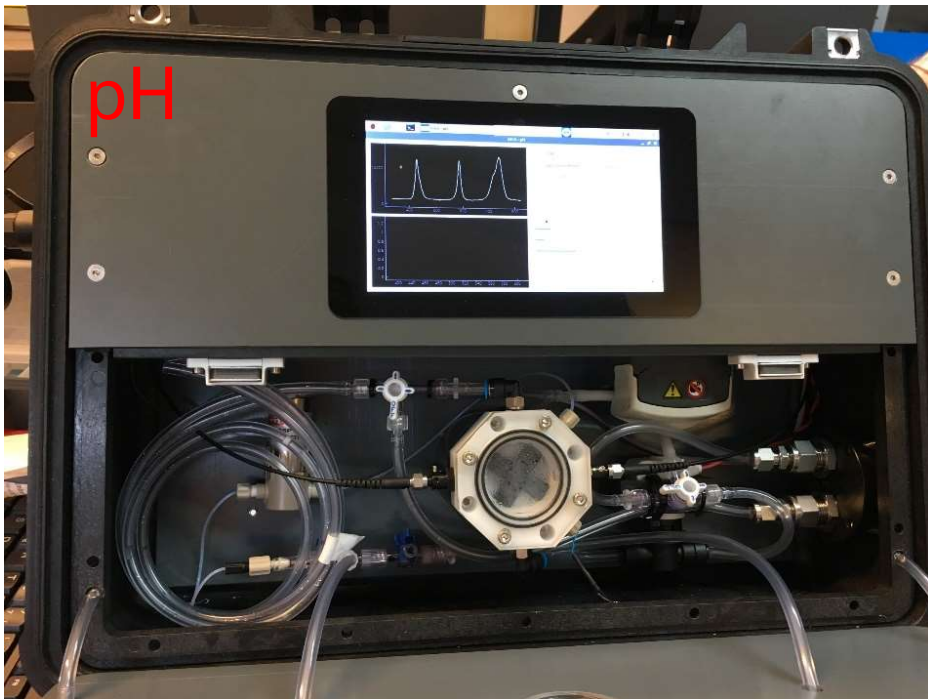


# ISCO vanninnsamler

- 1 L flasker i en rosett
- Fylles ved å få et signal
  - Signalene bestemmes ved koordinater
- Fjernstyres
- Vann til lab for videre analyse
  - Næringsalter
  - Planteplankton
  - mm







NIVA spektrofotometrisk pH sensor  
med m-cresol farge målt ved insitu temperatur



Franatech-NIVA pCO2 sensor  
med membran og NIR detektor

## Automatisk næringssaltanalyse Systea



NIVA

## Imaging FlowCytobot McLane



mclanelabs.com



## C3 - Turner

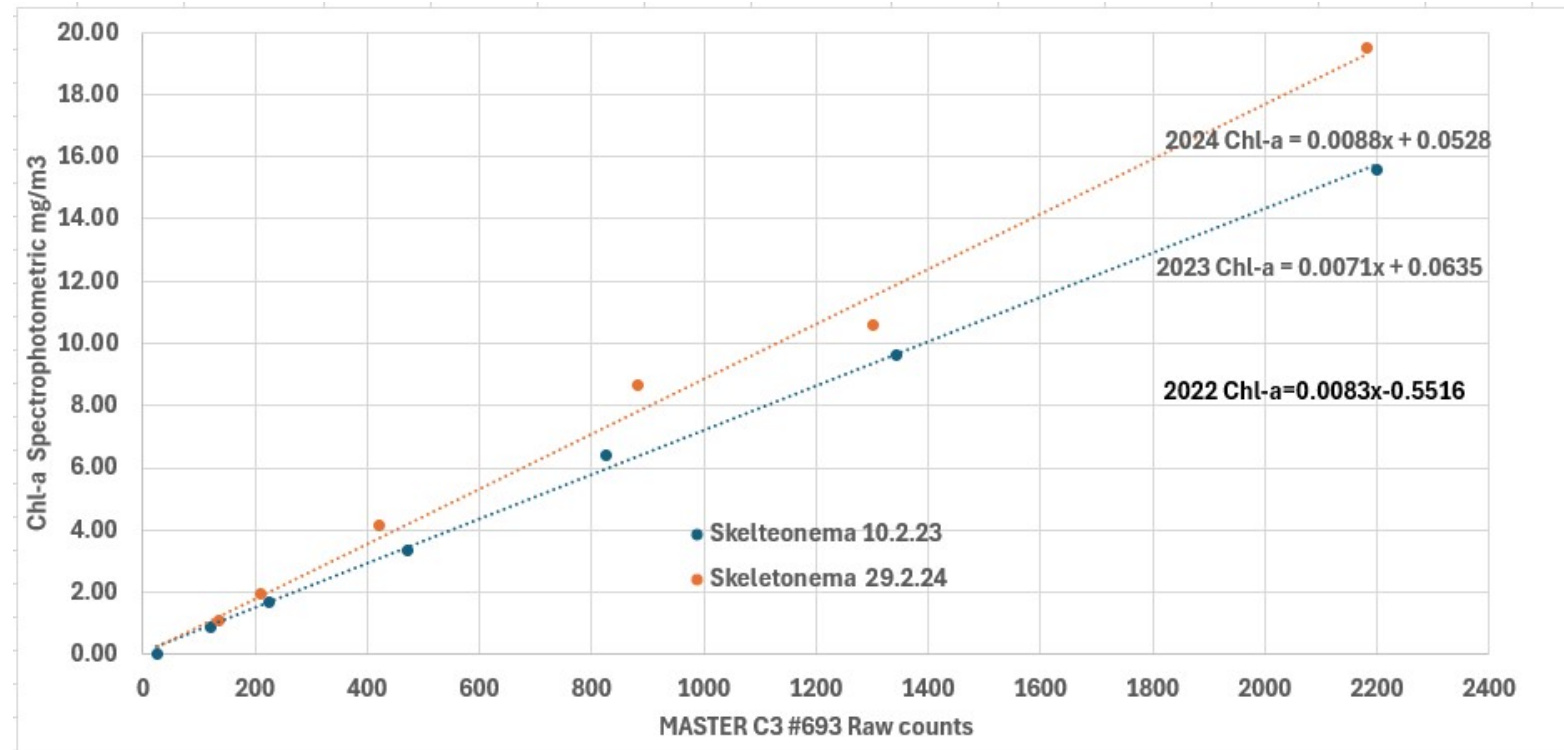
- 1 . Klorofyll a fluorescence
- 2. cDOM fluorescence (fDOM)
- 3. Turbiditet

