NorEMSO - The Norwegian node for the European Multidisciplinary Seafloor and water column Observatory

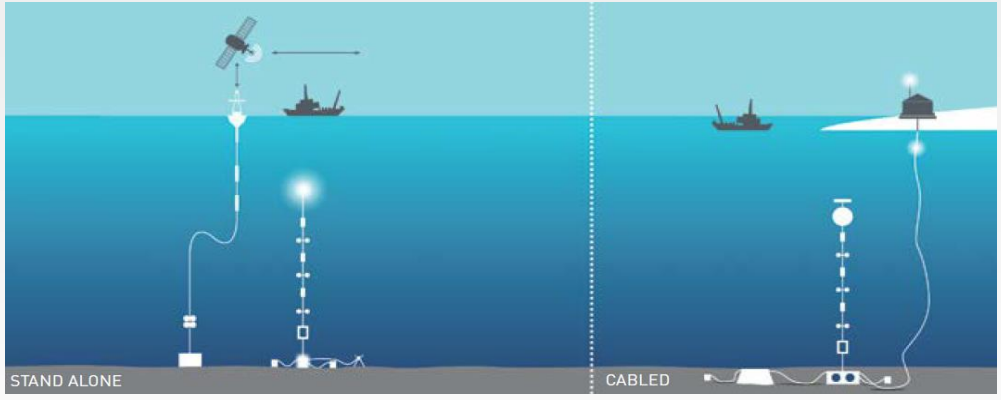
Project owner : University of Bergen
Project leader : Ilker Fer
Host institution : Geophysical Institute, UoB
Partners : UoB, IMR, NORCE, UoT, NPI and MET
Budget : 90 MNOK (60 MNOK NFR)

UNIVERSITY OF BERGEN

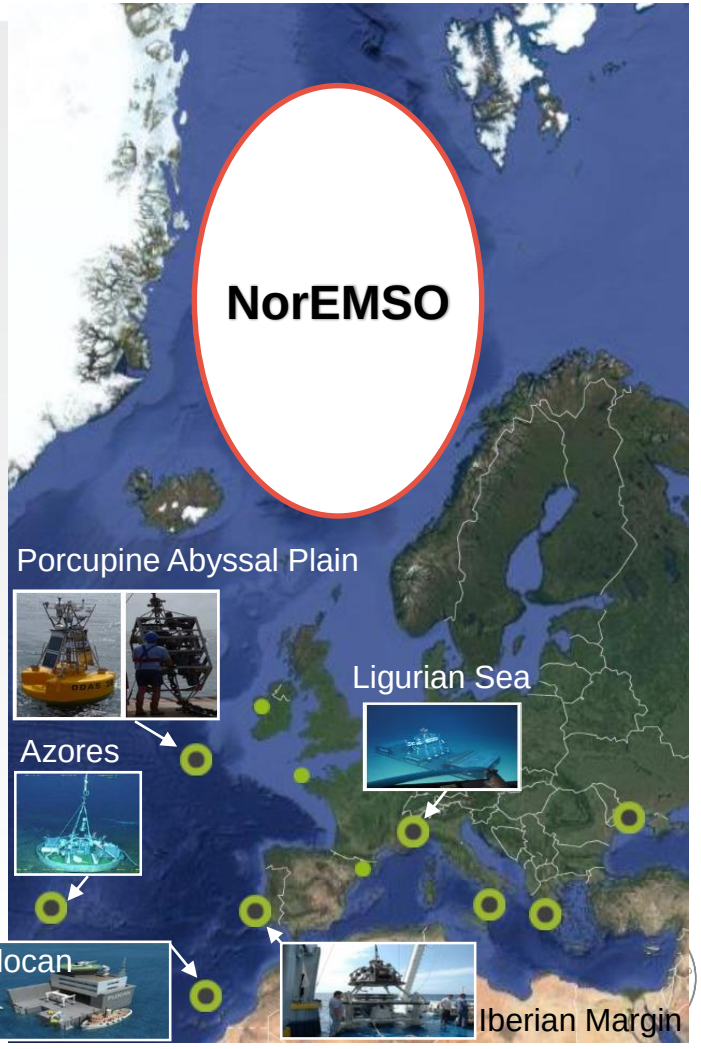
EMSO is a strategic Marine European Research Infrastructure Consortium (ERIC), with the capacity to collect high quality environmental parameters

