Experiences from application of remote sensing in marine and freshwaters areas

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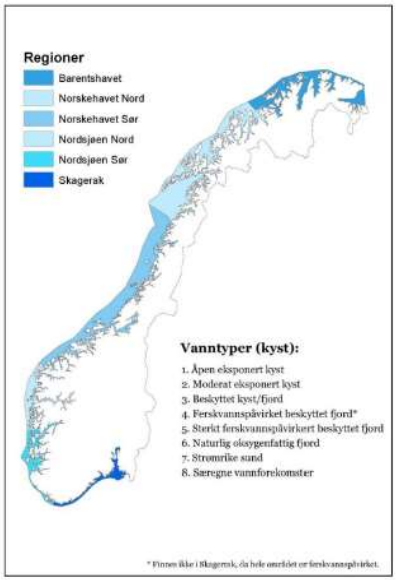
Content

- Optical Remote Sensing for water quality
- Marine and Freshwater satellite application
  - Examples from EU, ESA and internal strategic program (SIS)
- New freshwater project for NEA
- New NIVA SIS project on drones

Ecological and chemical classification of water bodies in Norway



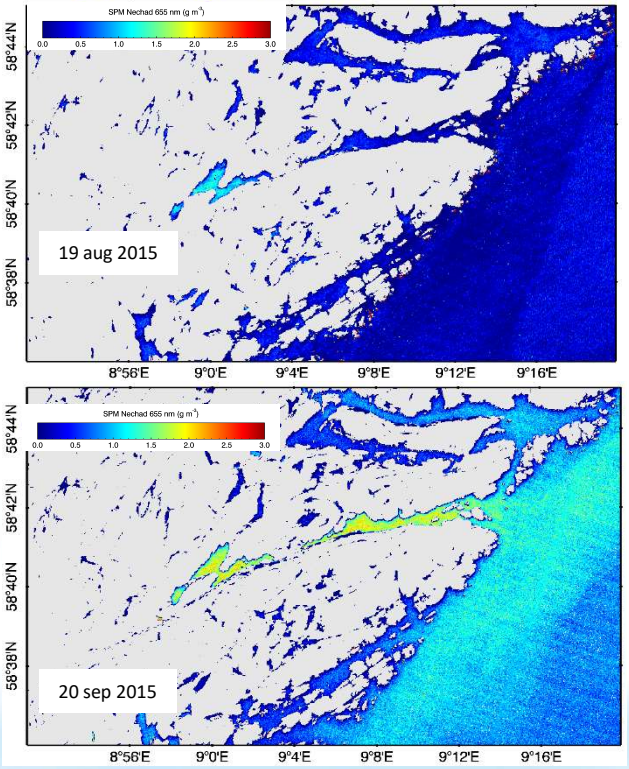
Summary of parameters covered by EO data for WFD

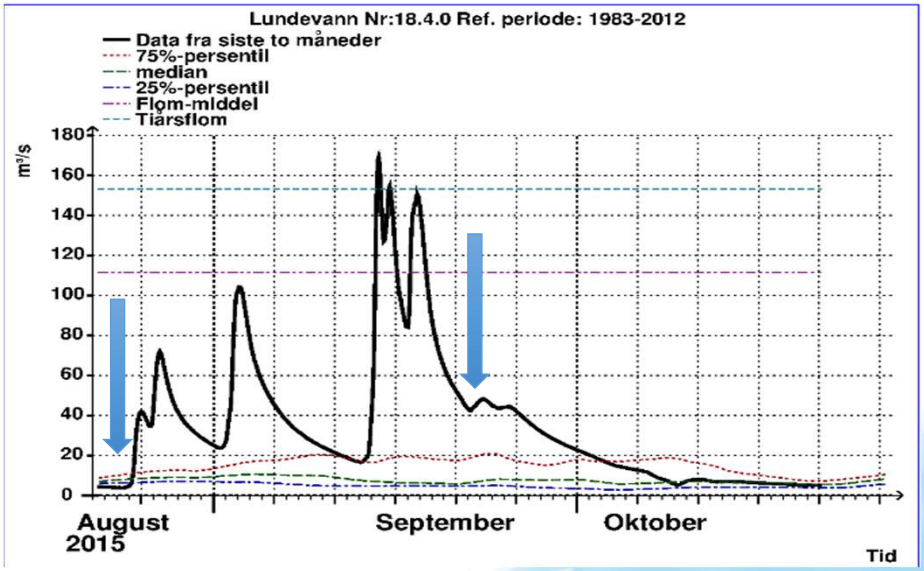
Surface water body type	Biological element	Chemical and physico-chemical elements	Hydromorphological elements
Rivers	✓ Frequency/intensity of planktonic blooms	✓ Thermal conditions	✓ River continuity
Lakes	✓ Abundance of phytoplankton in terms of Chl concentration ✓ Frequency/intensity of planktonic blooms	✓ Transparency ✓ Thermal conditions	
Transitional waters	✓ Abundance of phytoplankton in terms of Chl concentration ✓ Frequency/intensity of planktonic blooms	✓ Transparency ✓ Thermal conditions	