Har et “master” instrument som kalibreres på lab



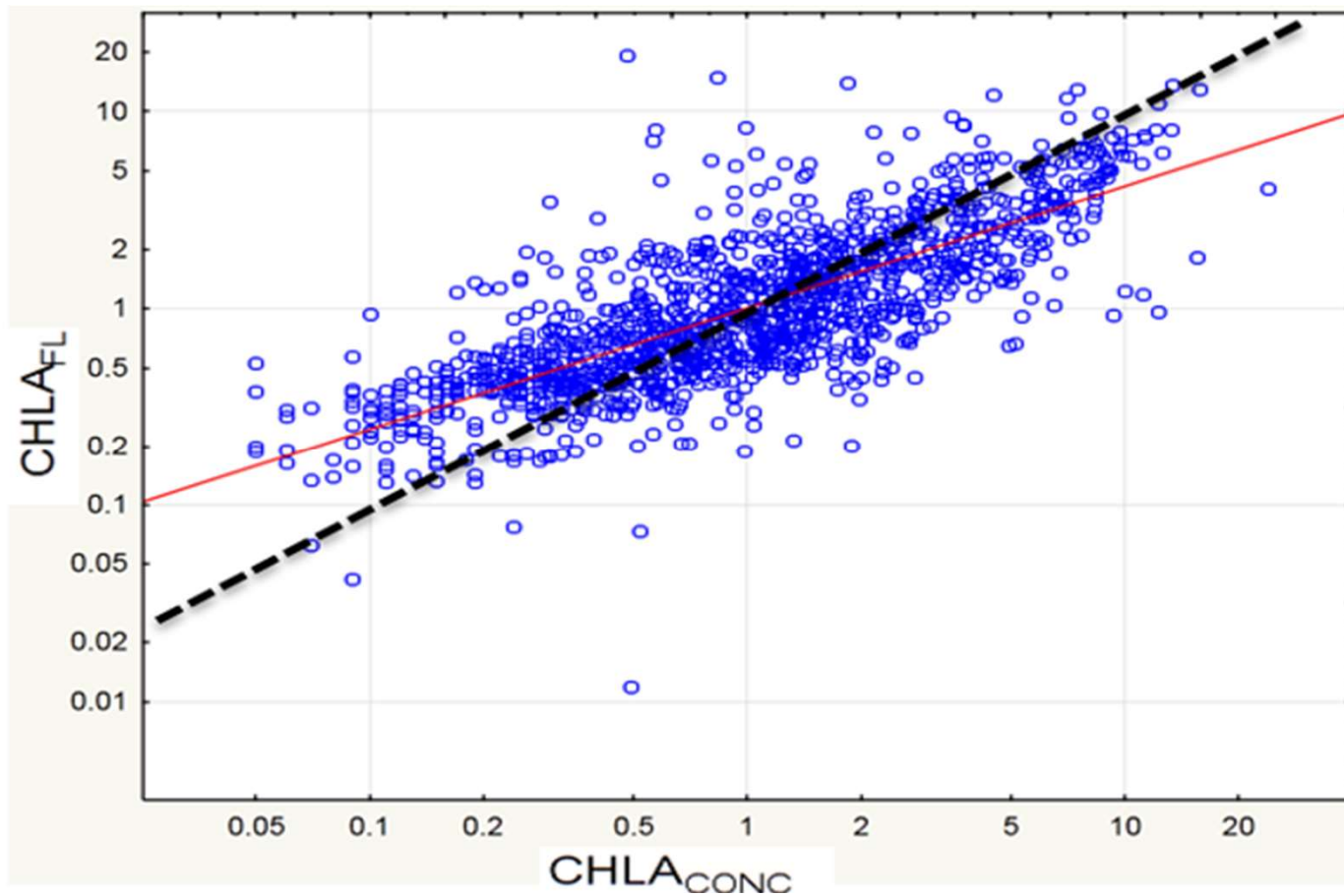
# C3 - Turner

Klorofyll a kalibreres med algekultur – *Skeletonema pseudocostatum*



## Sensor vs vannprøve

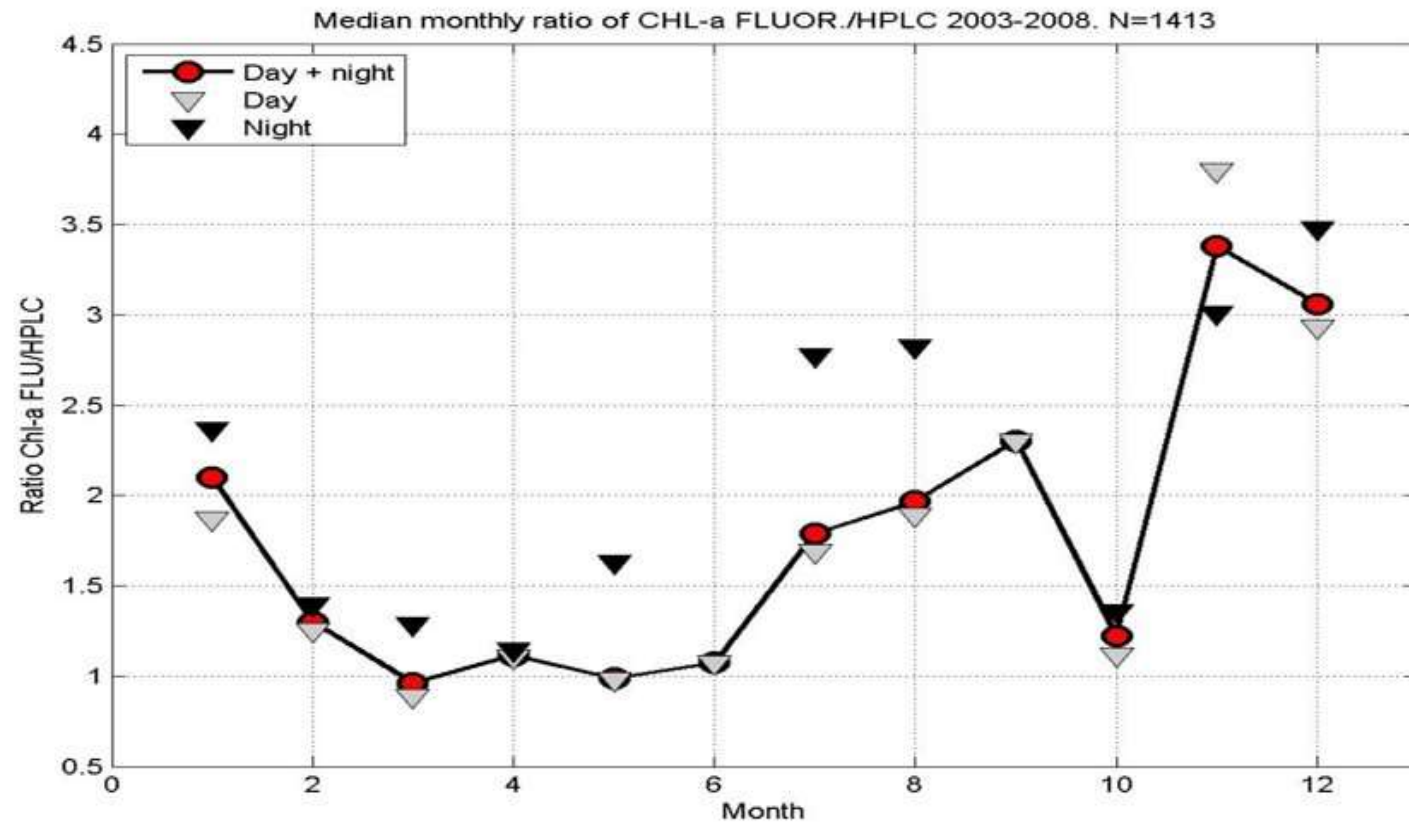