8 Regional Facilities; 3 Test sites

located at strategic sites from the North Atlantic through the Med. to the Black Sea



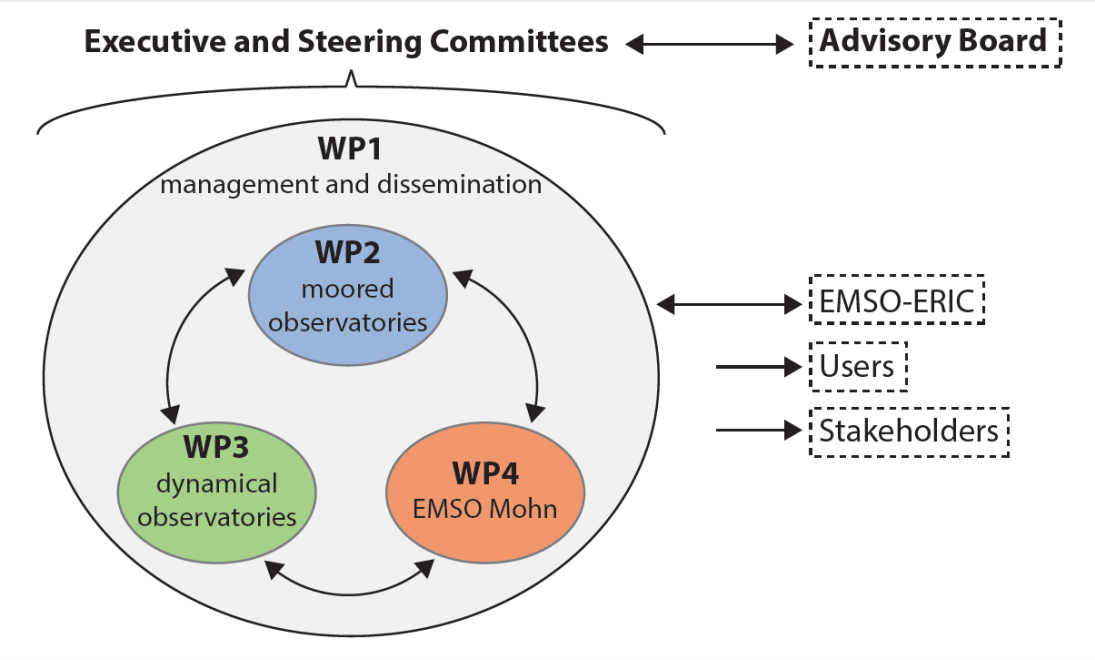
NorEMSO will fill the gap in the Nordic Seas



http://www.emso-eu.org

- NorEMSO is a coordinated, large-scale deep-ocean observation facility to establish a Norwegian node for the EMSO
- The Nordic Seas, a tremendous player in our climate system and global ocean circulation, appear as a large gap in the EMSO.
- NorEMSO combines expansion of existing infrastructure, establishment of new infrastructure, and their coordination.
- **Overarching scientific objectives**: to better understand the drivers for the changes of water mass transformations, ocean circulation, acidification and thermo-chemical exchanges at the seafloor in the Nordic Seas;
  to contribute to improvement of models and forecasting by producing and making available high quality, near real-time data.

