



The Polar dream is about collaboration

An integrated and collaborative research and education effort between the Kingdom of Denmark and Norway

Meeting at the Norwegian Embassy in Copenhagen, Denmark, 3-4 Oct 2018

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Eureka: Idea launched at Outreach Campaign June 2018 organized by UiT – The Arctic University of Norway

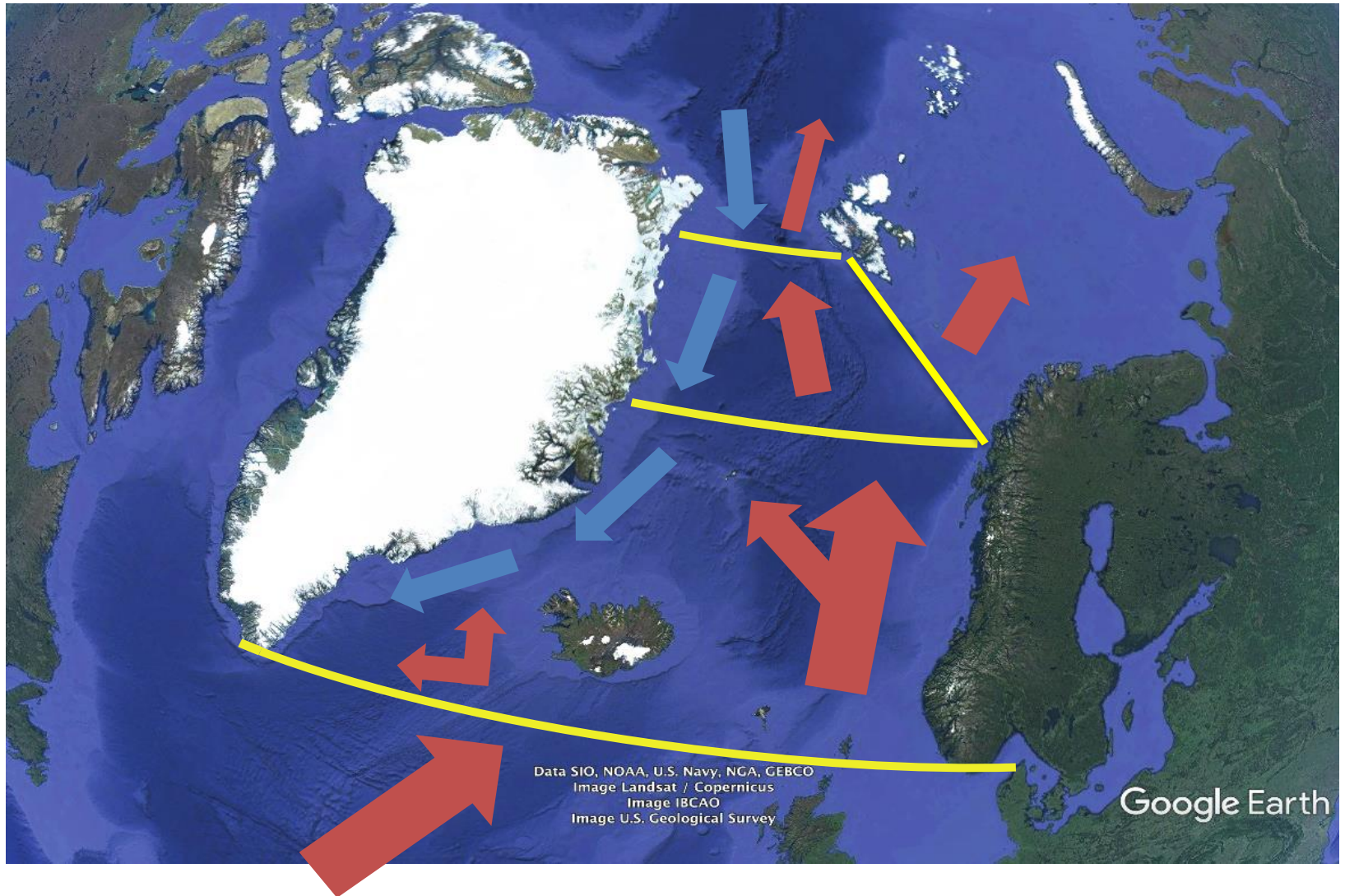
Partners

- Aarhus University, Denmark
- The Greenland Institute of Natural Resources
- Havstovan, the Faeroe Islands
- UiT - The Arctic University of Norway
- Norwegian University of Science and Technology (NTNU)
- The University Centre on Svalbard (UNIS)
- REV Ocean