- 1400 datasett fra Skagerrak over 6 år
- Natt- og dagdata
- Svart linje er 1:1





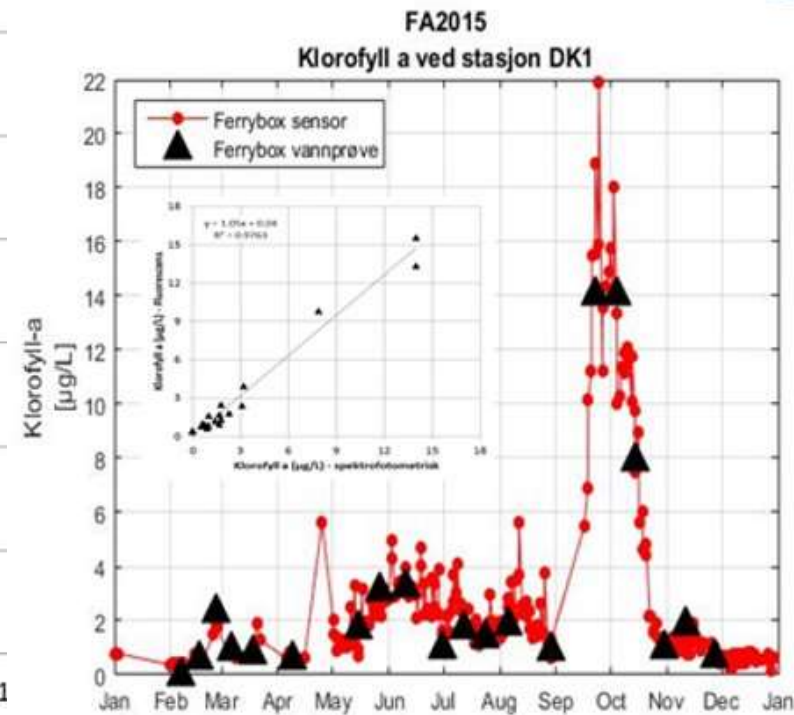
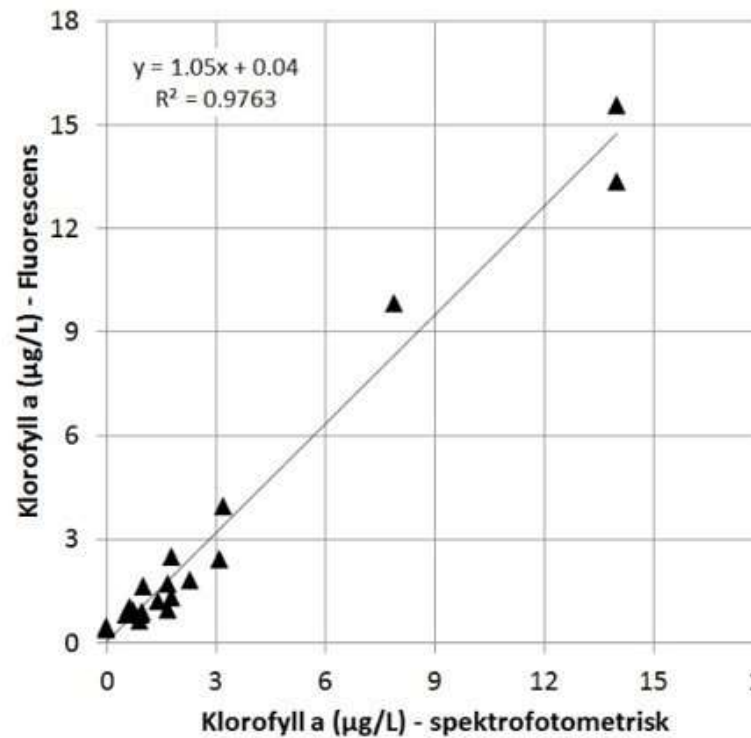
## Sensor vs vannprøve