Structure



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UoT, Bénédicte Ferré

WP2: IMR, Øystein Skagseth
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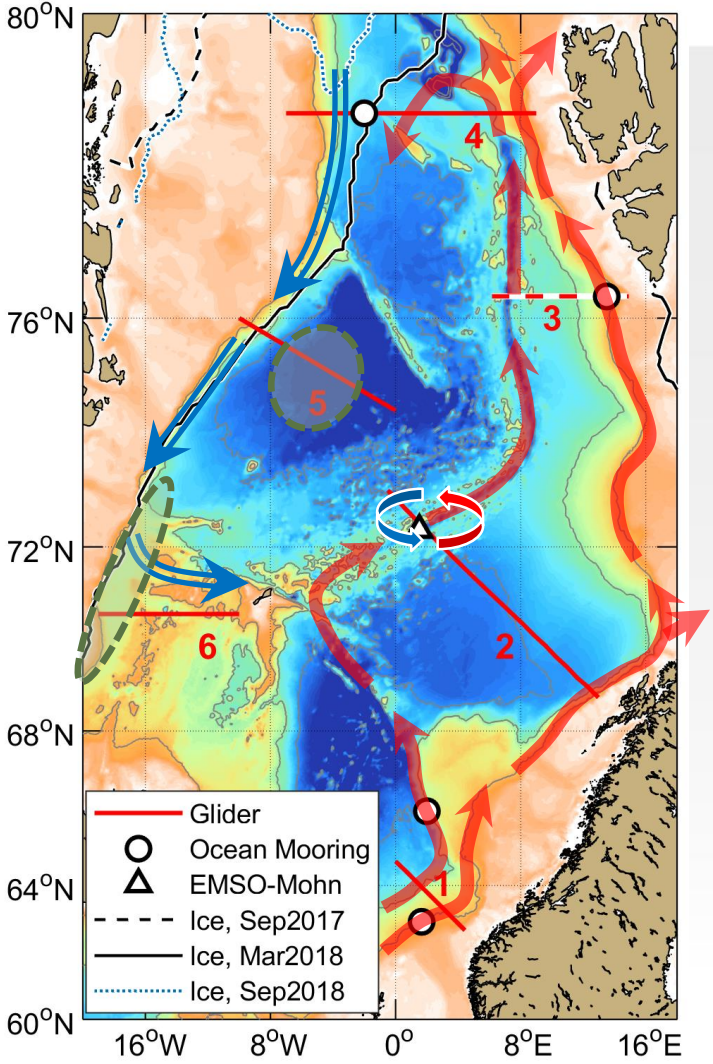
WP3: UoB, Kjetil Våge
NPI, Laura de Steur

WP4: UoB, Thibaut Barreyre
NORCE, Ingvar Henne



The network of NorEMSO in the Nordic Seas has three main components:

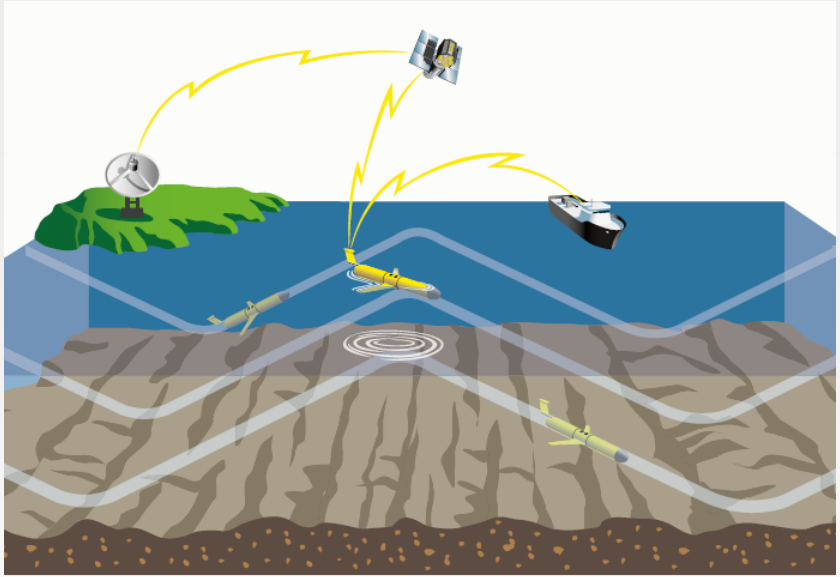
Glider sections (red): (1) Svinøy, (2) Gimsøy and (3) South Cape West, (4) Fram Strait, (5) Greenland Sea and (6) Iceland Sea

