The Future.....

A key component to achieving the ESONET objective of strategic long-term, multi-disciplinary monitoring capability in deep waters around Europe is the development of a cabled network of observatories

Arctic Ocean ESONET Mission

ARCTIC OCEAN FUTURE PERSPECTIVE

ACOUSTIC OBSERVATORY

Relevant capabilities: 1) measures the acoustic travel times, to derive heat content and mean circulation on a regional or basin scale, 2) provide an underwater 'GPS' system for navigation and timing for under-ice Lagrangian systems, 3) provide information about ice dynamics, earthquakes, and marine mammals through passive listening.

Data availability: Regional and basin wide measurements in real time and year round from cabled acoustic network. Real time data from drifting acoustic ice-tethered platforms.

Platforms: Regional to basin wide acoustic network of moored low frequency transceivers. Cables will provide long-term monitoring. Local acoustic networks (<100 km) consist of drifting acoustic ice tethered platforms, their lifetime depends on how stable the ice conditions are.

Complementary systems: Continuous data availability in fixed locations the cabled network combined with drifting ice platforms can observe episodic events in the ocean and the sea ice. An acoustic network is needed for development and operation of a robust Lagrangian underwater observing system in the Arctic.

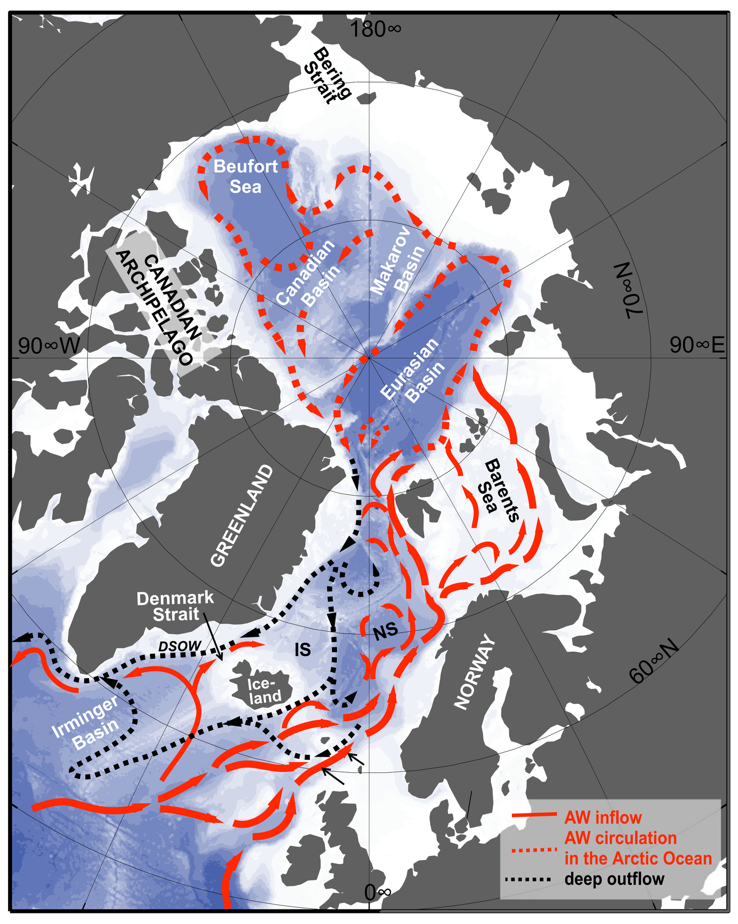
Technological status: The acoustic technology is mature and can be used in un-cabled and cabled networks.