- Stor døgnvariasjon
  - Mer fluorescens ila natt



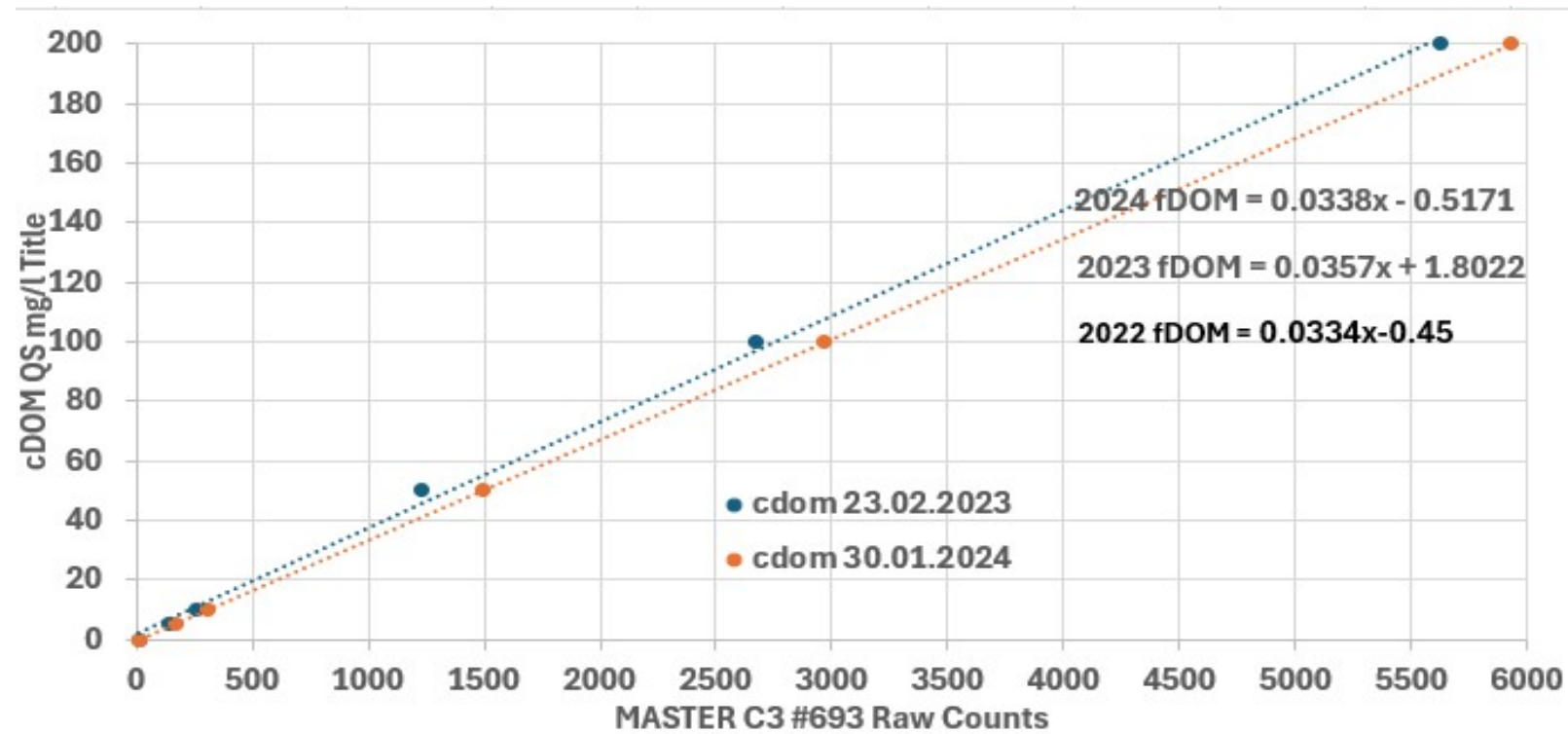
# Sensor vs vannprøve

Etterkalibrering av sensordata med klorofyll a vannprøver



## C3 - Turner

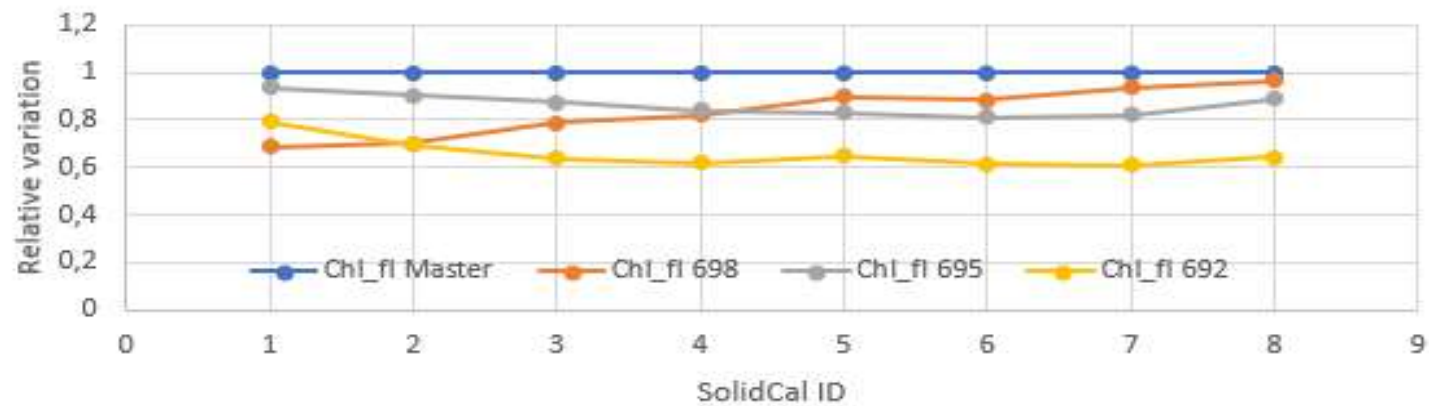
fDOM kalibreres med  
quinin sulfat oppløst i  
0.05M svovelsyre



## C3 - Turner

Variasjon mellom sensorene,  
dvs en kalibrering passer ikke  
alle instrumentene