Other relevant partners

- Bergen University
- Copenhagen University
- The Marine Institute, Iceland
- Marin Research Institute, Norway
- Technical University Denmark (DTU), Denmark
- Norwegian Polar Institute
- Kongsberg Group
- SMB companies
- Royal Greenland
- DNV GL
- Arctic Science Partnership
- More

The Polar dream



Vision

- The overarching vision is to develop an integrated environmental observation system that will enable a sustained, near real-time observation of the atmosphere, ice and ocean. at the scale of an entire ocean basin.

Why do we need an observing system?

- Climate change is occurring rapidly and has cascading effects from physical changes to the environment, to ecosystems, and to social, economic and political conditions.
- There is a need to understand larger scales in order to understand local conditions.
- To operate safely and responsibly there is a need for improved weather, ice hazard and environmental forecasting

What will we get from it?

- Near real time high quality data with high coverage and resolution both in space and time, which will improve understanding of a data poor region.
- This will deliver better weather, ice hazard and environmental forecasting.
- It will deliver better advice for fisheries and harvest enabling a sustainable economy.
- It will provide vital basic variables for research projects and attract and increase collaboration between local, regional and international investigators.

THE BAFFIN BAY OBSERVING SYSTEM



www.asp-net.org



Canada



UNIVERSITY OF NORTHERN DENMARK



UiT



Technical University of Denmark



GEM 2017-2021

High Arctic

Threshold High Arctic/ Low Arctic

Low Arctic

Qaanaaq

Thule

Pitagor

Zuckenberg

Nuuk

Kobbeboj

Arctic Station

Arctic Ocean

Greenland Sea

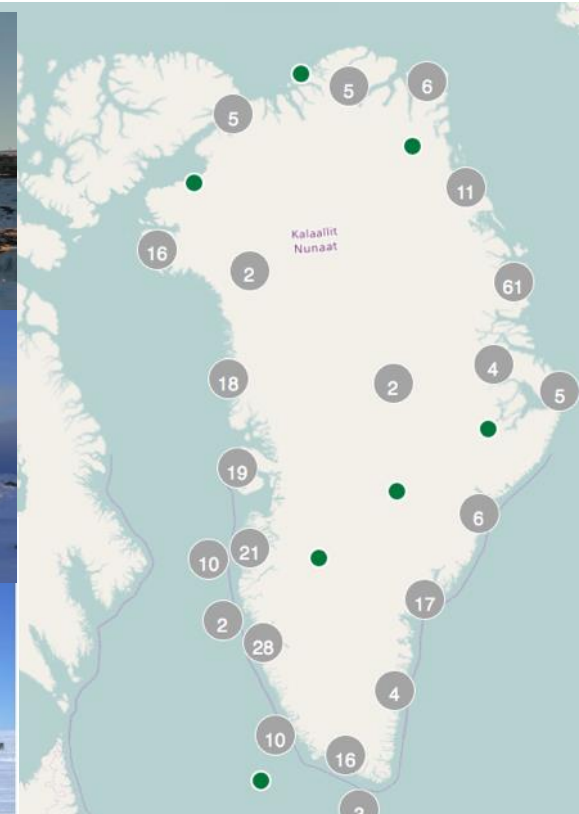
Danmark Strait

Labrador Sea

Arctic Circle

Legend:

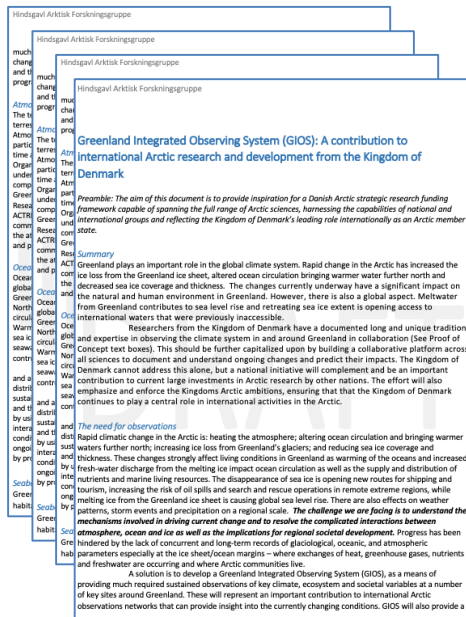
- GEM long-term
- GEM long-term - Exact locations
- GEM temporary
- GEM temporary - Exact locations



<http://www.isaaffik.org>



Greenland Integrated Observing System (GIOS): A contribution to international Arctic research and development from the Kingdom of Denmark



Preamble: The aim of this document is to provide inspiration for a Danish Kingdom/Arctic strategic research funding framework capable of spanning the full range of Arctic sciences, harnessing the capabilities of national and international groups and reflecting the Kingdom of Denmark's leading role internationally as an Arctic member state.