Hanne Sagen
Stein Sandven

Emmanuel
Skarsoulis

Peter Haugan
Ilker Fer

Eberhard Fahrbach
Agn. Beszczynska-M^ller



IN-SITU OBSERVATORIES

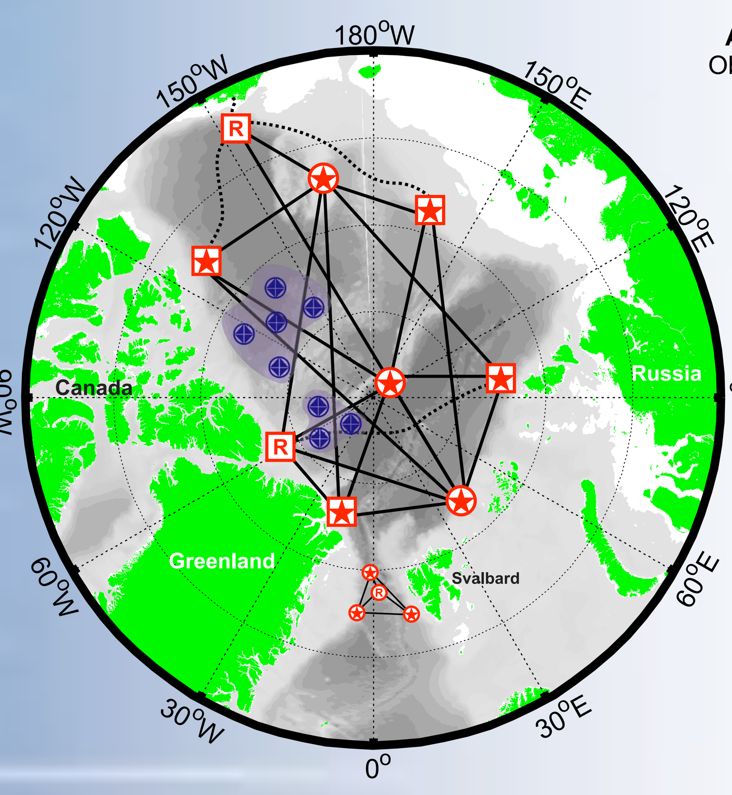
Relevant properties: Climate relevant parameters including physical (e.g. temperature and salinity) and biogeochemical quantities.

Data availability: Time scales of availability from near-real time to delayed mode by several months determine the technology to be applied.

Platforms: Controlled vehicles as gliders guided by acoustic homing beacons provide repeated observations on a network of controlled track lines. The frequent repeat to docking stations will guarantee to control of the sensor stability and fast data provision.

Complementary systems: Moving vehicles will supplement drifting and moored systems and serve as data messengers for underwater platforms.

Docking stations: Cabled observatories would provide the ideal docking stations for the vehicles



Design based on **AURORA** (Arctic Regional Undersea Observatory for Research and Analysis) and **ACOBAR** (Acoustic technology for Observing the interior of the Arctic Ocean) ideas

- cabled moorings with source and receiver
- two cabled ATAM moorings with shore terminus
- autonomous source with receiver
- drifting ice tethered acoustic platforms (source/receiver)
- acoustic thermometry path
- cable