What happening in the wetlands and rivers influence the Lakes and Marine areas

Photos: Lillian Øygarden, BioForsk

Suspendert materiale transport into the fjord and open sea areas

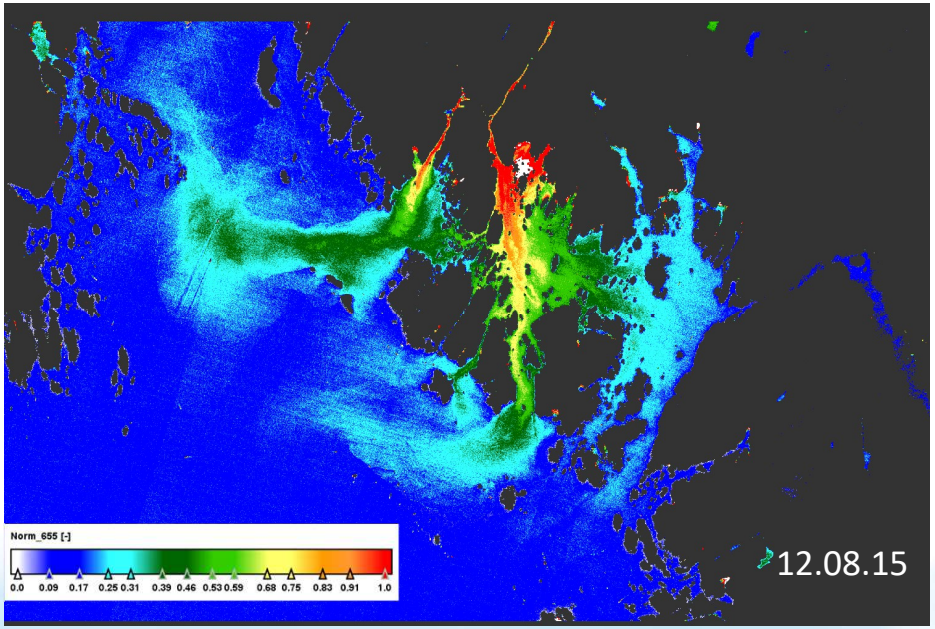




NVEs sanntidsdata fra utløpet av Storelva into Sandnesfjord

- 19. august 2015, 4 m^3/s
- 20. september 2015, 60 m^3/s (> 160 m3/s noen dager før)

Image from Landsat 8 showing the relative particle distribution from the Glomma River into the Oslofjord/Skagerrak

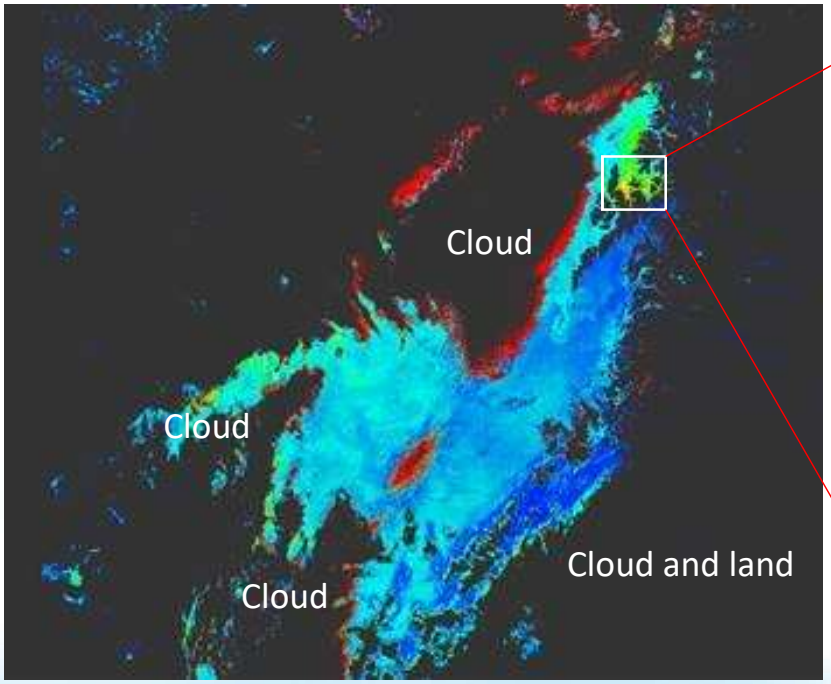


- Mapping of particle distribution and influence area
- Secchi Disc estimates
- Light climate in the water column
- Station representativity

