FAR NORTH FIBRE

A PAN-ARCTIC SUBMARINE FIBRE OPTIC CABLE LINKING

ASIA, NORTH AMERICA AND EUROPE TO PROVIDE

UNRIVALLED FAST, SECURE GLOBAL CONNECTIVITY

TRUE NORTH Global Networks   Far North Digital   Cinia

This document contains forward-looking statements concerning plans, intentions, strategies, expectations, predictions, financial projections and beliefs concerning the project outlined herein, and any related future activities and results of operations and other future events and conditions. Actual results, events or conditions could differ materially from those projected in this document due to a variety of factors.

FAR NORTH FIBRE

True North Global Networks is a Canadian entity that in partnership with Far North Digital and Cinia will deliver the first long-haul submarine fibre system, Far North Fibre (FNF), through the Northwest Passage connecting Asia to North America, and Europe. The 14,500 kilometer fibre optic cable system will transit geopolitically stable and secure regions, greatly reducing the optical distance between Asia and Europe, thus minimizing signal latency between three of the largest internet markets. Planned branching units to northern Canadian communities have the potential to bring significant social and economic benefits and reinforce Canada's arctic sovereignty. Additionally, FNF will incorporate SMART cable technologies to offer remarkable new tools in the study of climate change, seafloor seismicity, and oceanography.

WHO WE ARE

- **True North Global Networks (TNGN)**, assisted by its affiliate **Far North Digital LLC**, an Alaskan limited liability company, is developing the circa CAD $1.5 billion **Far North Fibre** submarine cable project in cooperation with **Cinia**, a diversified Finnish telecommunications company. TNGN is a Canadian entity with its future majority shareholder expected to be one of Canada's largest national pension plans.
- **Cinia** offers cybersecurity solutions, data network and software services. Cinia's existing fibre optic network of some 15,000 kilometers, including the C-Lion1 submarine cable, enables the fastest data communications solutions to the Nordics and Central Europe as well as to markets in Asia and Eastern Europe
- **Alcatel Submarine Networks** (ASN) is the principal turnkey supplier for Far North Fibre. ASN, part of Nokia, leads the submarine cable industry in deployed fibre with more than 650,000 km of cable installed worldwide, enough to circumnavigate the globe 15 times. ASN provides turnkey global undersea fibre systems along with marine and maintenance operations performed by ASN's wholly owned fleet of cable ships.

TECHNICAL SPECIFICATIONS

240Tb/s, 14,000 km repeatered, long-haul submarine cable system

Open Network with 16 fibre pairs – 14 Express, 2 Local Add/Drop.

Express Fibre Pair:

- Early deployment with 200Gb/s per channel without regeneration. 12Tb/s (60λ x 200Gb/s)
- Future: 15Tb/s (60λ x 250Gb/s)

Local Add Drop Fibre Pair:

- Transponders reconfigured to 250Gb/s+ with regeneration in Prudhoe Bay. 15Tb/s (60λ x 250Gb/s)
- Future: 20Tb/s (60λ x 333Gb/s)

Double End Power Feed - double branches in Prudhoe Bay secures redundant, diverse system power feed.

PROJECT ADVANTAGES

Shortest, fastest, most secure

- 14,000 km pan-Arctic route greatly reduces the optical distance between Asia and Europe relative to all other cable routes. It minimizes signal latency to an unrivaled 142 millisecond Round-Trip Delay.
- The high fibre count cable (16 fibre pairs) offers unprecedented transmission capacity, route diversity, and geopolitical stability to the global fibre network.
- Branching units are located to support a complementary buildout to Arctic communities, "Canada Connect," serving critical infrastructure needs, system redundancy, and diverse backhaul.
- Exclusive agreement with supplier Alcatel for turnkey project; system ready-for-service 2026.
- Agreements in place with Japanese, Icelandic, Finnish and Irish partners for landing rights, backhaul, and permitting services.
- Community outreach and regulatory review underway.

SMART CABLE

- Integrated Science Monitoring And Reliable Telecommunications (SMART) cable[1] technologies will give Arctic communities and Indigenous peoples, academic institutions and science agencies around the world advanced new tools to study the oceanography of the most rapidly changing ocean and region of earth.

- A Joint Task Force under the auspices of the International Telecommunication Union, the World Meteorological Organization, and the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO/IOC) is guiding development of SMART cable.

- SMART cables will be a major new element in the Global Ocean Observing System, integrating temperature, pressure, and three-axis seismic accelerometer sensors into the fibre system to obtain long-term measurements of ocean bottom environmental conditions.

- Deployed sensors will return extensive, longitudinal, real-time data on ocean circulation patterns, sea level rise, tides, wind and pressure waves that are critical for understanding climate change processes and enabling earlier and more accurate tsunami hazard mitigation.

1. See appendix for further information regarding SMART cable

FAR NORTH FIBRE TIMELINE

Estimated Total Project Interval: Approximately 48 months.[1]

Supply Contract-in-Force (CIF)	2022
Marine Route Survey	2022 – 2024
Cable Manufacturing & Installation	2023 – 2025
Ready-for-Service	2026

1. Timeline assumes ship and other resource availabilities subject to revision at time of CIF.

CANADA CONNECT

CANADA'S ARCTIC FIBRE BACKBONE

- The **Canada Connect** portion of the Far North Fibre (FNF) project will extend branch landing segments from branching units (BU's) built into the FNF express cable to landing stations located along Canada's Arctic coast. Potential branch landings include Tuktoyaktuk, Resolute, Grise Fjord/Pond Inlet, and Iqaluit.
- The FNF system architecture includes the necessary wet and dry plant elements, e.g. power feed capacity, BU's and repeater spacing, to link it with Canada's telecommunications infrastructure.
- **Canada Connect** will enable integration of existing Canadian telecom providers' systems, including microwave and satellite networks, with the FNF express system, giving remote communities robust, diverse connectivity into the global broadband network.
- As a financially stand-alone project, Far North Fibre effectively subsidizes the costs to interconnect remote communities accessed through **Canada Connect**.

CANADA CONNECT

POTENTIAL LANDINGS

Distance from Branching Unit to Landing:

Tuktoyaktuk- 351 km, Inuvik to Tuk – 161 km,
Resolute- 41 km Grise Fjord - 193 km,
Iqaluit- 590 km Total Distance: 2272 Km

Science Monitoring And Reliable Telecommunications (SMART) cable

FAR NORTH FIBRE SYSTEM

SMART cable – Ocean monitoring and research

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ASIA, NORTH AMERICA AND EUROPE TO PROVIDE

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TRUE NORTH Global Networks

Far North Digital

FAR NORTH FIBRE ROUTE

Far North Fibre will be the first submarine fibre optic system through the Arctic's Northwest Passage connecting Asia to North America, Europe, and Scandinavia. SMART cable technology offers remarkable new tools to study the most rapidly changing ocean on earth.

Far North TRUE NORTH

SMART CAPABILITIES

- Challenge is to integrate environmental sensors into commercial submarine telecom cables, with extended life spans and comparable reliability, and without affecting telecom performance.
- The standard solution will use sensors per JTF SMART specification:
  - Temperature
  - Three-axis accelerometers
  - High accuracy pressure sensors
- Sensors to be fully qualified "submarine grade" components.
- Optional sensors anticipated for future development include:
  - Seismometer, Hydrophone, Conductivity, others
- Dedicated housings, distinct from repeaters, to offer more flexibility and specificity for sensor locations.

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Mid-span Power Feed - Dual branch landing in Prudhoe Bay, Alaska, provides double-end power feed from the cable midpoint toward terminal landings in Japan, Ireland and Norway. Redundant PFE protects operational continuity in event of cable shunt fault.