Moored observation systems (circles): Svinøy, Station M, South Cape, and Fram Strait

The **EMSO Mohn** observatory over the Mohn Ridge (triangle)

Integration across Nordic Seas
Exchanges, transformations

An ocean glider

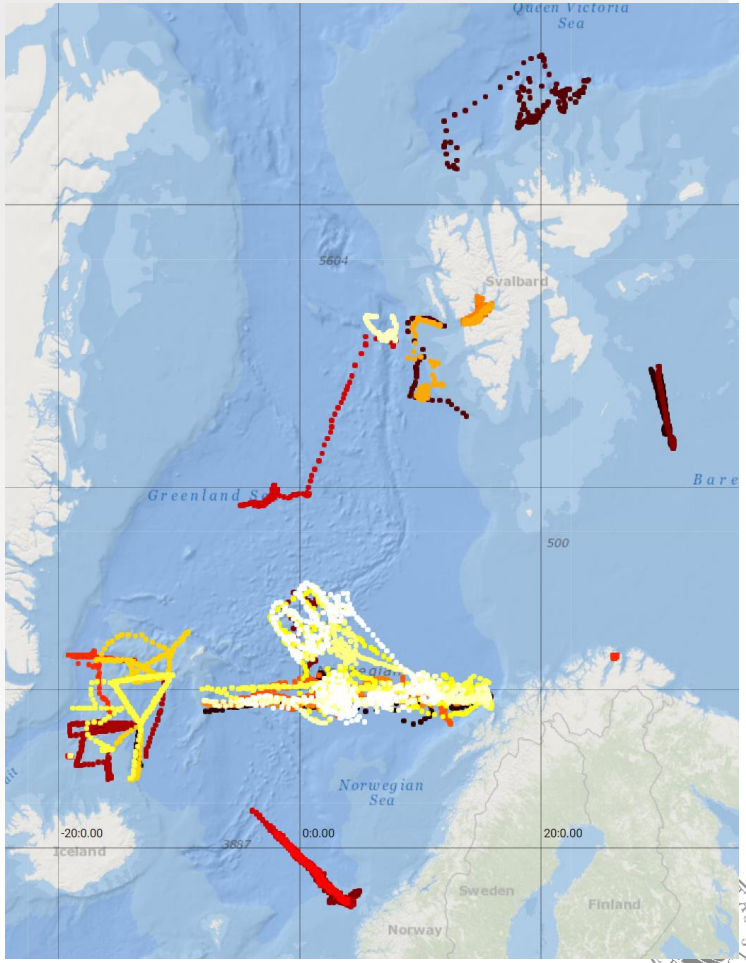


- sustainable, fine resolution observations even in severe weather conditions
- upper 1000 m, 4-6 h cycle, 20-25 km/day horizontal speed, 4-12 mon. deployments
- Impact ocean modeling and forecasts