Water quality – potential products possible from EO data

- Monitoring of surface phytoplankton
- Monitoring particle load, Turbidity/Total susp. material
- Monitoring turbidity/water transparency (Secchi Disc Depth)
- Coloured Dissolved Organic material
- Surface Water Temperature
- Ratio between green and blue-green algae
- Detection of Harmful Algal Blooms
- Mapping of shallow waters sea bed, coastline and shore

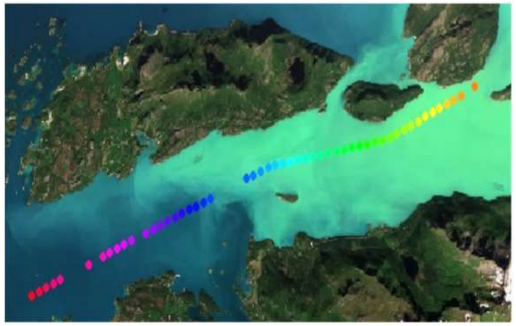
Sentinel 3 and 2 from 4. August 2017 showing the classical coccolith bloom

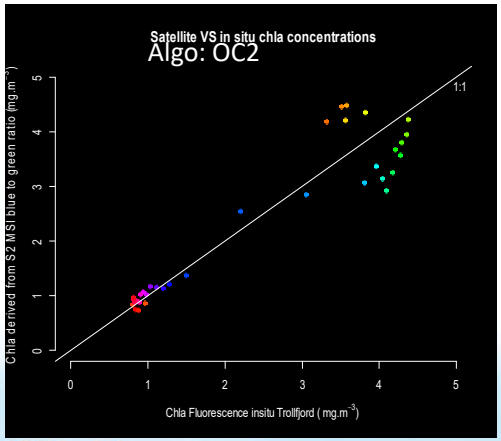


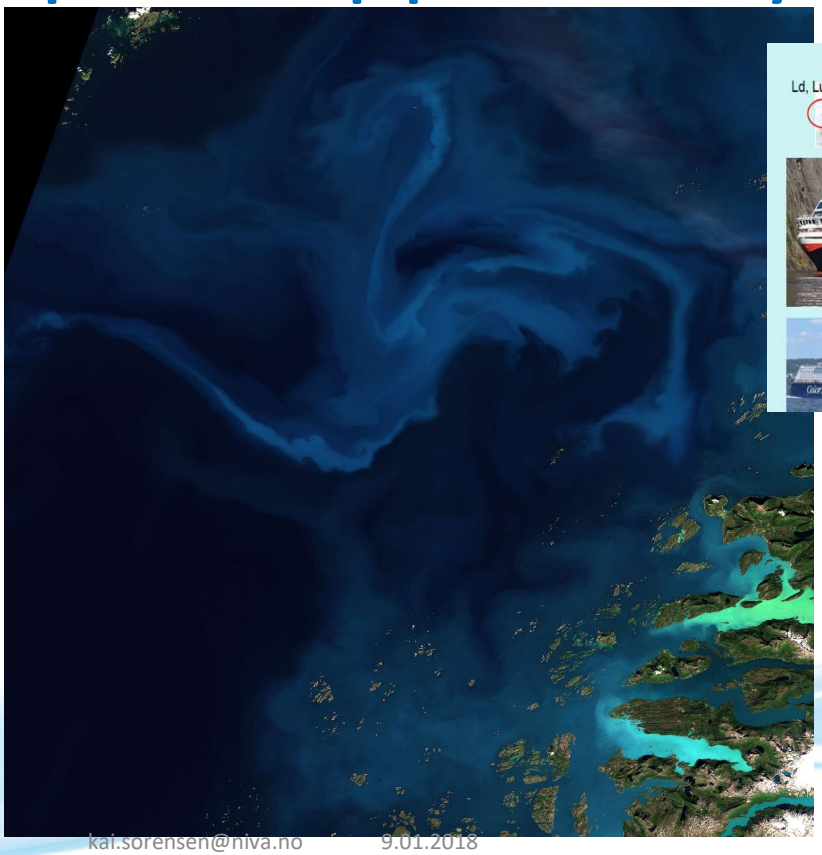
Total Suspended Material (Rel.Unit)