Far North TRUE NORTH Cinia

SUBMARINE FIBRE OPTIC NETWORK

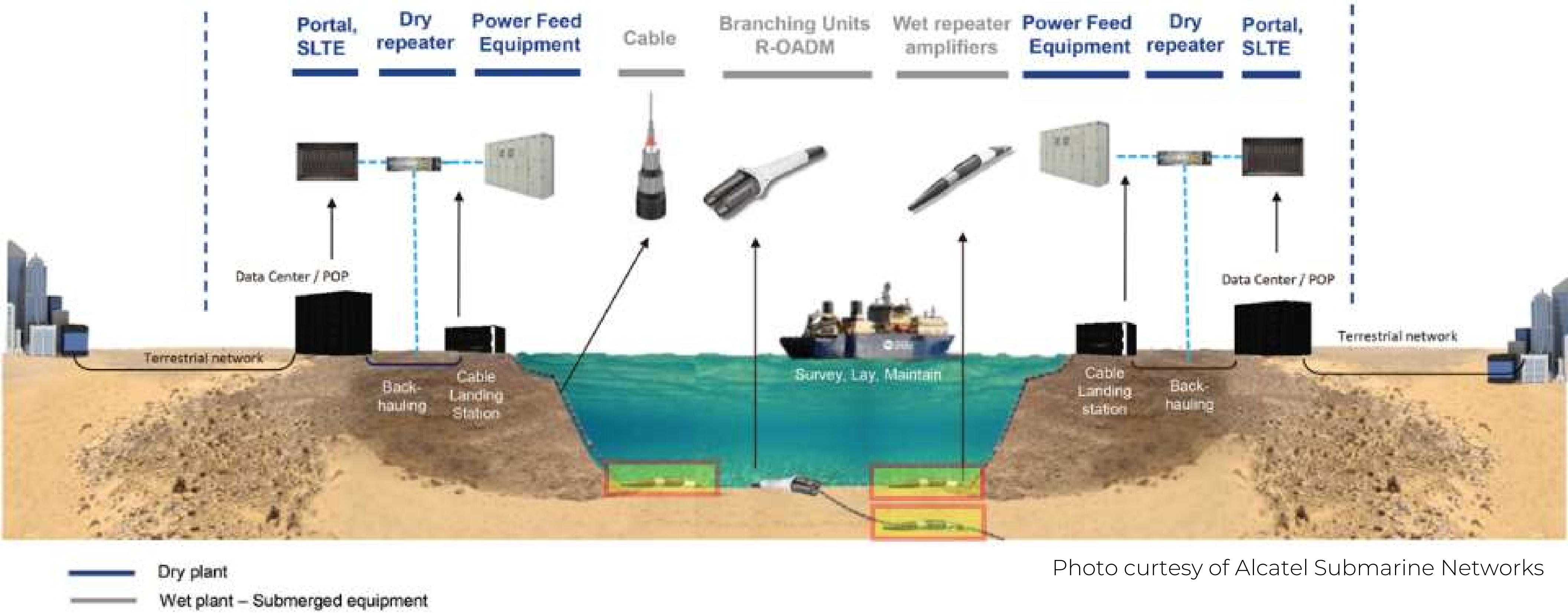
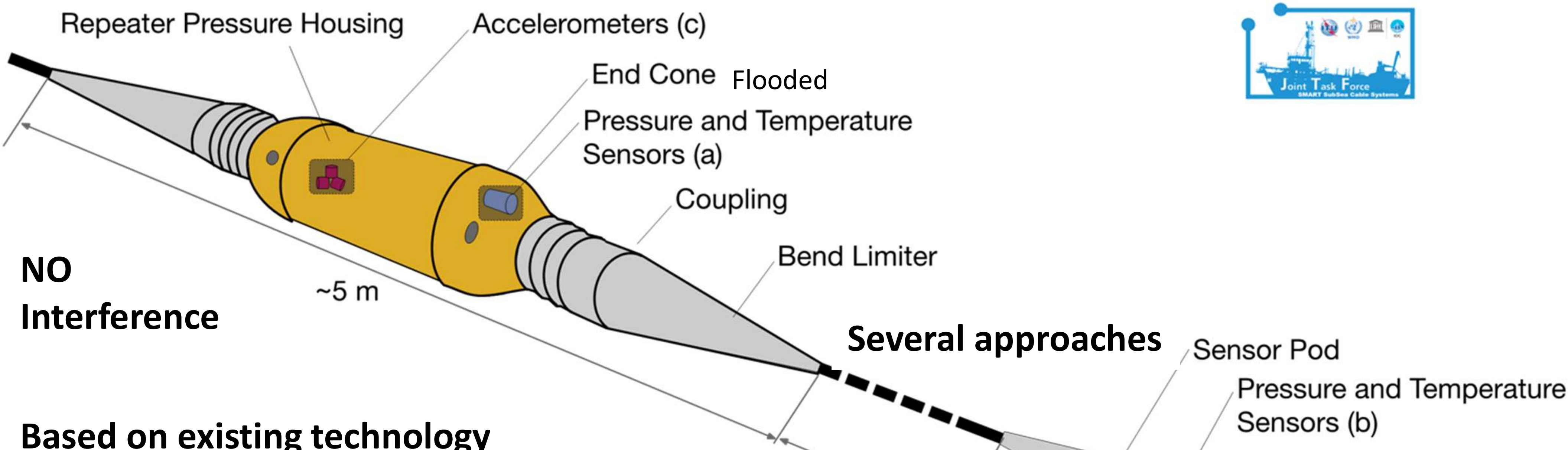


Photo curtesy of Alcatel Submarine Networks

- Repeaters are placed at constant intervals to insure the greatest transmission to power ratio.
- Environmental sensors built into repeater housings collect subsea data from great depths and distances.