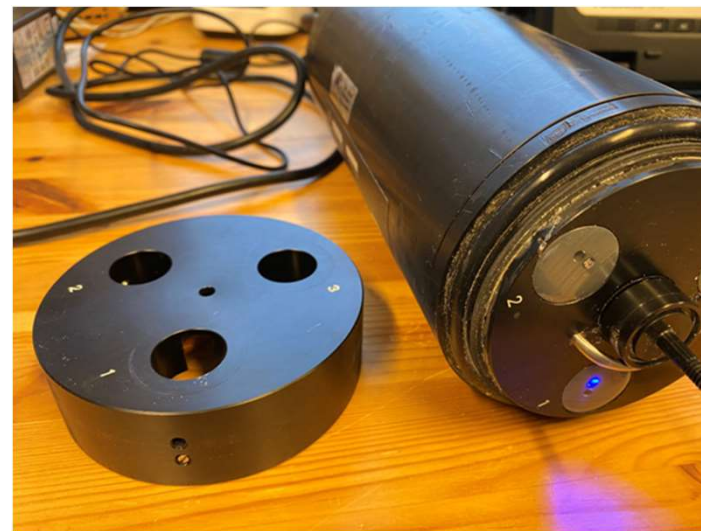
Variation between Chl-a FI sensor respons on 4 C3 units  
(Master = 1)