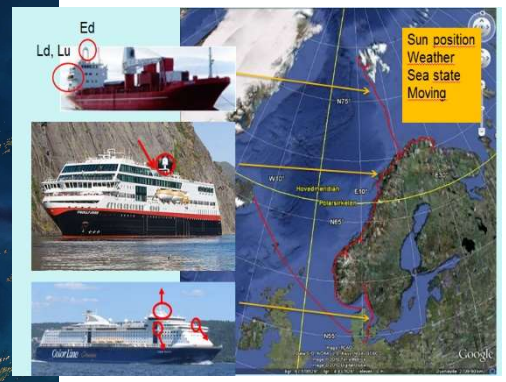
RGB ~ TSM (in this example)

Chl-a Sentinel 2 validation using the network of Ships of Opportunity (FerryBox)







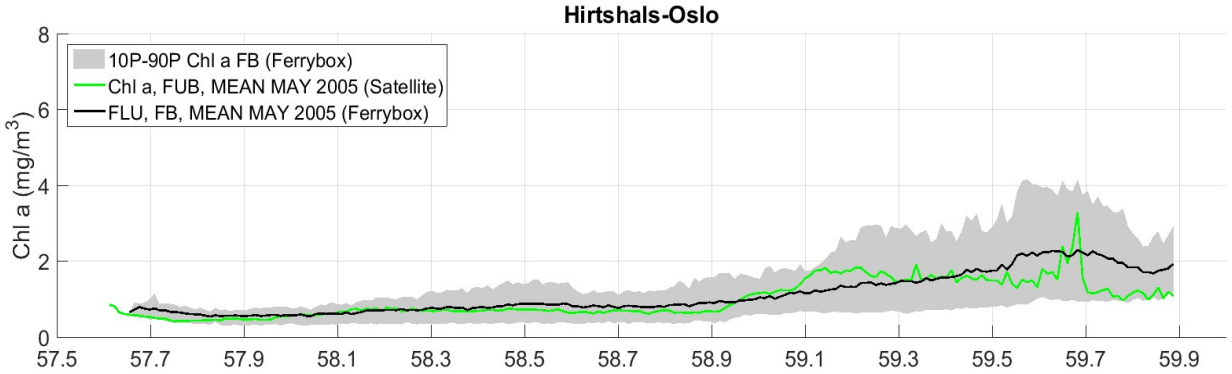


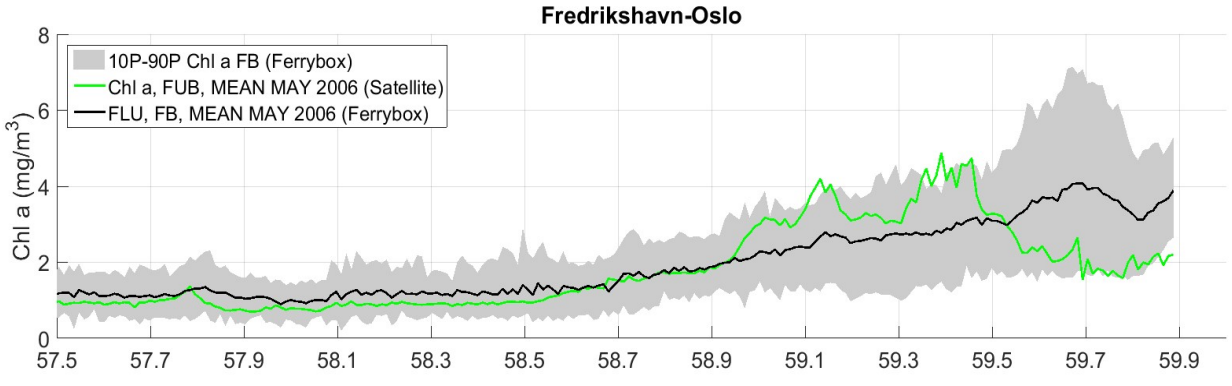
Case Study: Glomfjord area.

Particle from Glacier Svartisen

Marty and Sørensen:
EU project HighROC

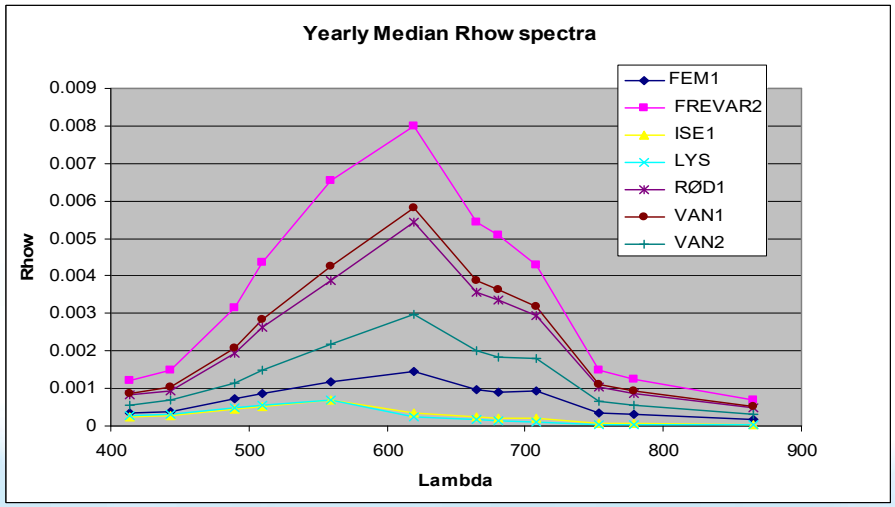
Validation of MERIS data from open areas