SMART REPEATERS



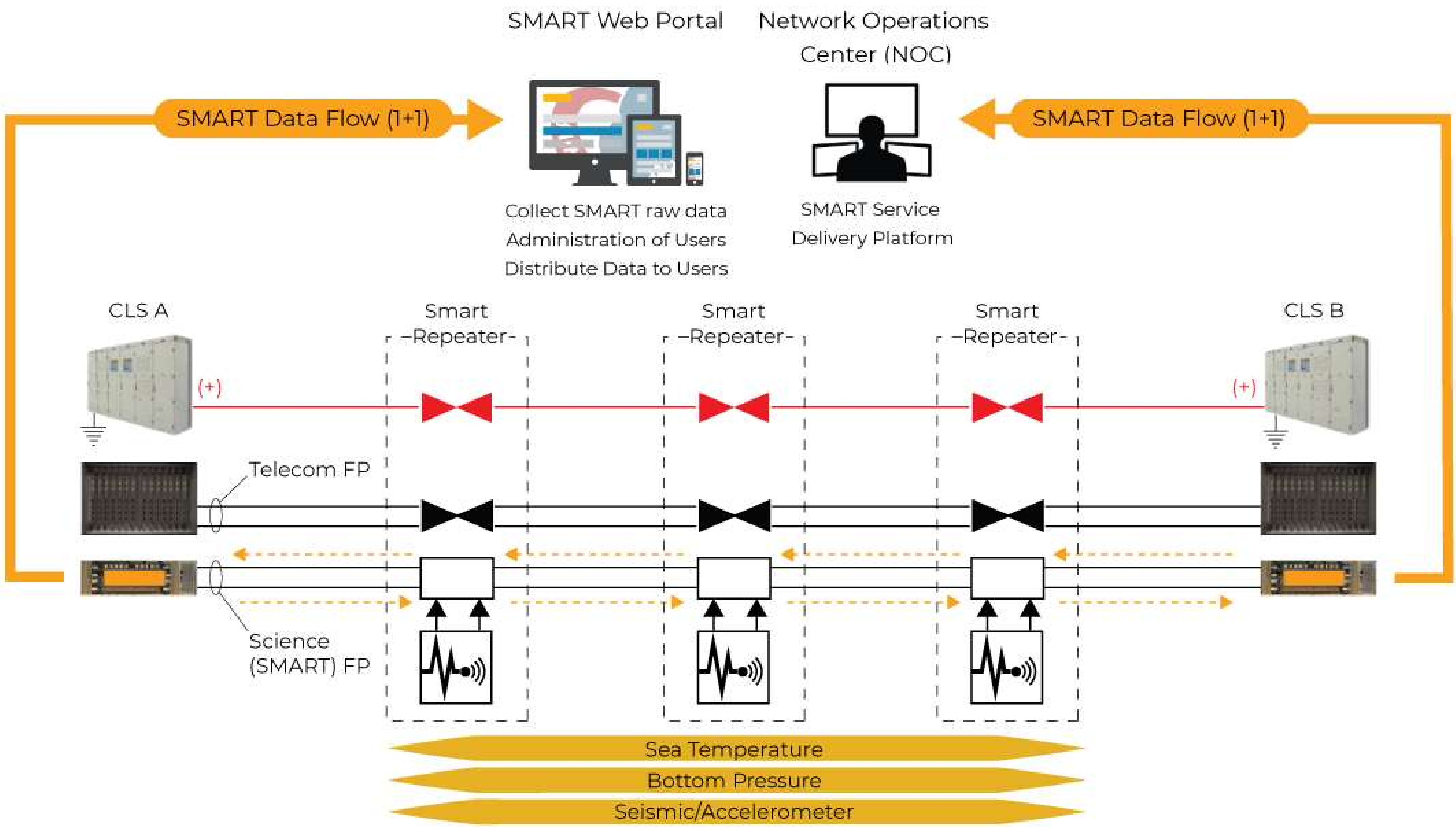
NO Interference

Several approaches

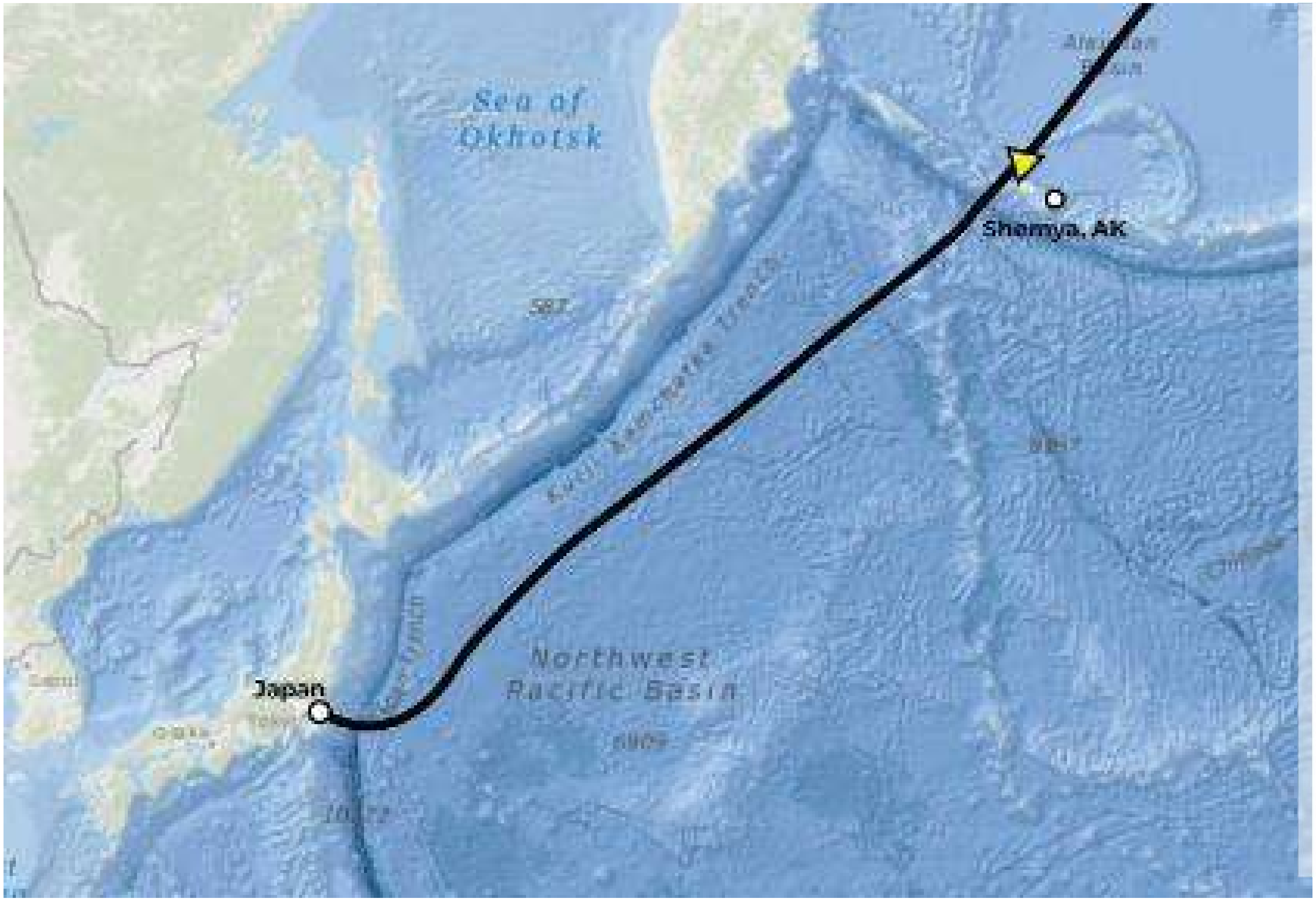
Based on existing technology

Or, a separate SMART repeater with telecom fibre pass-through

SMART CABLE SCIENCE NETWORK



SMART CABLE SCIENCE NETWORK

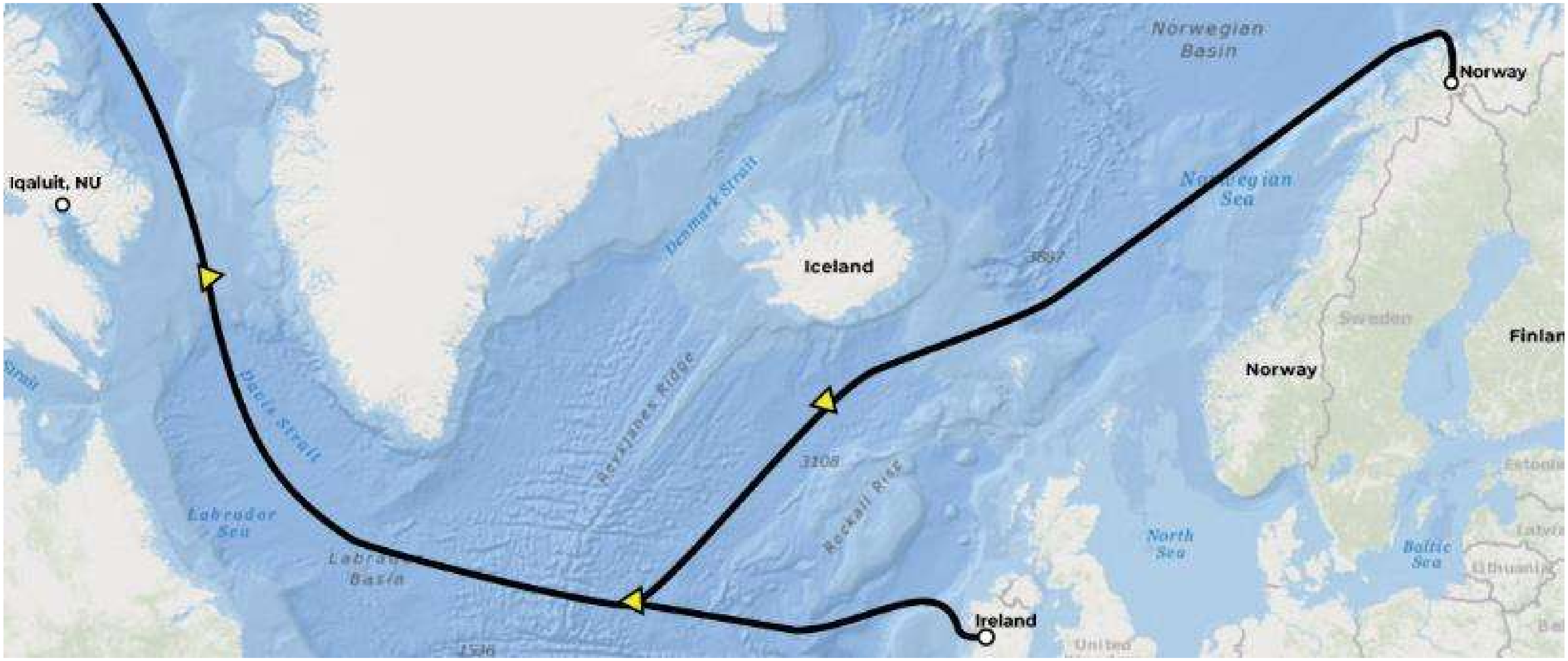


- Tokyo to Shemya portion of the cable route crosses the Japanese Trench (deepest point 8,020 m) and the Aleutian Trench (7,822 m).
- Research into seismic activity in these deep ocean subduction zones along the Pacific "Ring of Fire."
- Enhanced tsunami early warning capability.