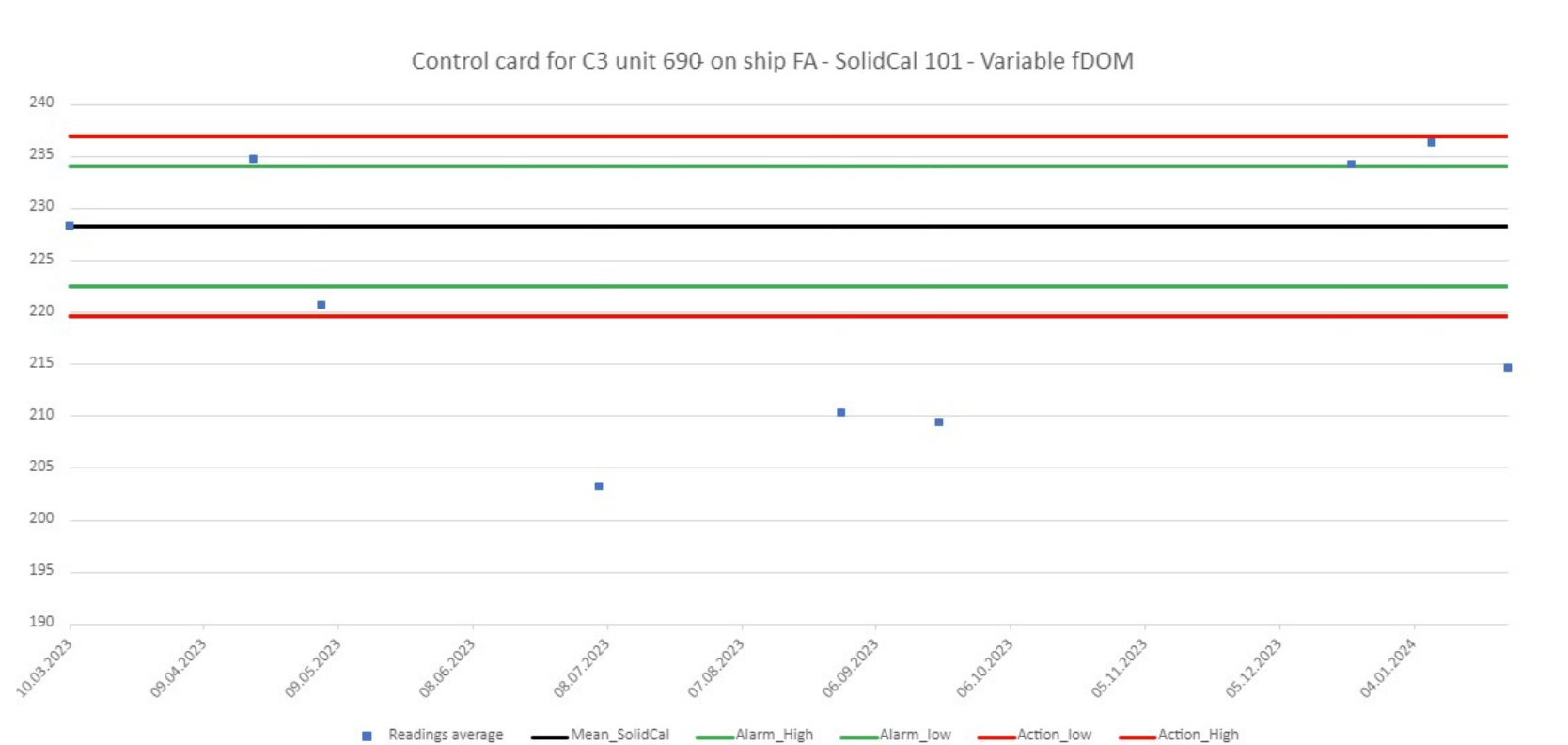
## C3 - Turner

Bruker solid standards for å korrigere mellom “master” og øvrige instrumenter

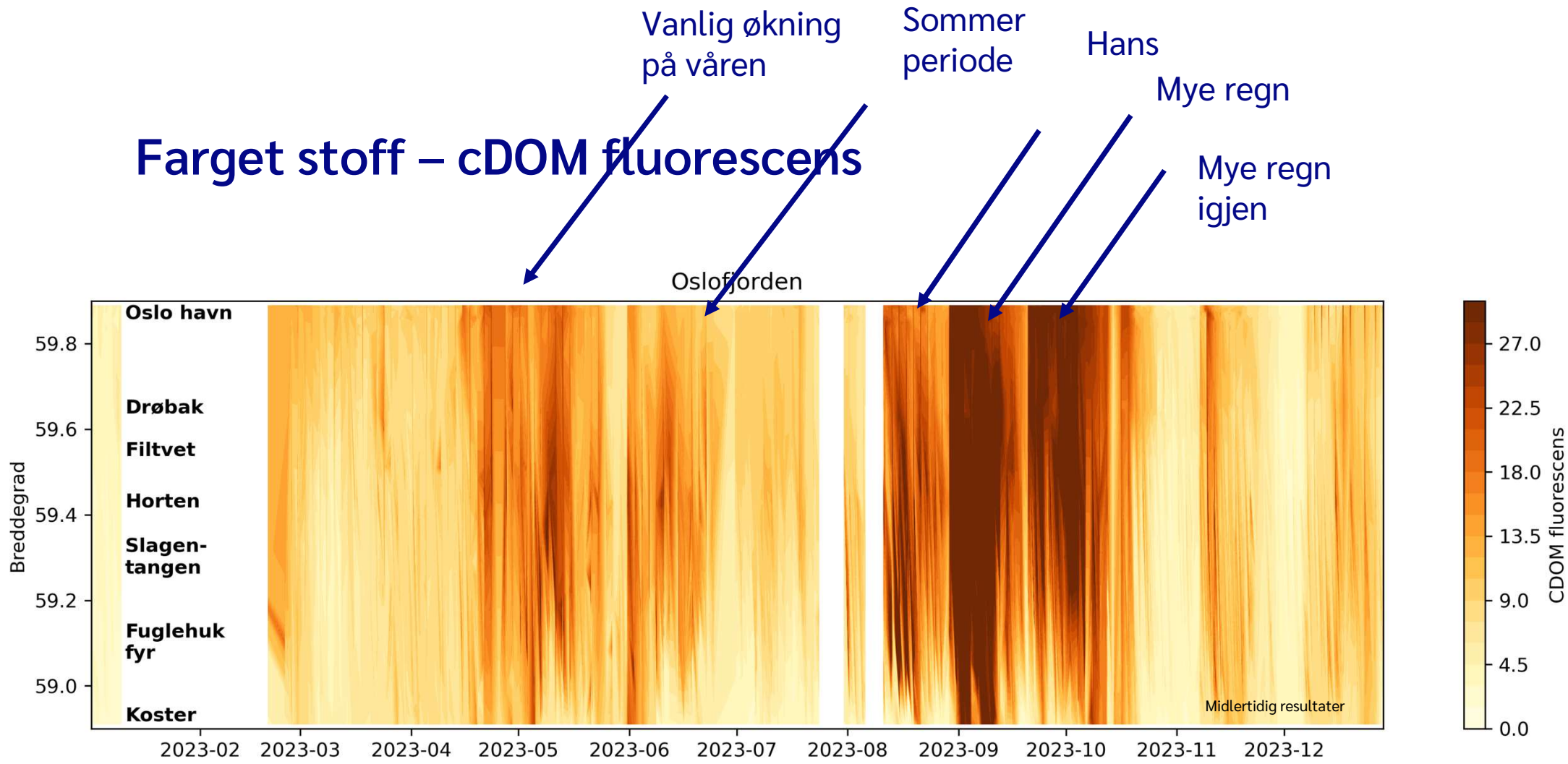
Legger til “korreksjonsfaktor” på kalibreringslikningen



# Kontrollkort for cDOM C3 om bord Color Fantasy



# Farget stoff – cDOM fluorescens



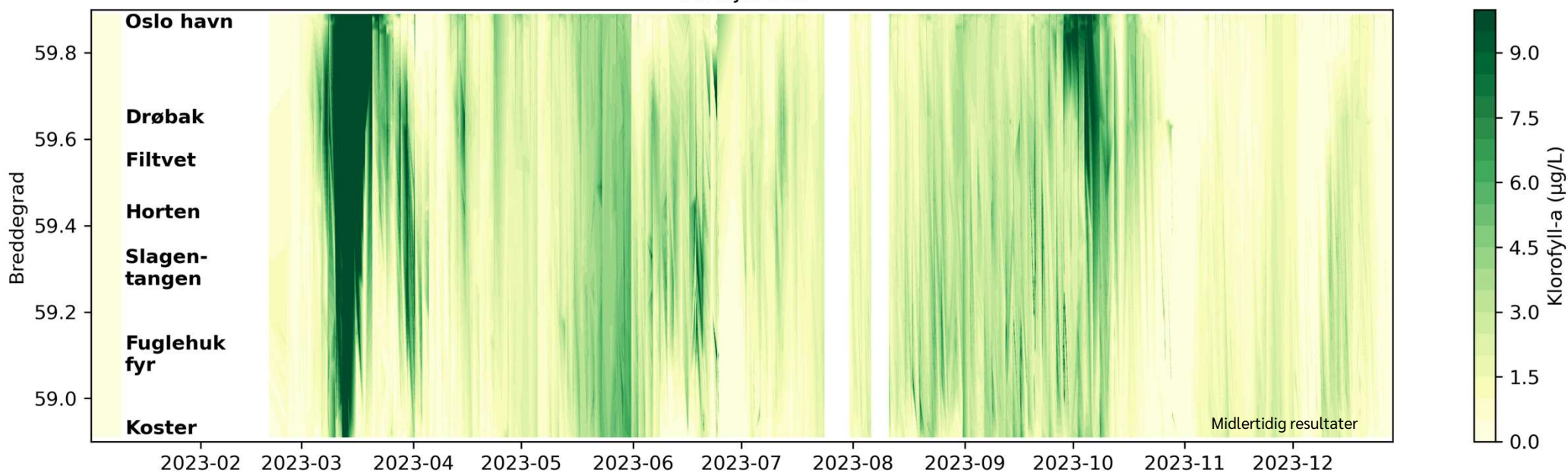
# Planteplankton – klorofyll-a fluorescens