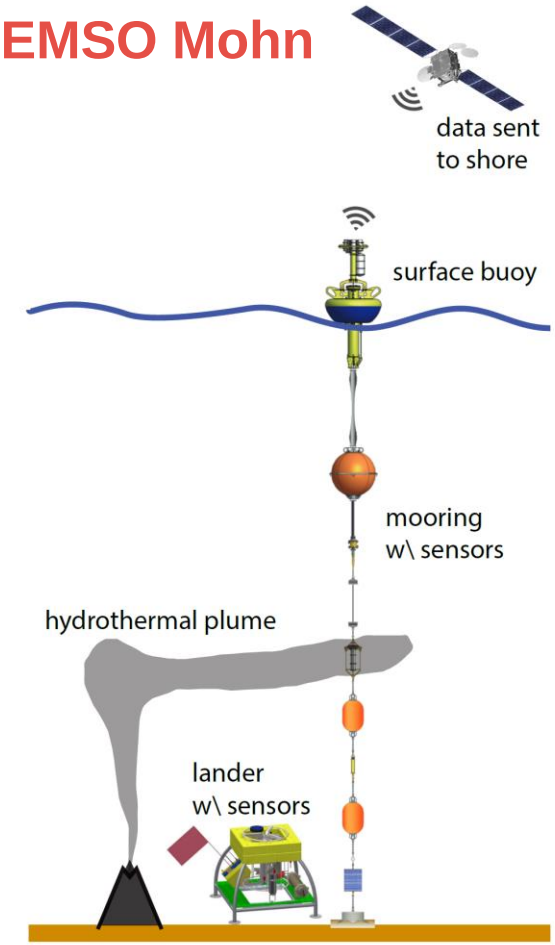
NorGliders: Norwegian National Facility for Ocean Gliders
http://norgliders.gfi.uib.no

Norwegian National Facility for Ocean Gliders

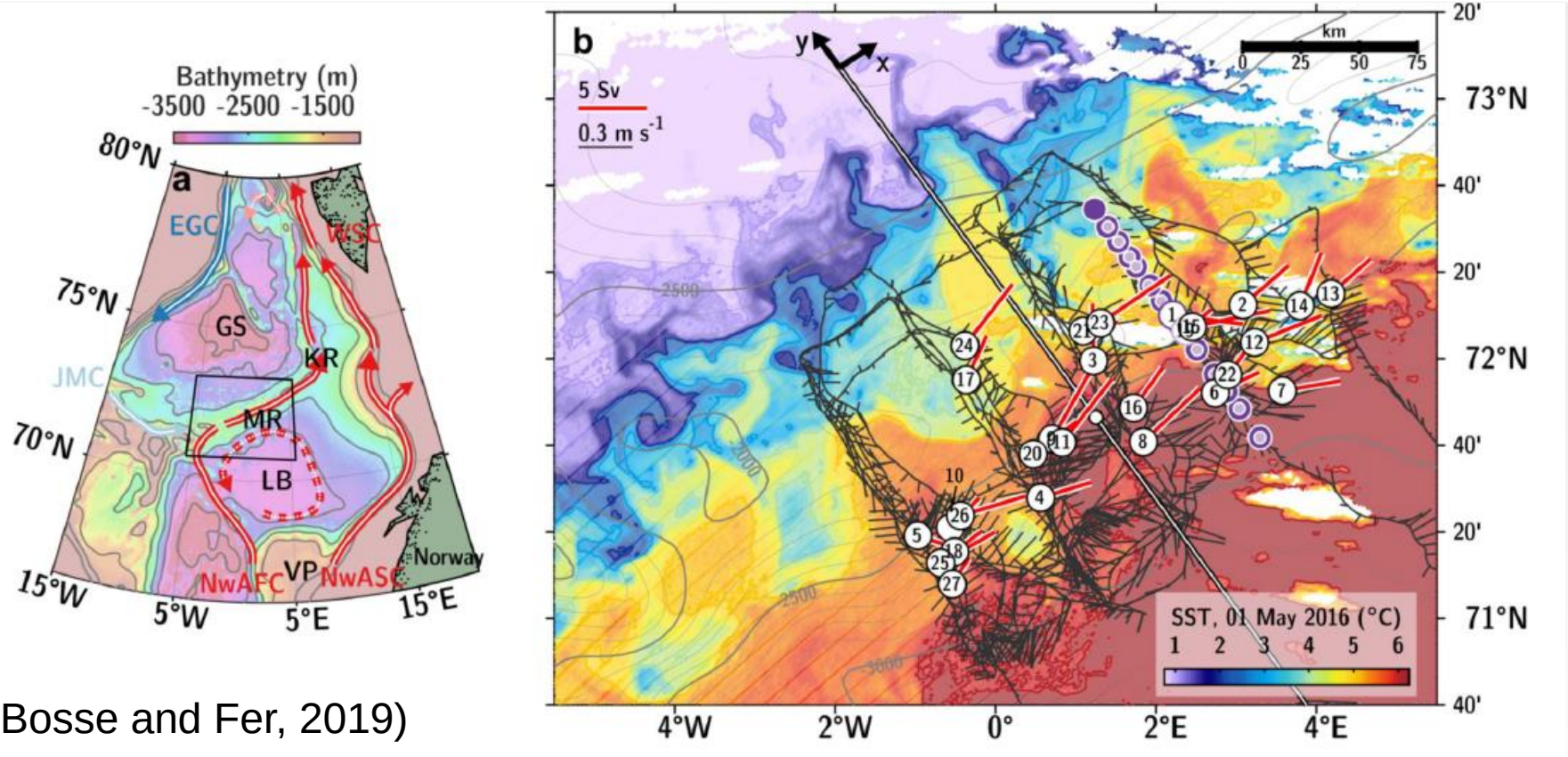
- http://norgliders.gfi.uib.no
- As of today, 5 Kongsberg Seagliders, 2 TDW Slocums
- Piloting tool & **Glider Portal** developed at GFI
- A **Glider Lab** and 24/7 operation team of pilots
- Near real-time data delivery
- NorEMSO will expand on the glider facility by
  - 5 new deep gliders
  - a national team of pilots, by training and integrating technicians from partner institutions