SMART CABLE SCIENCE NETWORK

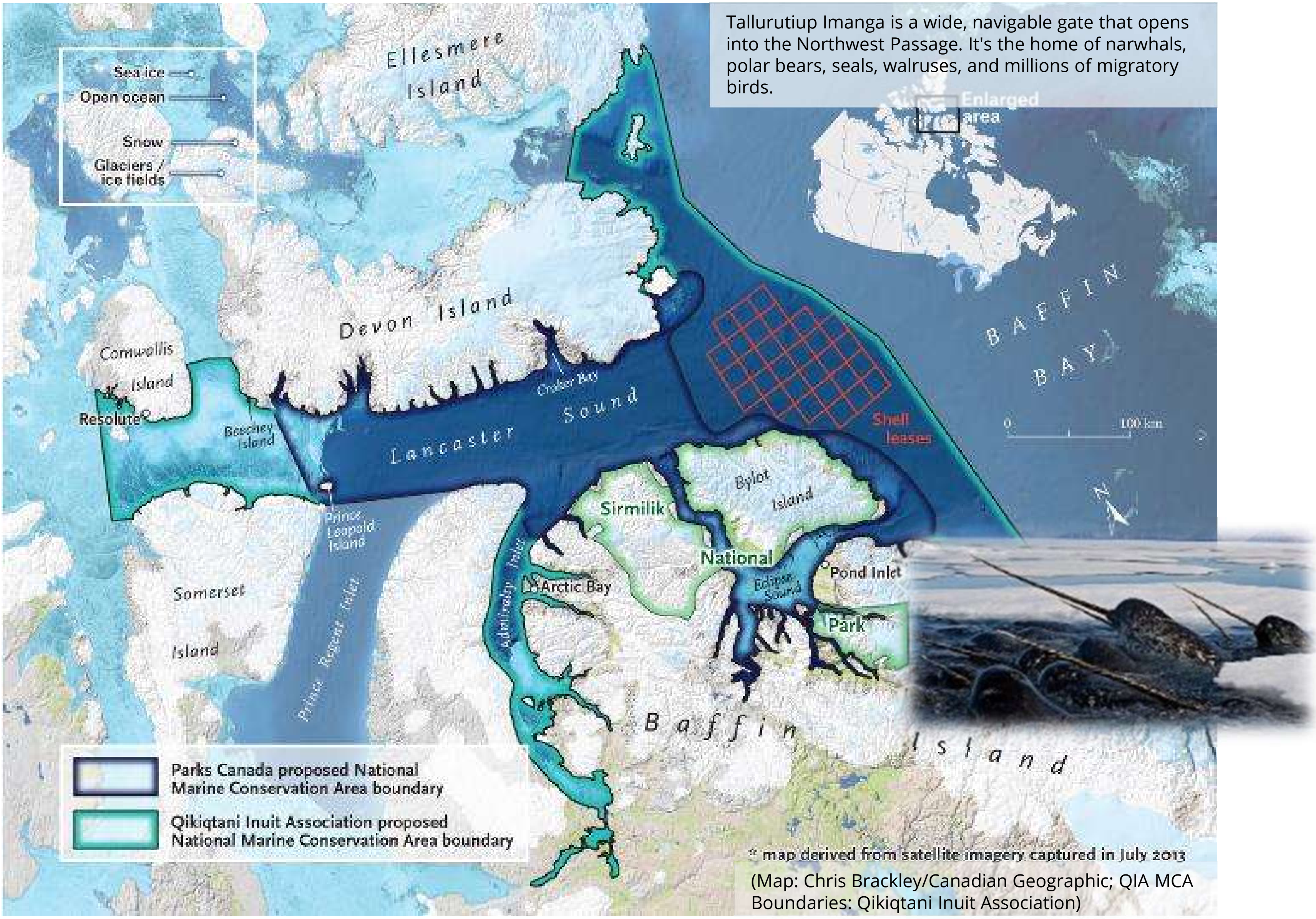
- Cable route climbs from the Beaufort Sea basin (4,683 m) onto the relatively shallow waters of the Northwest Passage (400 m) before dropping into the Baffin Basin (over 2,700 m).
- Cable through the Chukchi and Beaufort basins could incorporate powered BU to support moored sensor installations, acoustic transmitters/receivers for real-time, pan-Arctic acoustic navigation and position control under the ice.

SMART CABLE SCIENCE NETWORK



- Cable drops out of Davis Strait to the Labrador Sea (4,316 m) and across the North Atlantic, forking to landings in Ireland and Norway.
- Longitudinal, real-time environmental data series through Baffin Bay and Davis Strait.
- Seismicity of mid-Atlantic spreading ridge, Reykjanes Ridge.
- Oceanography of Norwegian Basin.

NATURAL RESOURCE CONSERVATION



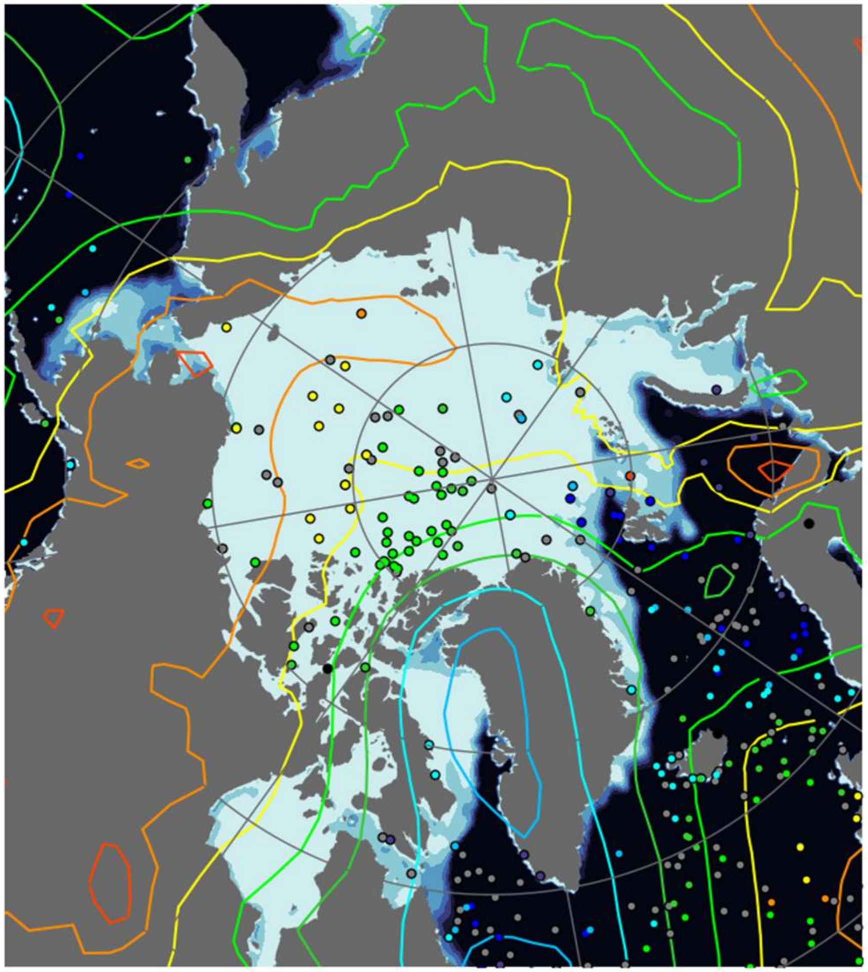
Tallurutiup Imanga is a wide, navigable gate that opens into the Northwest Passage. It's the home of narwhals, polar bears, seals, walruses, and millions of migratory birds.