Summary

Greenland plays an important role in the global climate system. Rapid change in the Arctic has increased the ice loss from the Greenland ice sheet, altered ocean circulation bringing warmer water further north and decreased sea ice coverage and thickness. The changes currently underway have a significant impact on the natural and human environment in Greenland. However, there is also a global aspect. Meltwater from Greenland contributes to sea level rise and retreating sea ice extent is opening access to international waters that were previously inaccessible.

Researchers from the Kingdom of Denmark have a documented long and unique tradition and expertise in observing the climate system in and around Greenland in collaboration (See Proof of Concept text boxes). This should be further capitalized upon by building a collaborative platform across all sciences to document and understand ongoing changes and predict their impacts. The Kingdom of Denmark cannot address this alone, but a national initiative will complement and be an important contribution to current large investments in Arctic research by other nations. The effort will also emphasize and enforce the Kingdoms Arctic ambitions, ensuring that that the Kingdom of Denmark continues to play a central role in international activities in the Arctic.

Background

- Strong climate gradient (N,S) along East Greenland
- Little is known about E, W gradients
- Need for upscaling of long-term measurements and from few monitoring sites to the Greenland scale
- Need to link atmosphere-ice-land-ocean compartments and interactions
- Time is ready for this adventure

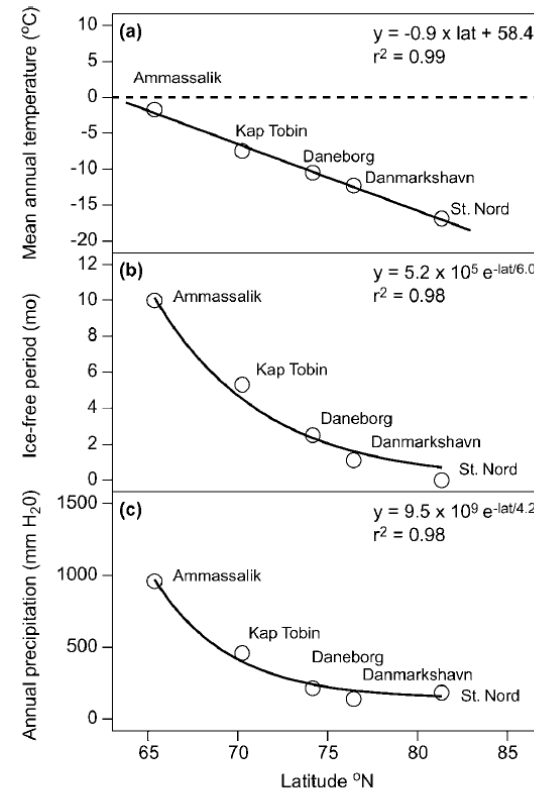
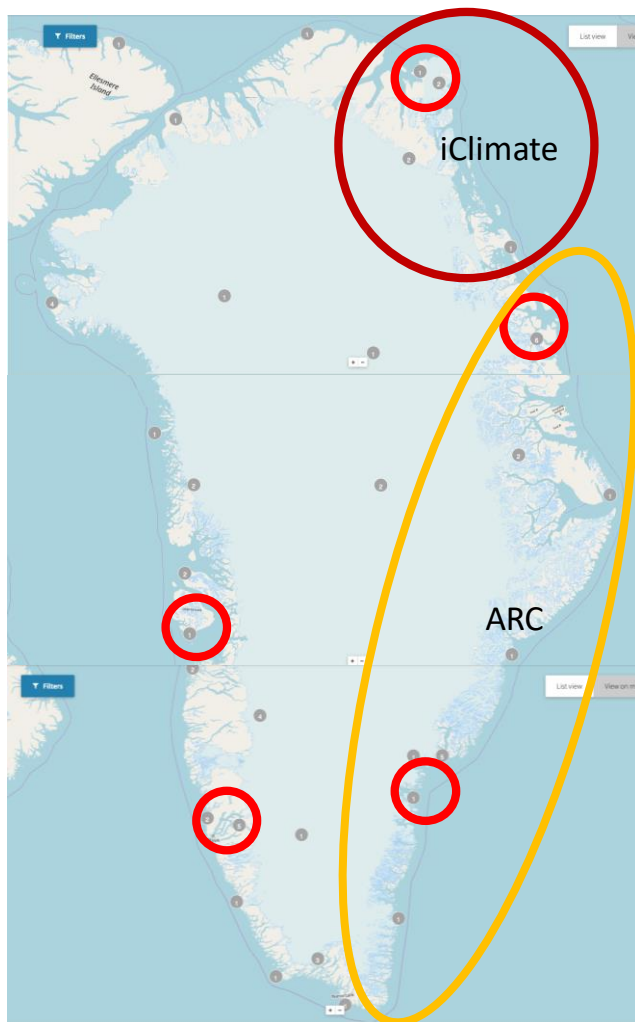