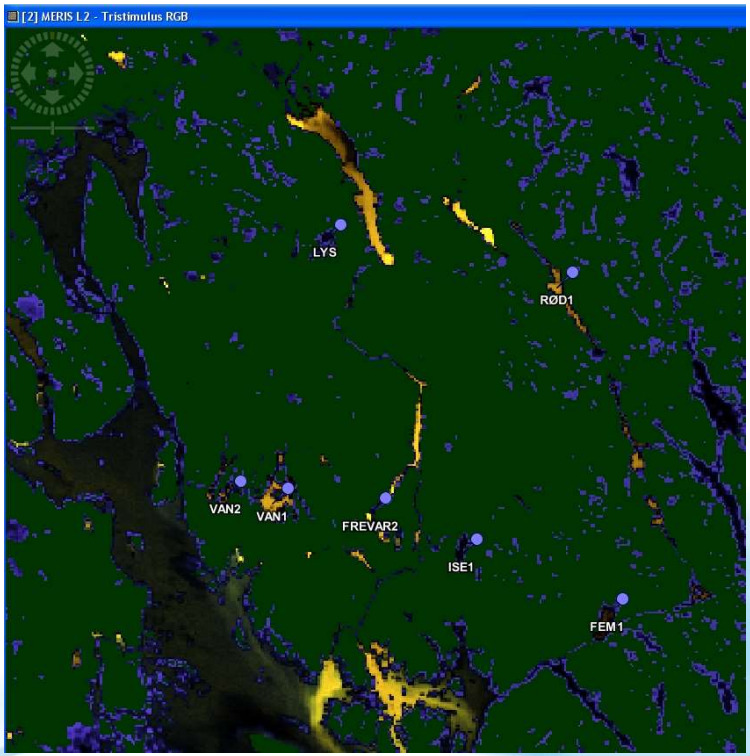




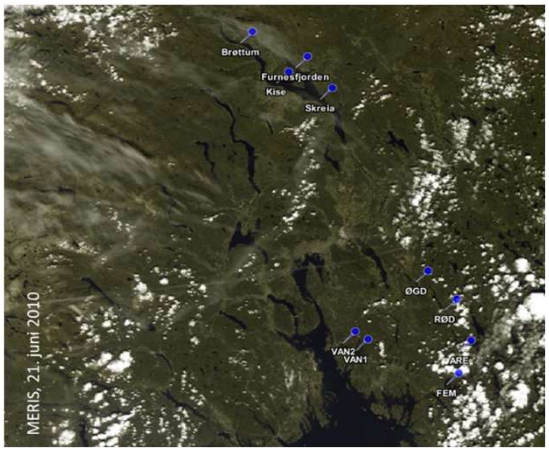
Water reflection spectra from some Norwegian Lakes in Southern Norway