(Map: Chris Brackley/Canadian Geographic; QIA MCA Boundaries: Qikiqtani Inuit Association)

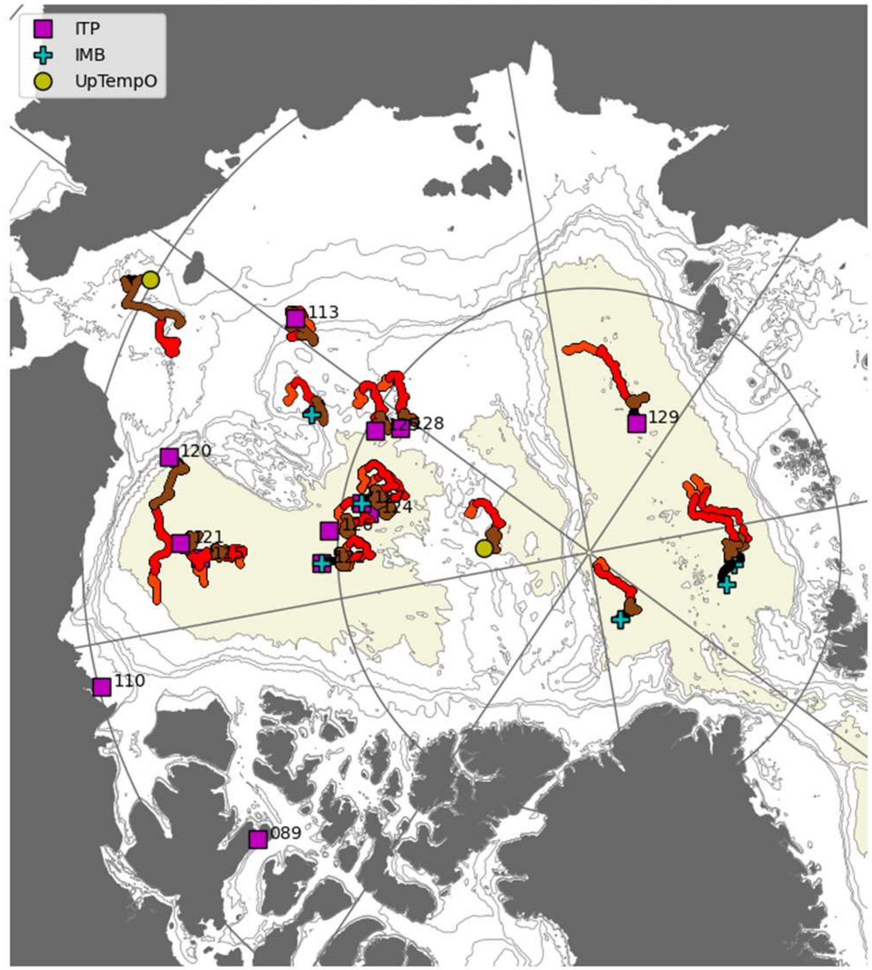
RESEARCH OPPORTUNITIES

International Arctic Buoy Program – coordinated at the University of Washington
Ocean Data from under the ice

01/16/2022 Overview: SLP



Ocean Buoys (ITP, IMB, UpTempO) 01/15/2022



Drifting ice observatories collect sea ice and ocean parameters as they drift with the ice.
Send data back in near real time.

Data available at: https://iabp.apl.uw.edu

Applied Physics Laboratory
UNIVERSITY of WASHINGTON

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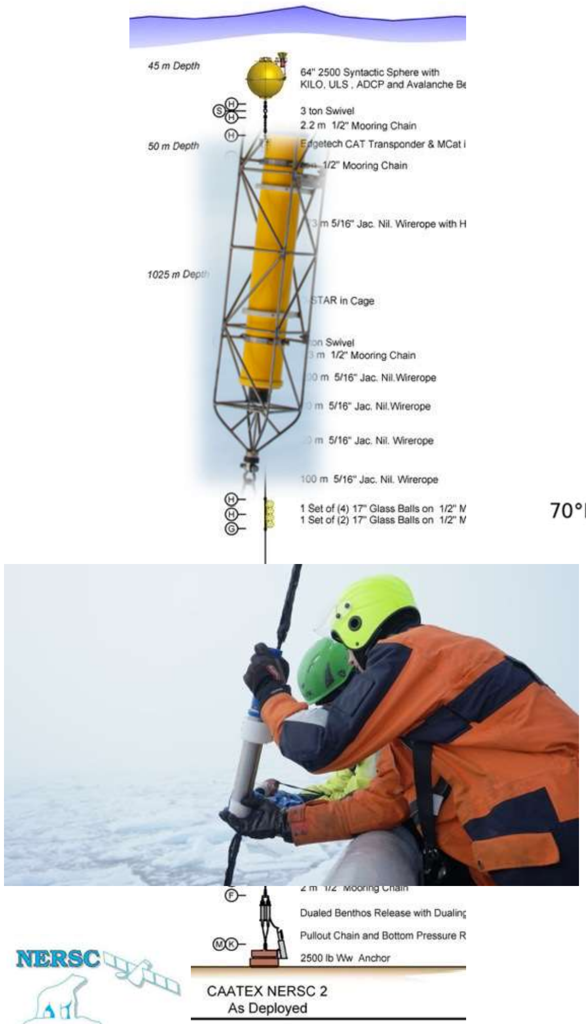
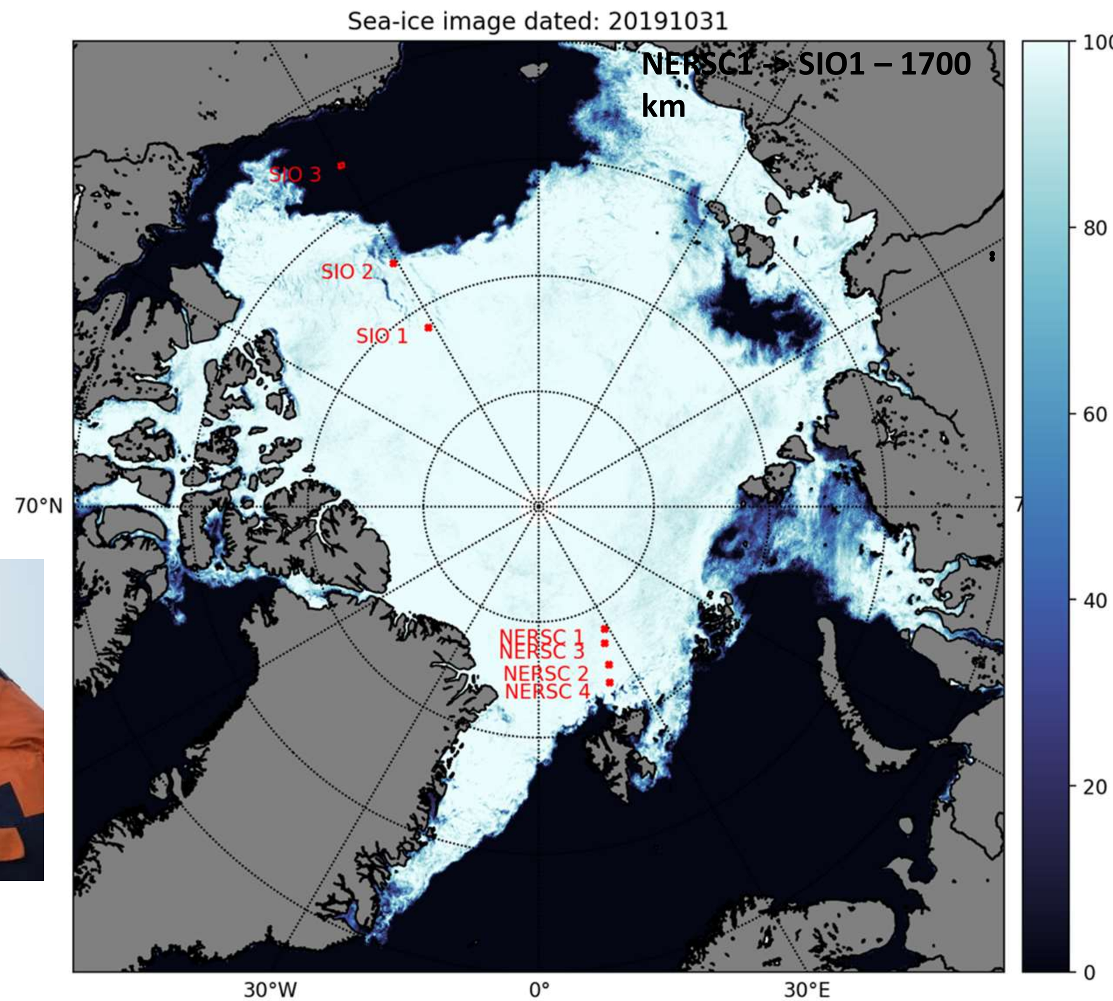
RESEARCH OPPORTUNITIES