EMSO Mohn



- At a hydrothermal vent side on Mohn Ridge, co-located with a glider section
- A fixed-point seabed-based compact and wireless observatory with a multidisciplinary approach – from geophysics and physical oceanography to ecology and microbiology
- Sensors include an Acoustic Doppler Current Profiler, a pressure gauge, a temperature probe, a conductivity sensor, a turbidity meter, an optode, and a hydrophone
- Acoustic modems enable wireless communications
- Data Processing Unit for on board data reduction



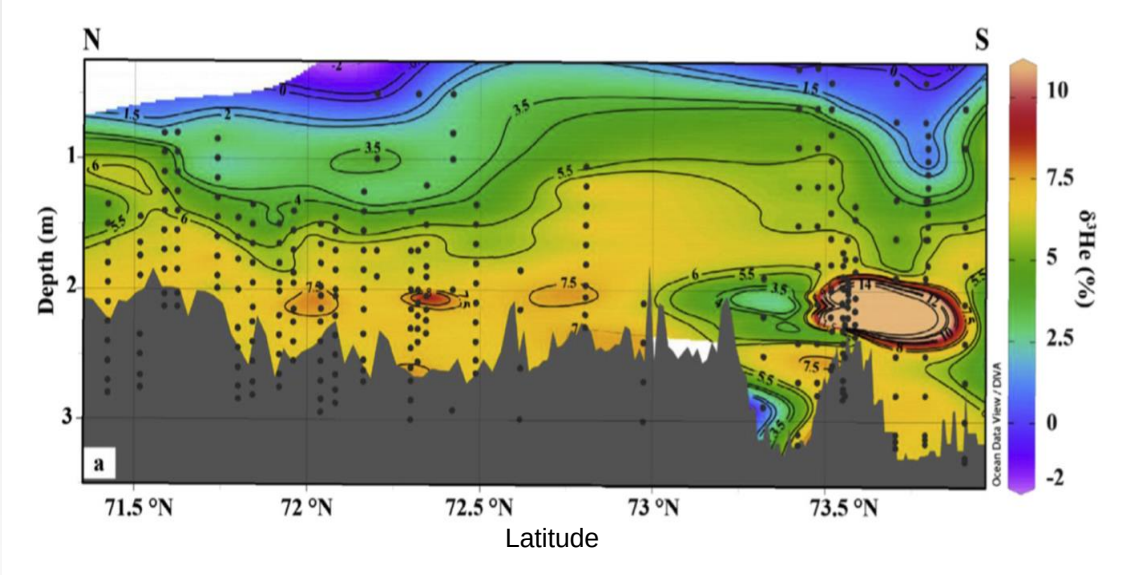
(Bosse and Fer, 2019)