RATIONALE

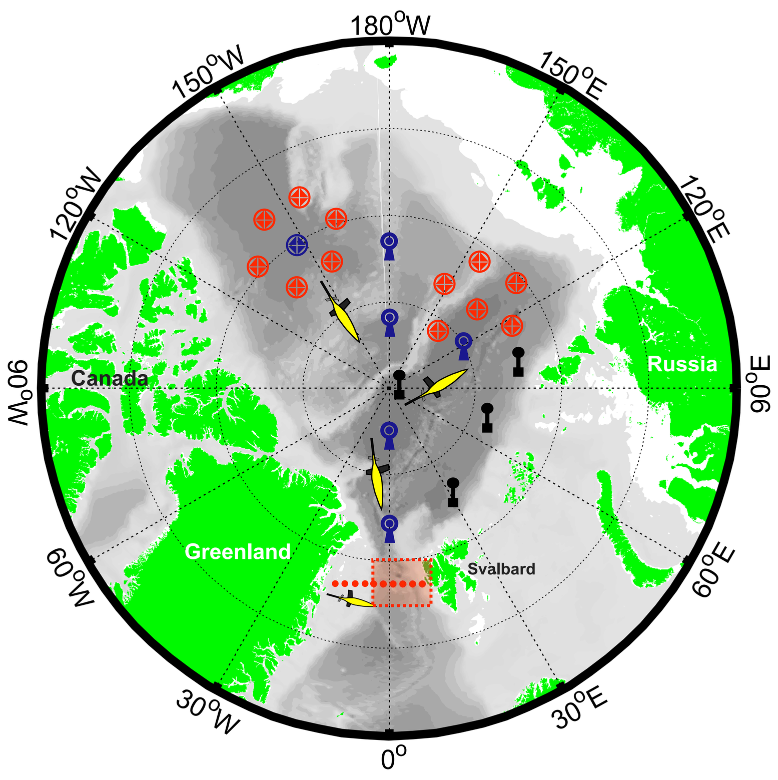
Studies of **Arctic Ocean** climate, processes and ecosystems require observations on local, regional and basin wide scale.

Consequently **local observations** must be **coordinated** with **regional observations** on the shelves and in the deep basins.

Integration of local cabled observations **requires** technical and organizational **solutions**:

1. **Series of observatories** in key areas.
2. **Organizations** to bring together active institutions and services.

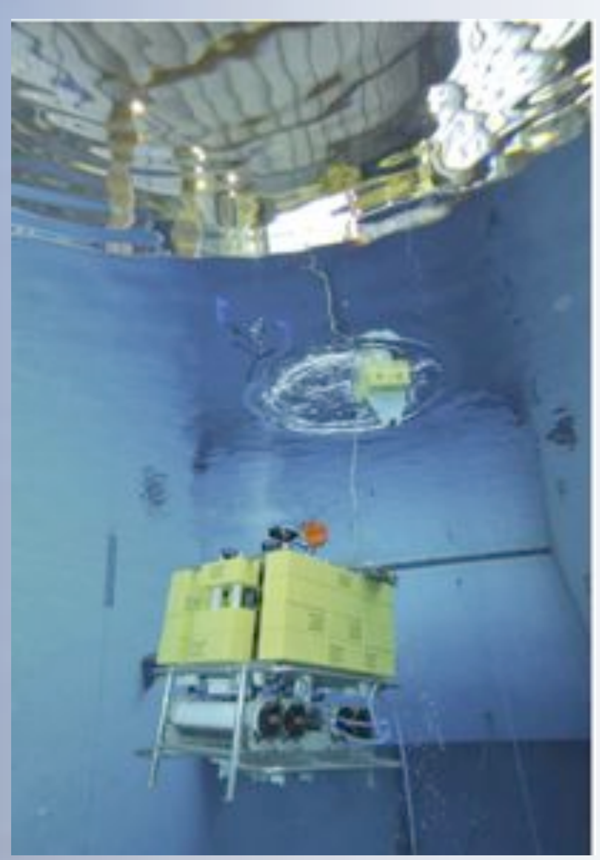
Observatories can consist of **integral** or networks of **in-situ measurements**.



- cabled observatory
- acoustic homing beacons for gliders
- ITPs clusters
- AITPs
- boundary and interior moorings
- moored arrays in gateways

GAS HYDRATE STUDIES

PLANNED CRUISES



2011 RV James Clark Ross

Maintenance of lander and deployment of BOB (Bubbles OBservatory module, see image left), for continuous acoustic surveillance of gas bubbles.