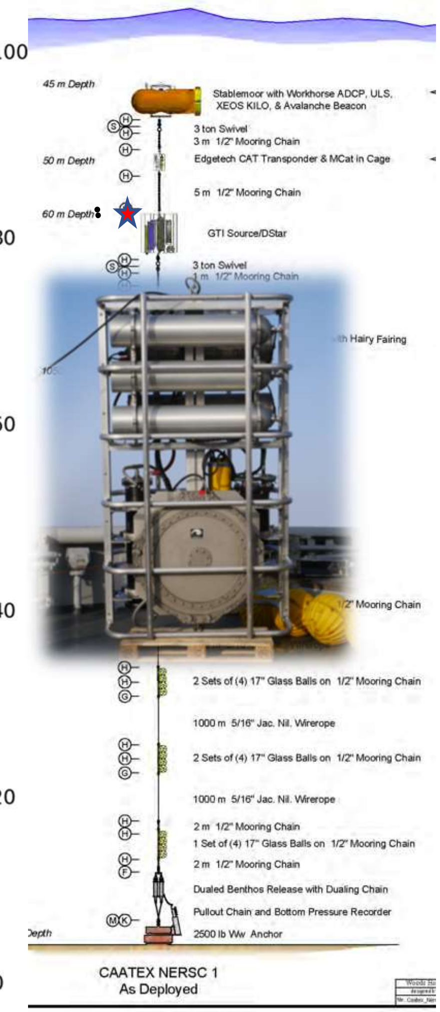
CAATEX: Mooring configuration and instrumentation

Receiver





Source/receiver



Ice concentration from University of Bremen (G. Heygster)

CAATEX

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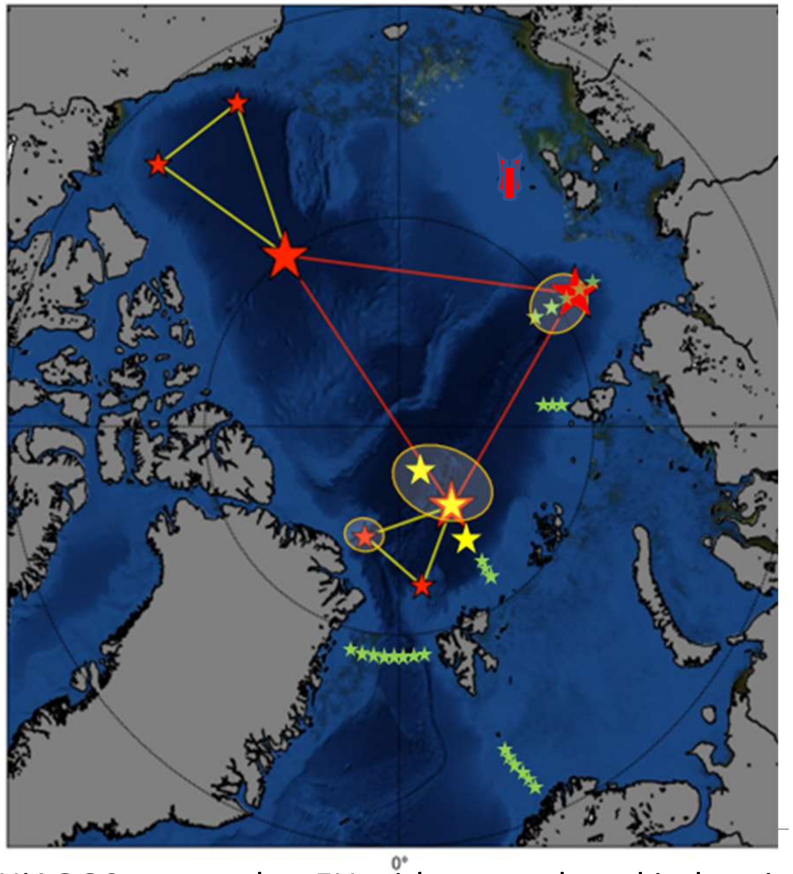
RESEARCH OPPORTUNITIES

Horizon Europe Programme
Proposal: HiAOOS – High Arctic Ocean Observing System.

ARGO floats in the Arctic. IFREMER deployed 2 ARGO floats at the NP September from Le Commandant Charcot 2021.

The ice prevents the float to surface.

Data cannot be delivered or geopositioned.



HiAOOS proposal to EU with research and industrial partners (April 2022)

Our goal is to develop and deploy a system that provide UW-GPS, thermometry, oceanographic point measurements and 'ocean sound'.

A cabled source or receiver would north of Alaska would be a great achievement for the sustainability of the Arctic Observing system.

→ Develop common interfaces for interoperability

NERSC

NORSK·POLARINSTITUTT

SCRIPPS INSTITUTION OF OCEANOGRAPHY

Woods Hole Oceanographic Institution

RESEARCH OPPORTUNITIES

Oceanographic moorings for long-term observations at fixed positions:

- High temporal resolution
- Host a large number sensors
- Cover the whole water column
- Vertical resolution depending on distribution and type of instruments and sensors