- Early work on MERIS to study the potential for water quality



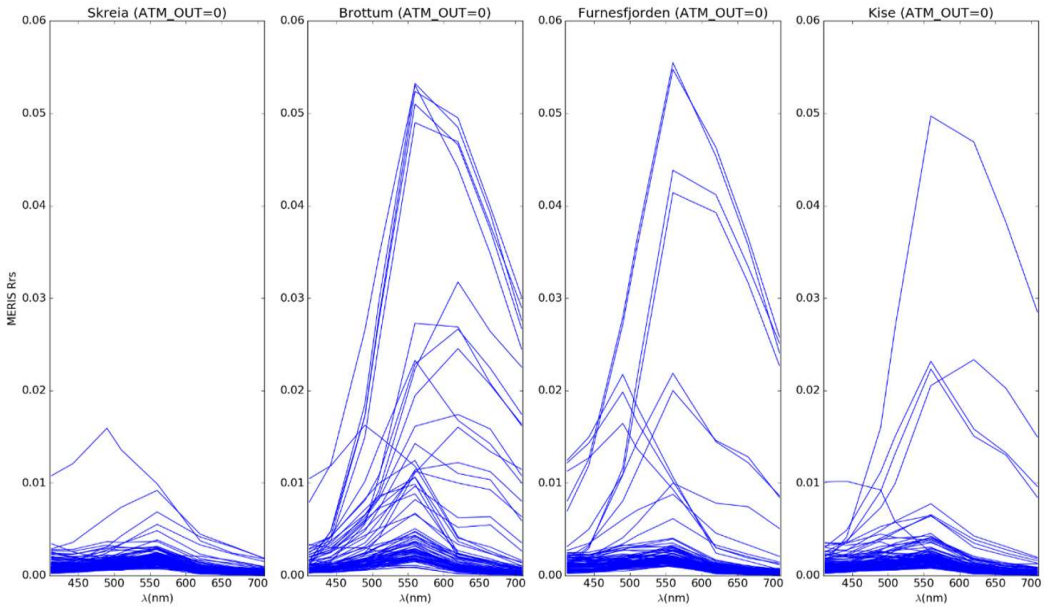


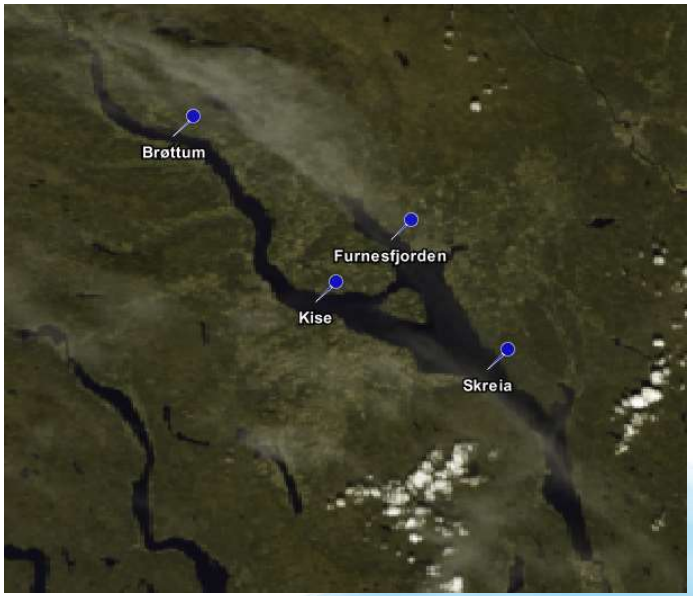
New freshwater R&D project for NEA



- Develope products and satellite service for Lake monitoring (WFD)
- Fase 1 in 2017
  - MERIS long time serie-Mjøsa
  - Started a biooptical field sampling
- Fase 2 in 2018
  - Sentinel 2 and Landsat-8
  - More on biooptical modelling
  - New lakes: Eutrophic, particle rich and humic.

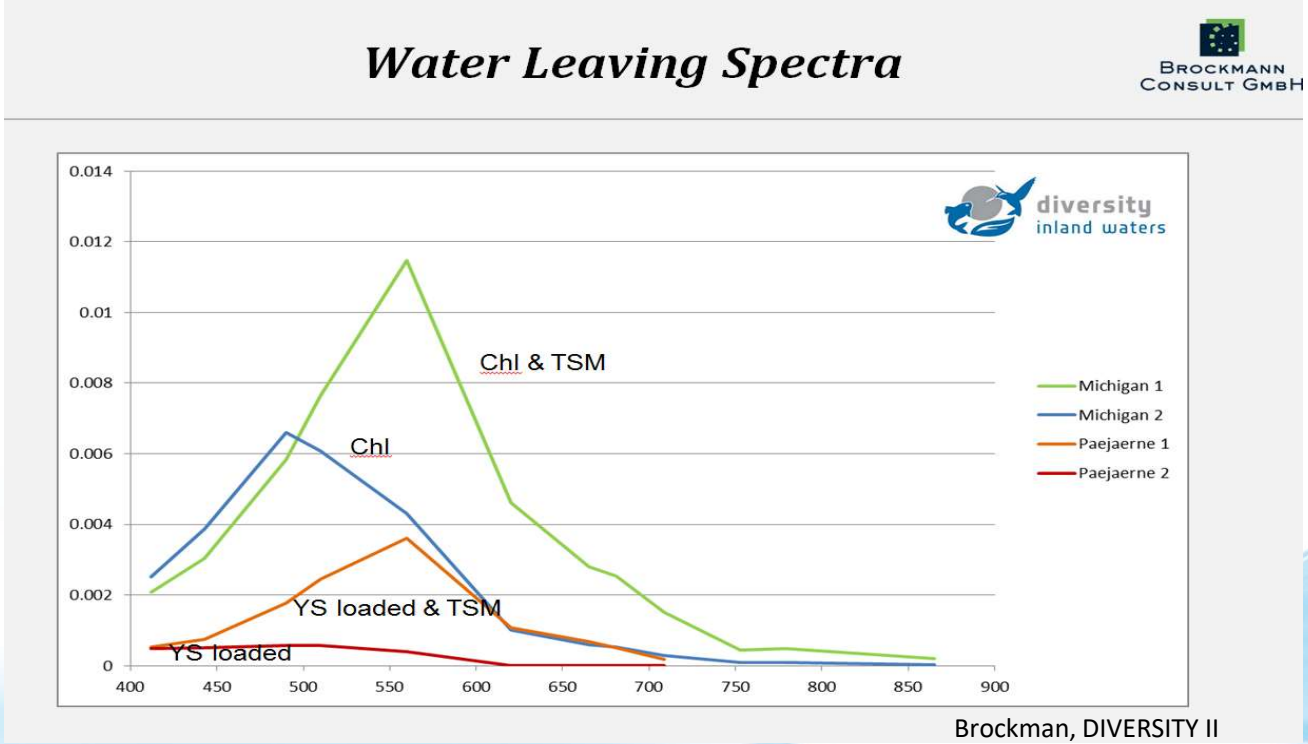
Spectral reflectance from some station in Lake Mjøsa seen by MERIS