The site is at the highly dynamic oceanographic front between cold waters in the Greenland Sea and warm waters in the Norwegian Sea

Quantifying the thermo-chemical output of solid earth to overlying ocean layer

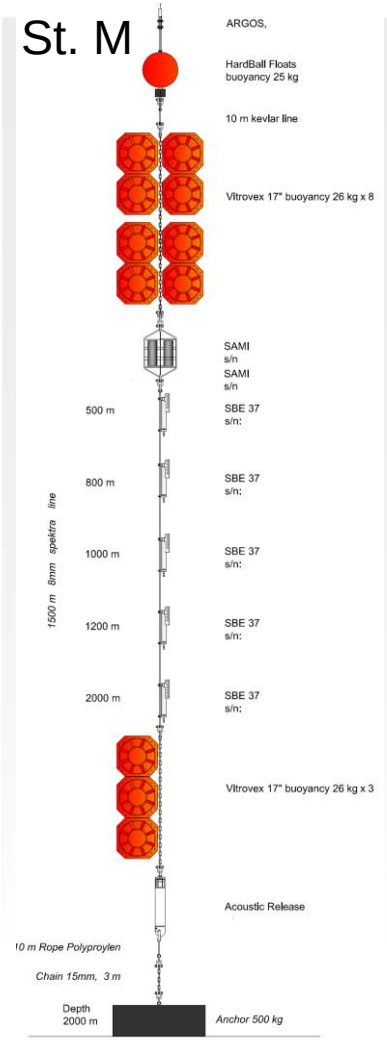
- Ocean circulation at hot-seep systems is a major heat and trace metal carrier (e.g., methane, carbon, micro-nutrients) from the Earth's sub-surface to the overlying ocean

- Transport rates from the seabed and through the water column are poorly constrained



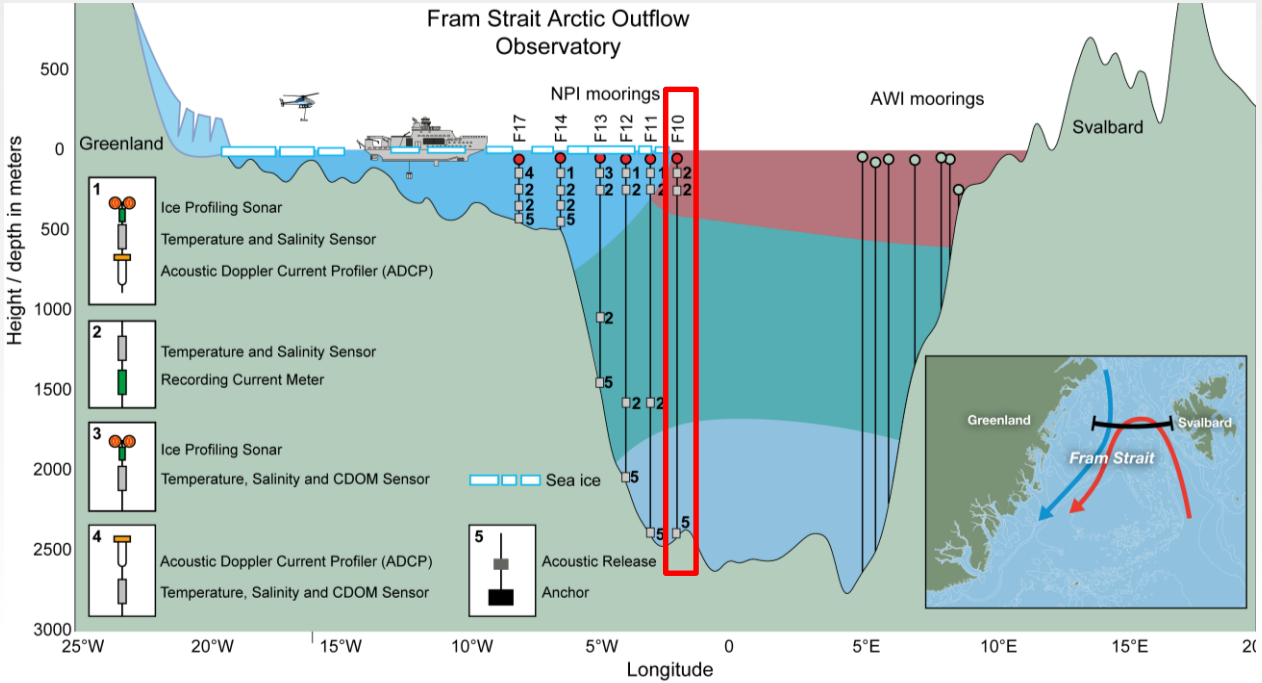
Stensland et al. (2019)