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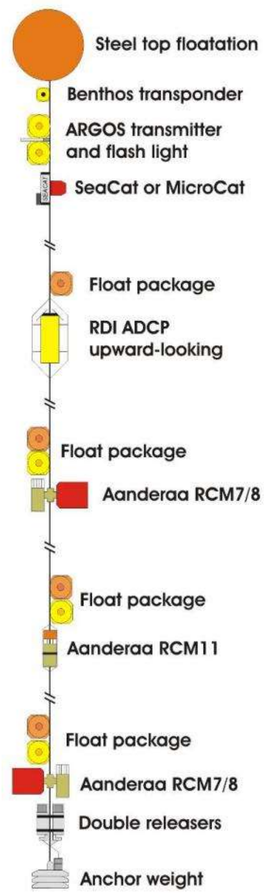
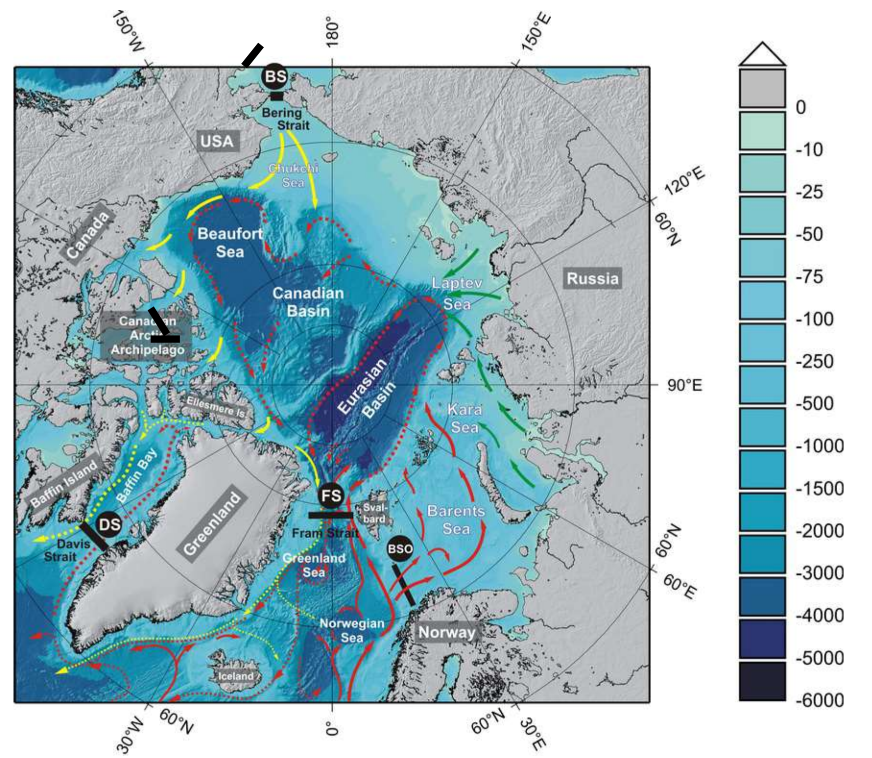
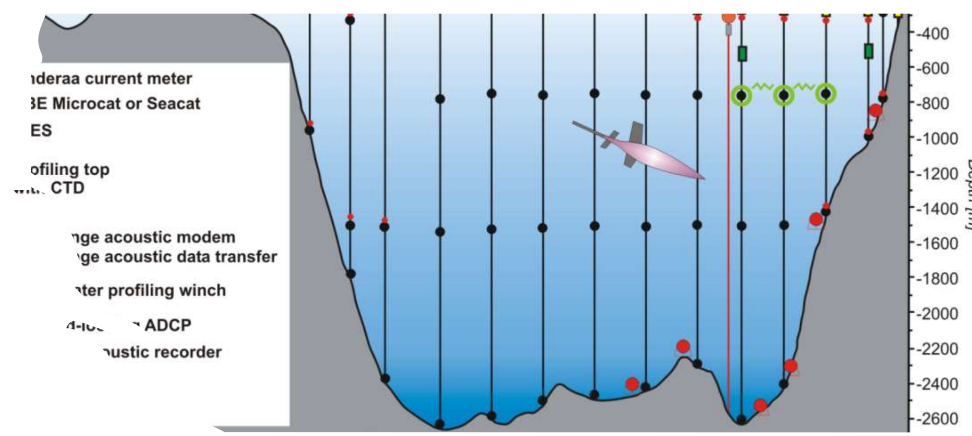
- Usually relatively low spatial resolution
- Must be recovered to get the data







RECOMMENDATIONS FROM OCEANOBS19

- By 2029 the Arctic should prominently demonstrate that it has a fully developed, implemented, and sustained ocean observing systems that meets at a minimum, earth system prediction needs - but also meets other critical Arctic Societal Benefit Needs (Lee et al. 2019)
- To improve the Arctic Ocean Observing capability OceanObs19 recommended ‘to pilot a sustained multipurpose acoustic network for positioning, tomography, passive acoustics, and communication in an integrated Arctic Observing System, with eventual transition to global coverage’ (Howe et al. 2019).

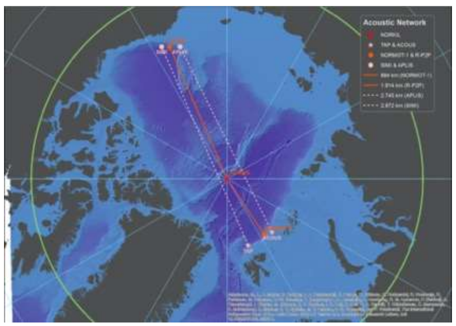
CHALLENGES

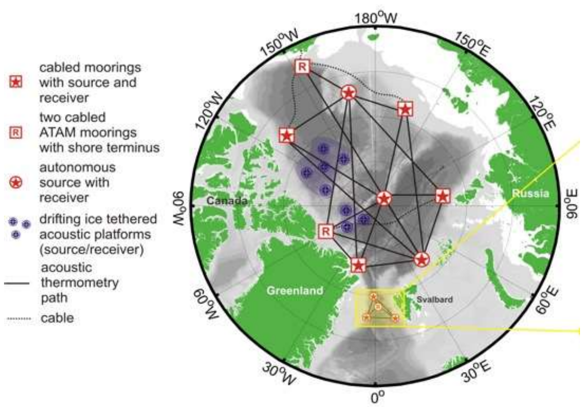
Technology and Sustainability

- Autonomous observing platforms used in the ice-free oceans such as Argo floats, gliders, and autonomous surface vehicles cannot yet be used operationally in ice-covered Arctic regions.
- Real time data from ocean under the ice is limited to a few drifting ITPs. ITPs must be replaced on a regular basis.
- Year-round ocean data from fixed moorings are available only in delayed mode. Moorings need to be recovered to be refurbished and for download of the data.
- Lack of operationality in the data chain from instruments into the data repositories

Evolution of Multipurpose acoustic networks in the Arctic

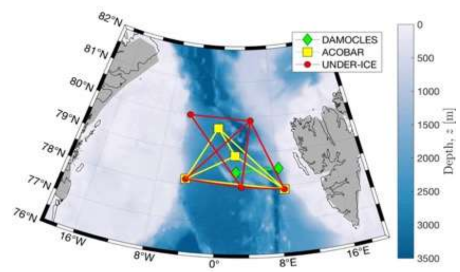
Basin wide thermometry system
TAP and ACOUS 1994, 1999