FIGURE 13. (a) Mean annual temperature in northeast Greenland versus latitude. Data from Capellen et al. (2001). (b) Annual ice-free period versus latitude. Data from the Danish Meteorological Institute—State of the Ice in the Arctic Seas, annual reports (1950–1964). (c) Mean annual precipitation versus latitude. Data from Ohmura and Reeh (1991). Daneborg is situated in the outer region of Young Sound.



Greenland land-based stations and weather stations

- Large areas with few or missing data, especially on East Greenland
- Let's use this meeting to identify:
 - Geographic focus areas along and across the ARC domain
 - Key parameters to measure (e.g. more E, W weather/ice/ocean stations)
 - Key platforms for joint logistics and operations
 - How to upscale our results

Infrastructure

Norway:

Ships: Helmer Hanssen, Kronprins Haakon, Gunnerus, REV

Robotic platforms by NTNU AUR and UAV Labs: 5 AUVs, 3 ROVs, 4 USV, 5-10 UAV, smallsats from 2021

Denmark:

Ships: Dana, Lauge Koch

Long-term monitoring programs: Zackenberg, Nuuk, Disko & St Nord, various moorings and autonomous platforms (drones, AUVs), Royal Greenland trawler instrumentation

Greenland:

Ships: Sanna, and new Paamiut

Long-term fishery and oceanographic data series, monitoring programs, various moorings.

Various research stations in Greenland

Faroe Islands:

Ships: Magnus Heinason

Long-term fishery and oceanographic, nutrients data series, monitoring programs, various moorings.

NTNU & UiT The Arctic University of Norway:

Integrated technology platforms for ocean space research

Air:

Penguin B fixed-wing UAV

X8 fixed-wing UAV

Hexa-copters



Sea surface:

Gunnerus (NTNU)

Unmanned vessel – Jetyak (UiT)

Unmanned vessel – 4 Otters (NTNU)

Helmer Hanssen (UiT)

Kronprins Haakon (UiT)



Underwater:

ROV Minerva

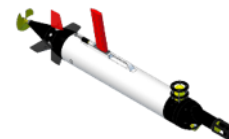
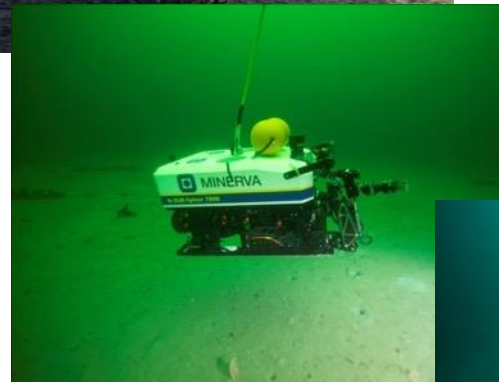
ROV 30k