- Frontal dynamics and eddies at Mohn Ridge (Bosse and Fer, 2019), strong and variable currents interacting with topography, vertical mixing redistribute micronutrients and dissolved matter and bring from the deep up towards the surface



Continuation of long-term observations

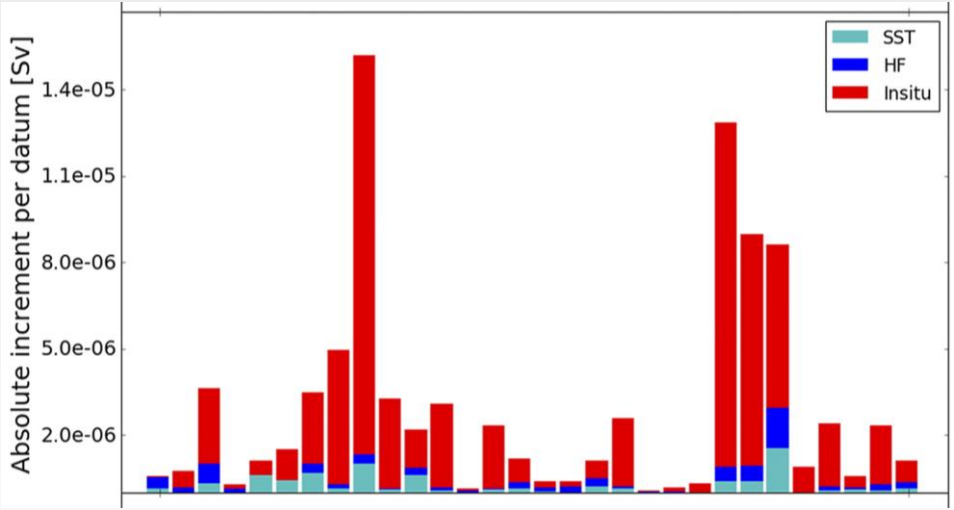
Station M (only subsurface); Svinøy; Fram Strait



Courtesy of Norwegian Polar Institute

Impact on forecasting

- In-situ data impact assimilative models:
  - Copernicus pan-Arctic model
  - MET Norway, coastal and Barents models
  - Numerical weather prediction models
- Specific impact of observation platforms will be quantified
  - assessment of how NorEMSO improves operational forecasts
  - Optimize the NorEMSO observational program



Example of impact on NCC transport at Torungen-Hirtshals section (Christensen et al. 2018)

Data management

- Open Research Data Pilot ; FAIR data management principles
- free and open access to all metadata and data (NRT and delayed mode)
  CC BY 4.0 and NLOD (Norsk lisens for offentlige data)
- Data will be delivered and made available through the Norwegian Marine Data Centre (NMDC) and international portals such as CMEMS, EMODnet, Coriolis, SeaDataNet/SeaDataCloud, SEANOE
- The data management of NorEMSO will function as a regional node and use existing competence and data infrastructure at UiB (Bjerknes Climate Data Centre) and archives of the Norwegian Marine data Centre hosted by the Institute of Marine Research