Vår-  
oppblomstring

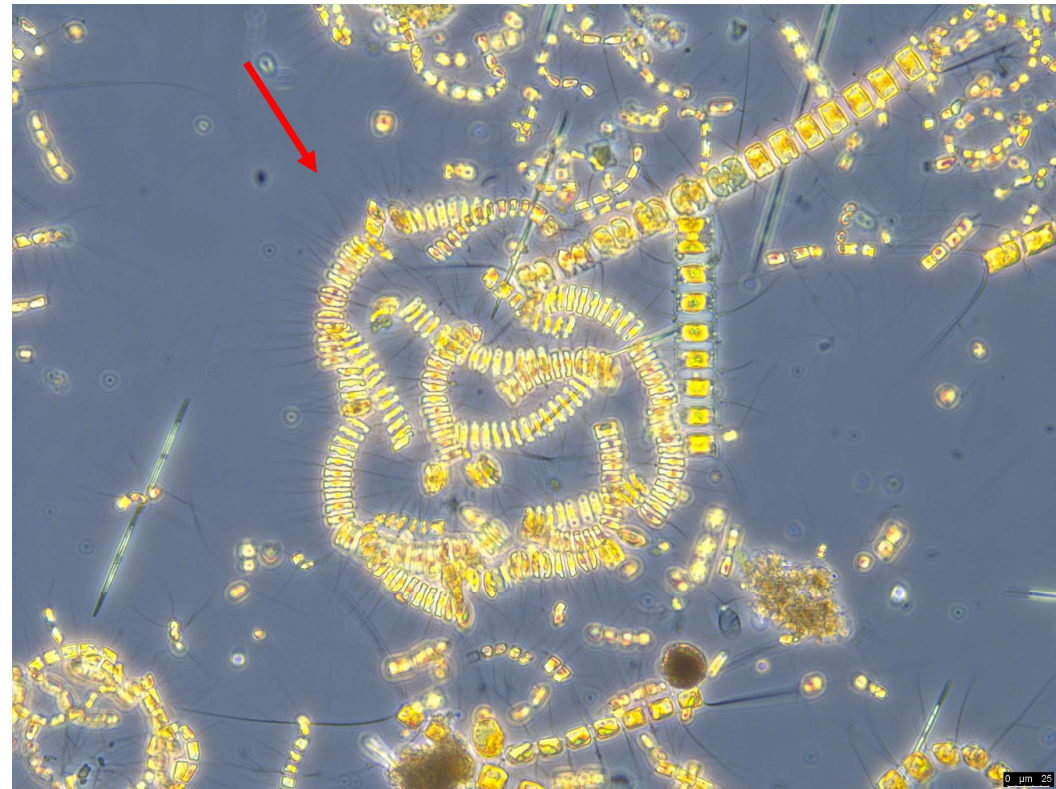
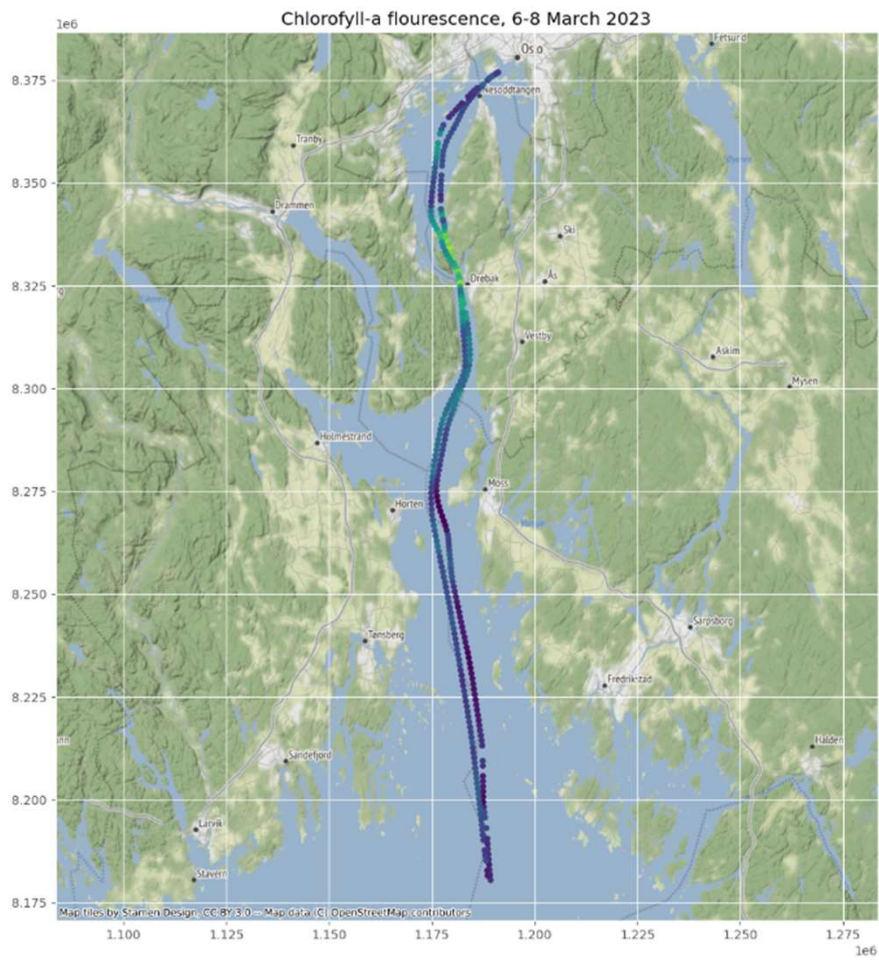
Sommer-  
oppblomstring