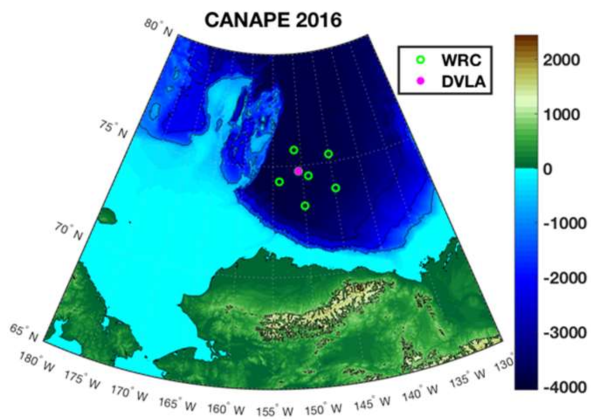


VISION: MIKAHALEVSKY ET AL. 2015

Regional Multipurpose Acoustic Networks

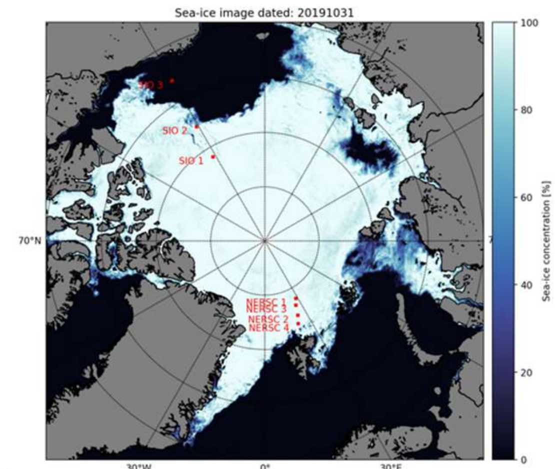


Fram Strait 2007-2016



Beaufort Sea 2016-2027

Basin wide Thermometry



RESEARCH LEADS

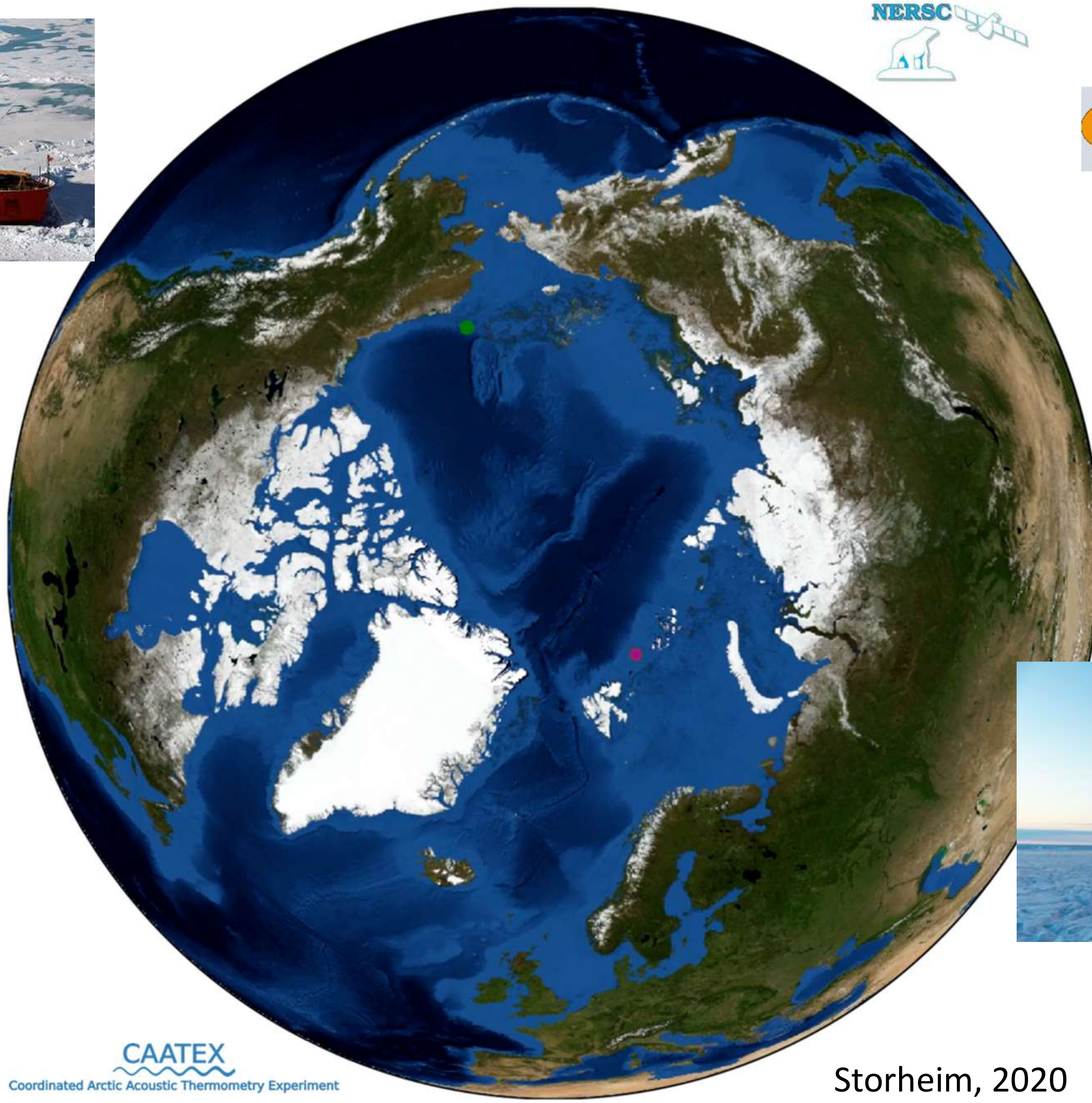
USCGC Healy

Deployment
3.9-14.10 2019

Planned recovery
18.08.2020 –
22.10.2020

Project Lead:
Matthew
Dzieciuch
SIO

Office of Naval Research
ONR
Science & Technology



CAATEX
Coordinated Arctic Acoustic Thermometry Experiment

Storheim, 2020

NERSC

The Research Council of Norway

KV Svalbard
Departure/Return LYR
Deploy
14.08 2019- 9.9 2019

Recover
17.07 2020- 9.8 2020

Project Lead:
Hanne Sagen, NERSC

KYSTVAKTEN

CAATEX

Far North

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RESEARCH SPONSORS

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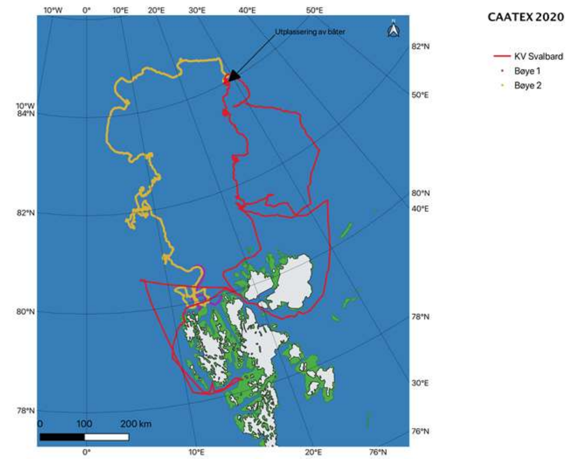
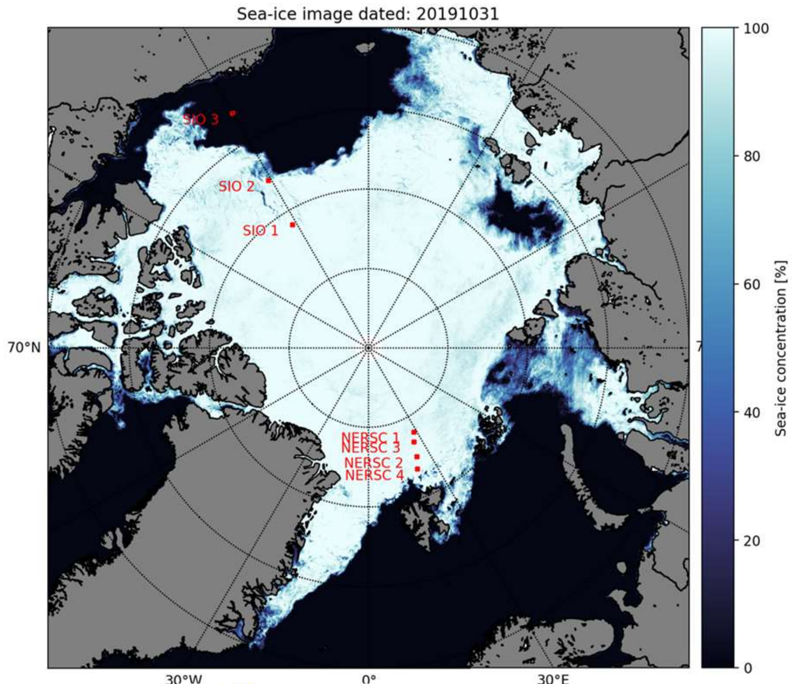
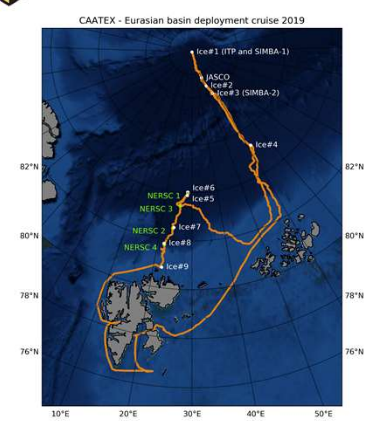
1909

Woods Hole Oceanographic Institution







NORCE

FFI Forsvarets forskningsinstitutt
Norwegian Defence Research Establishment

NORSK-POLARINSTITUTT

UNIVERSITAS BERGENSIS

KYSTVERKET
NORWEGIAN COASTAL ADMINISTRATION

Norwegian Meteorological Institute

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

INTAROS
2016 - 2022

CAATEX
Coordinated Arctic Acoustic Thermometry Experiment