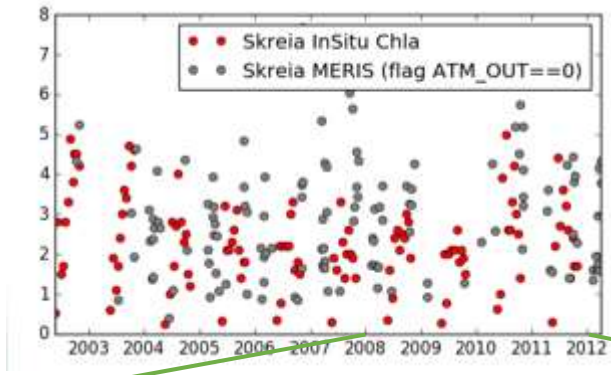
Figur 4. Rrs (Reflektans) fra MERIS for stasjonene Skreia, Brøttum, Furnesfjorden og Kise fra 2002 til 2012.

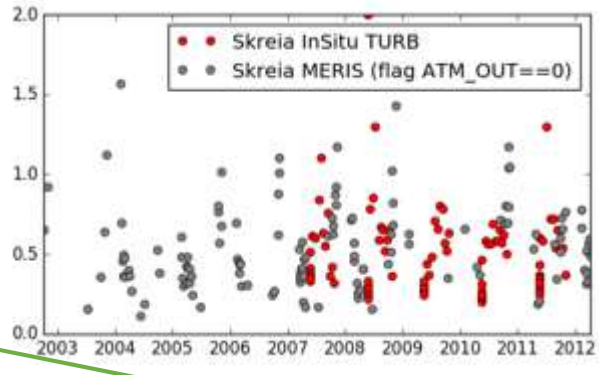
Water reflectance spectra of main optical components in water

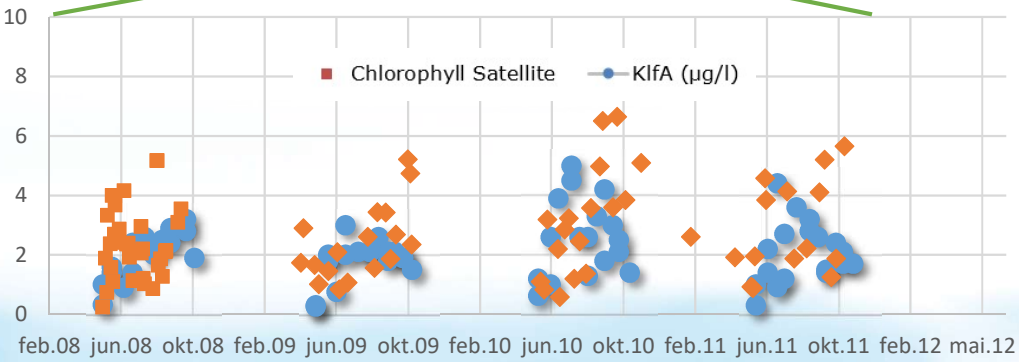


Brockman, DIVERSITY II

Preliminary data for Chl-a and TSM from Lake Mjøsa (St. Skreia). 10 year timeserie







- Relative good match of the Satellite Chl-a vs. the in situ Chl-a
- More studies on algorithms are ongoing
- Studies of the biooptical properties with advanced field measurements and sampling
- Perform bio-optical modelling