Ny  
oppblomstring  
etter flom

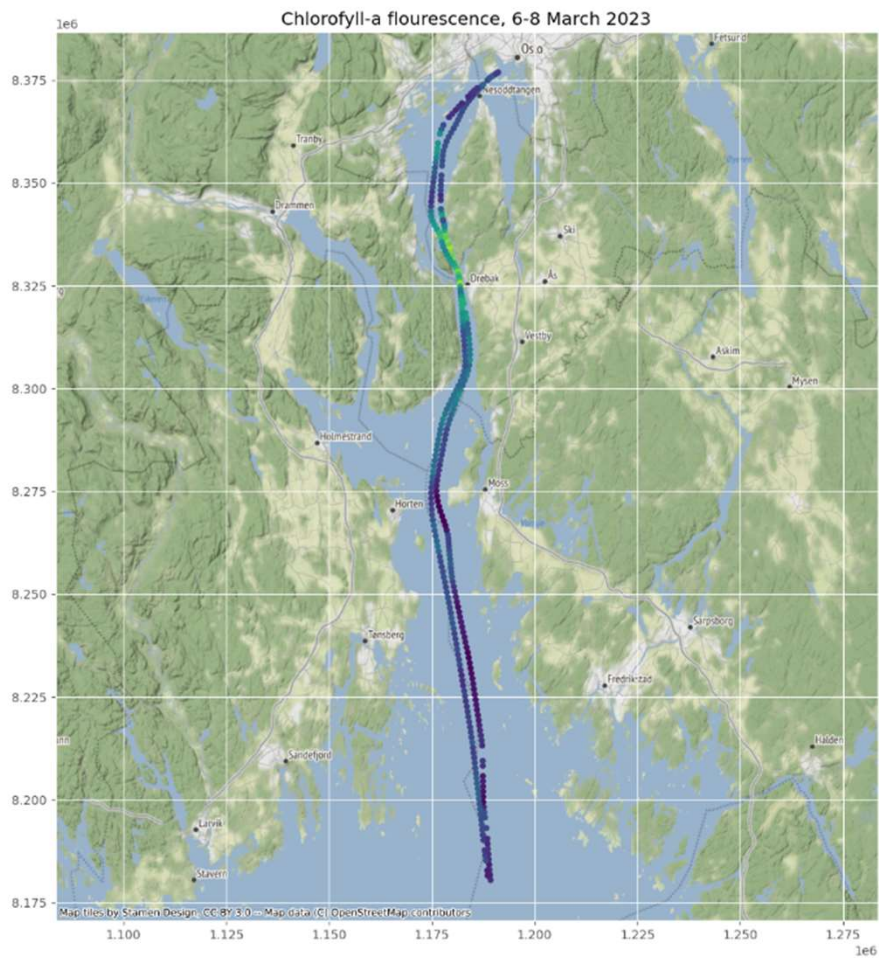
Oslofjorden







Kiselalger, hovedsakelig *Chaetoceros curvictus*

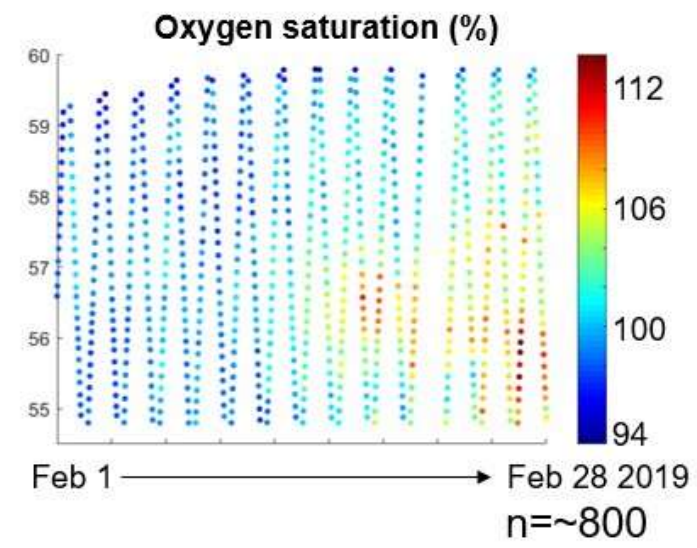
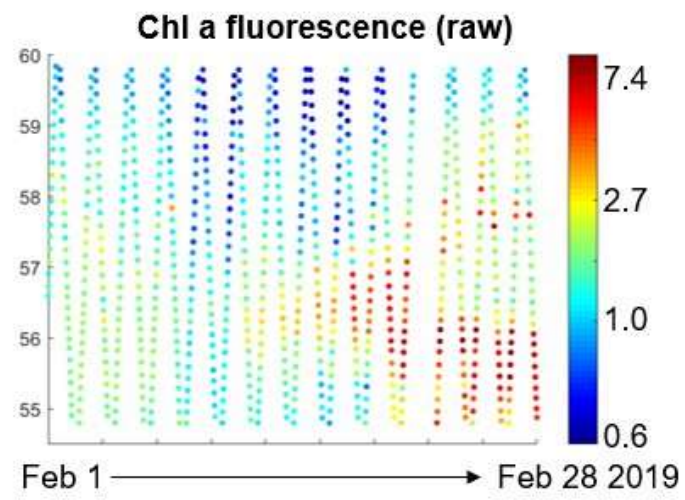
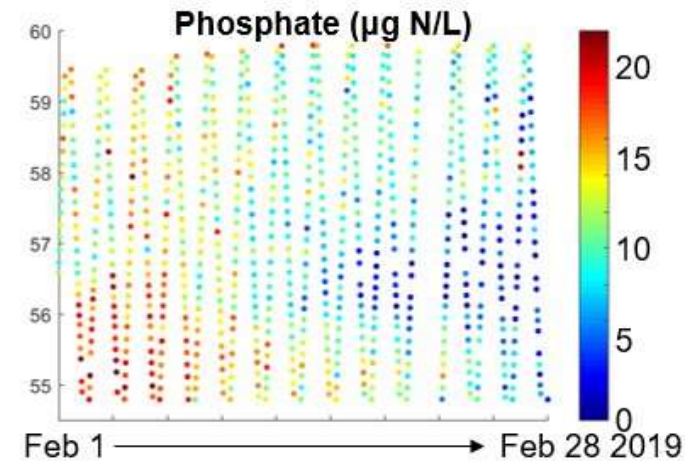
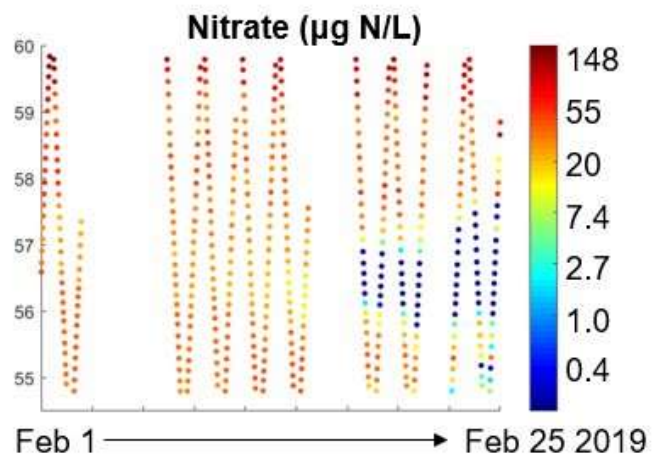


## MicroMAC System

1.  $\text{NH}_4$  og  $\text{PO}_4$  fluormetrisk
2.  $\text{NO}_2$  og  $\text{NO}_3$  coulometrisk
3.  $\text{PO}_4$  og  $\text{SiO}_2$  coulometrisk

Tilpasset til FerryBox positive kontroll av kalibreringsløsninger hver gang den går i havn





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- [Ferrybox | NIVA](#)
- [News & Events | NorSOOP](#)



Fagradet for vann- og avløpsteknisk samarbeid i indre Oslofjord



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