ROV SEABOTIX

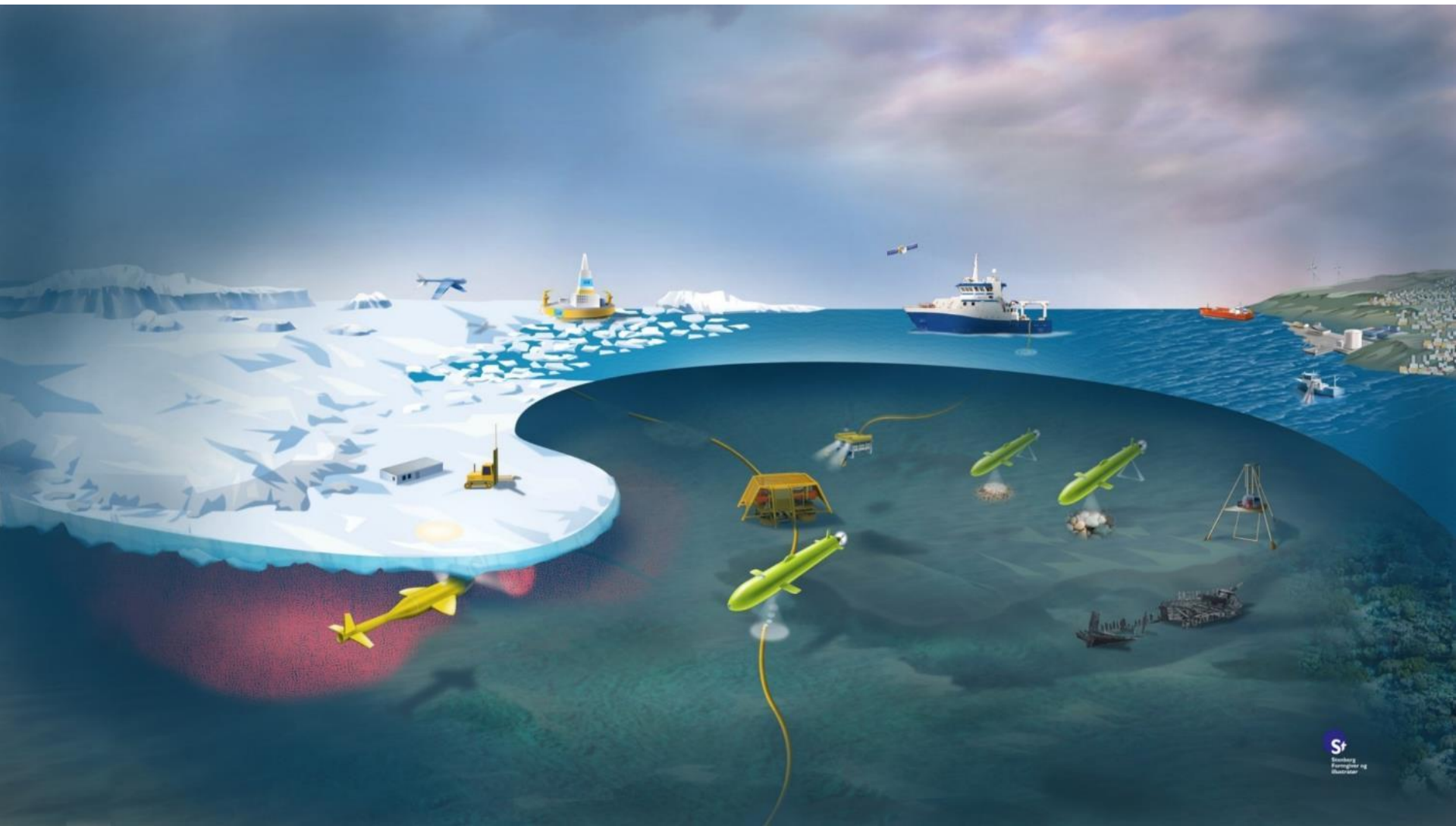
AUV Remus 100

HUGIN HUS

2 LAUVs



Integrated marine mapping and monitoring using ships and autonomous robotics solutions/platforms operating in space, air, surface and underwater



Next step – joint campaigns

- **Step 1** – coastal ecosystems – aligning existing data (ongoing). Joint publications review, in progress
- **Step 2** – Ships of opportunity – e.g. make LOI for Lauge Kock, new Pamiut, Sanna, REV
- **Step 3** – Dream cruise sections from coastal to open water – (preliminar sections, Dana, L. Kock and small vessels have been made)
- **Step 4** – Dream synoptic campaign in 2021.

Next Step - Education

- Mapping existing courses (Norway & Denmark/Greenland/Faroe Island)
- MoU (UNIS-ARC)
- Increase mobility between countries
- Organize PhD summer schools in 2020

Next step - Funding

- National – public and private
- Scandinavia (NorForsk)
- EU (new polar program).
- ITN PhD network (proposal should be submitted spring 2020 – so students can join the 2021 campaign)