Evaluating drones and novel imaging technology for mapping and monitoring of aquatic environments (DRONING)

A project in the NIVA strategic Institute programs

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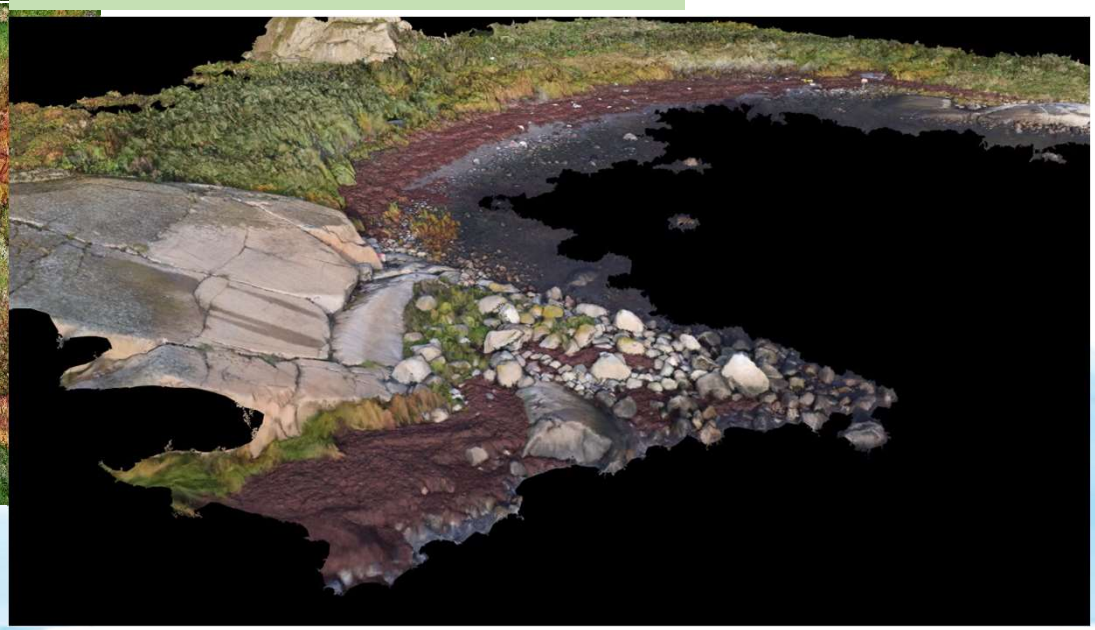
Quantifying seaweed biomass and C deposits in beach zones

Deposits of seaweed biomass the day after a storm



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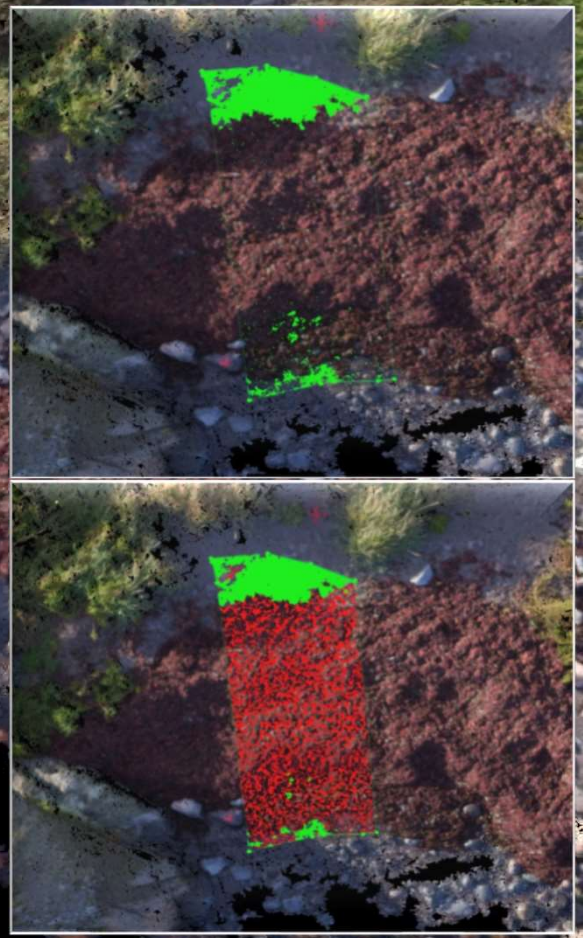
Quantifying seaweed biomass and C deposits in beach zones



Length: 5.40 cm
Arv. Height: 24.5 cm
Volume: 1.32 m^3 per meter beach
Volume in picture: 15.8 m^3

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9.01.2018


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