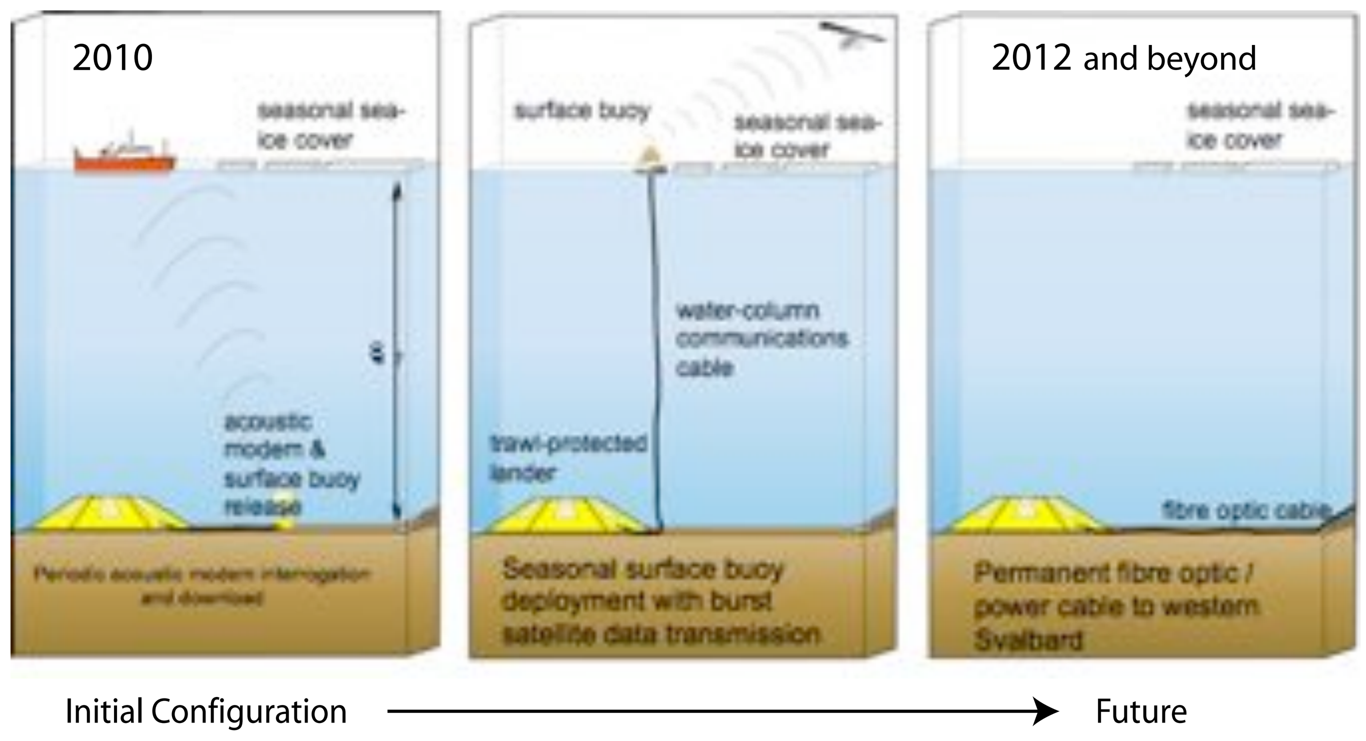
Deployment of temperature probe on lander - a 2000m cable which will be put out down the slope with a data logger and batteries connected to it, in order to measure annual bottom water temperature variability down the slope to see if that can cause hydrate dissociation.

Mapping of methane distribution in the water column and sediments in the vicinity of the lander through a combination of CTD casts and sediment core samples in addition to full sediment geochemistry measurements.

2012 RV Maria S Merian

Recovery of lander after 2 year deployment.

OTHER FUTURE PLANS



Proposed Upgrades

- Passive/active acoustic bubble tracking system

The acoustic tracking of bubble plumes will be a two-part system; a passive system that effectively 'listens' for bubble release, on hearing it will switch on the active system that sends pulses into the water column and records reflected sound. This two-part system reduces power use whilst still allowing long-term measurements.

- In situ methane sensors.

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University of Tromsø
ESONET NOE