

INTAROS and the way towards a sustained Arctic Observation System.

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Nansen Environmental and Remote Sensing Center, Norway
and 45 partners from 20 countries.

Overall objective: to develop an efficient integrated Arctic Observation System by **extending, improving and unifying** existing and evolving systems in different regions of the Arctic

A project funded by EC - H2020-BG-09-2016
Start date: 01 December 2016 - Duration: 5 year



INTAROS

www.intaros.eu

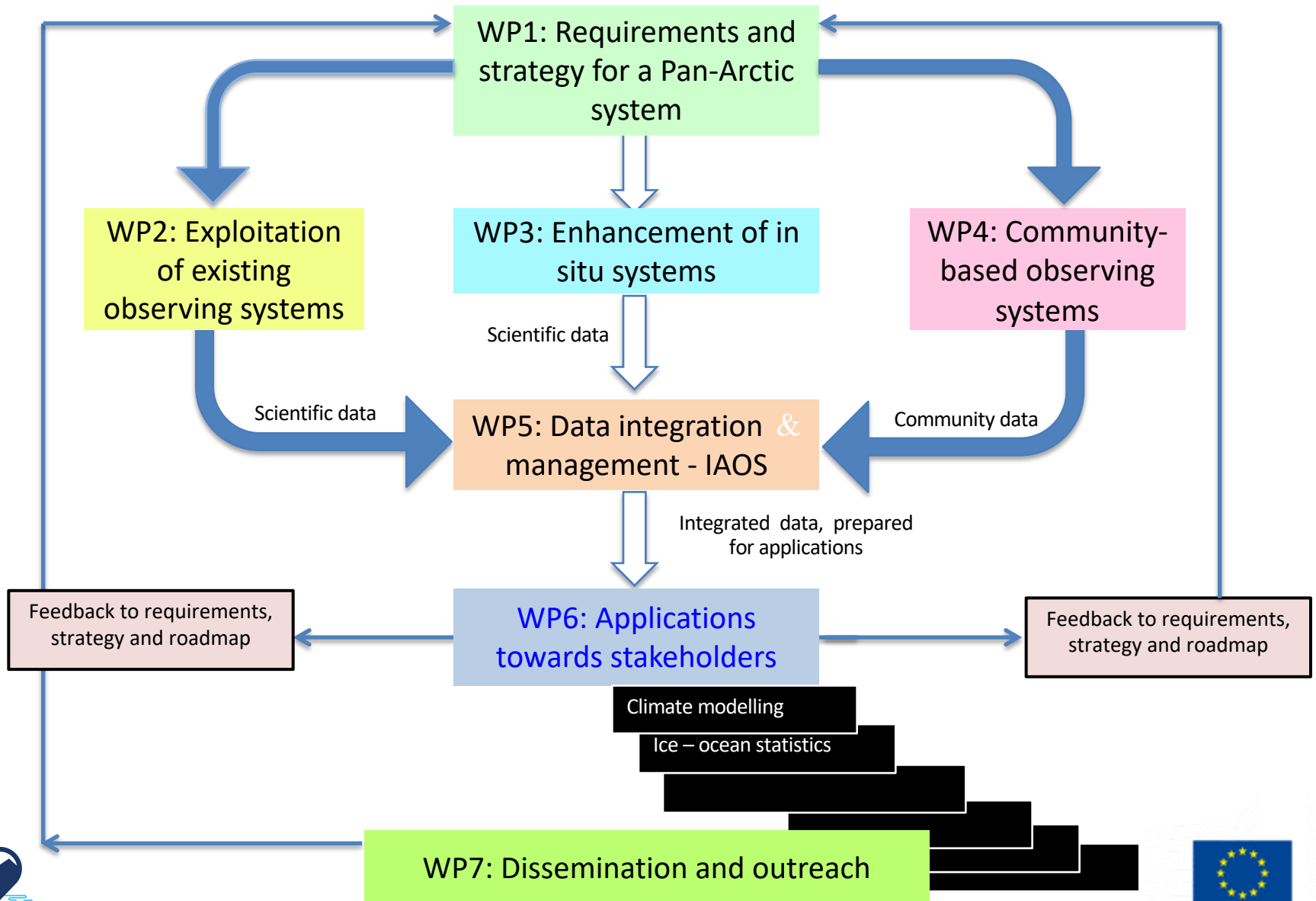


Challenges in building Arctic observing systems

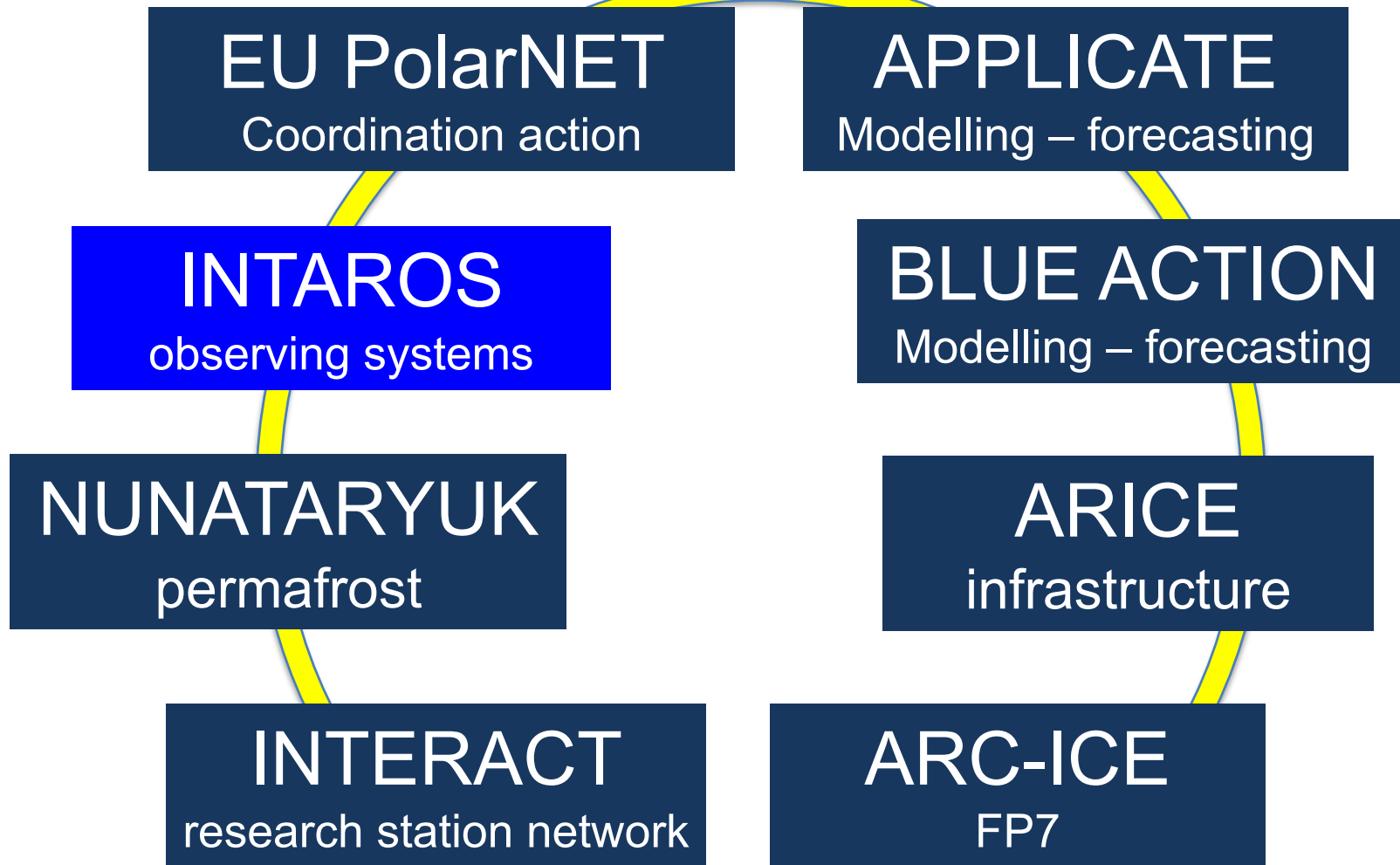
- (1) Develop coordination and collaboration between data providers and stakeholders in the pan-Arctic region in order to better use existing systems and resources (**Organisation**)
- (2) Improvement of the observing platforms and sensors, filling of gaps in the observing network and facilitate for year-round operation, how to go from research to operational systems (**Technology, filling gap, operational**)
- (3) Data sampling, transmission, calibration, processing, archiving and retrieval of required variables and build distributed and connected databases (**Data generation, dissemination, and management**)
- (4) How to develop sustainability of the observing systems, and what are the funding mechanisms ? (**Engagement→ Funding**)



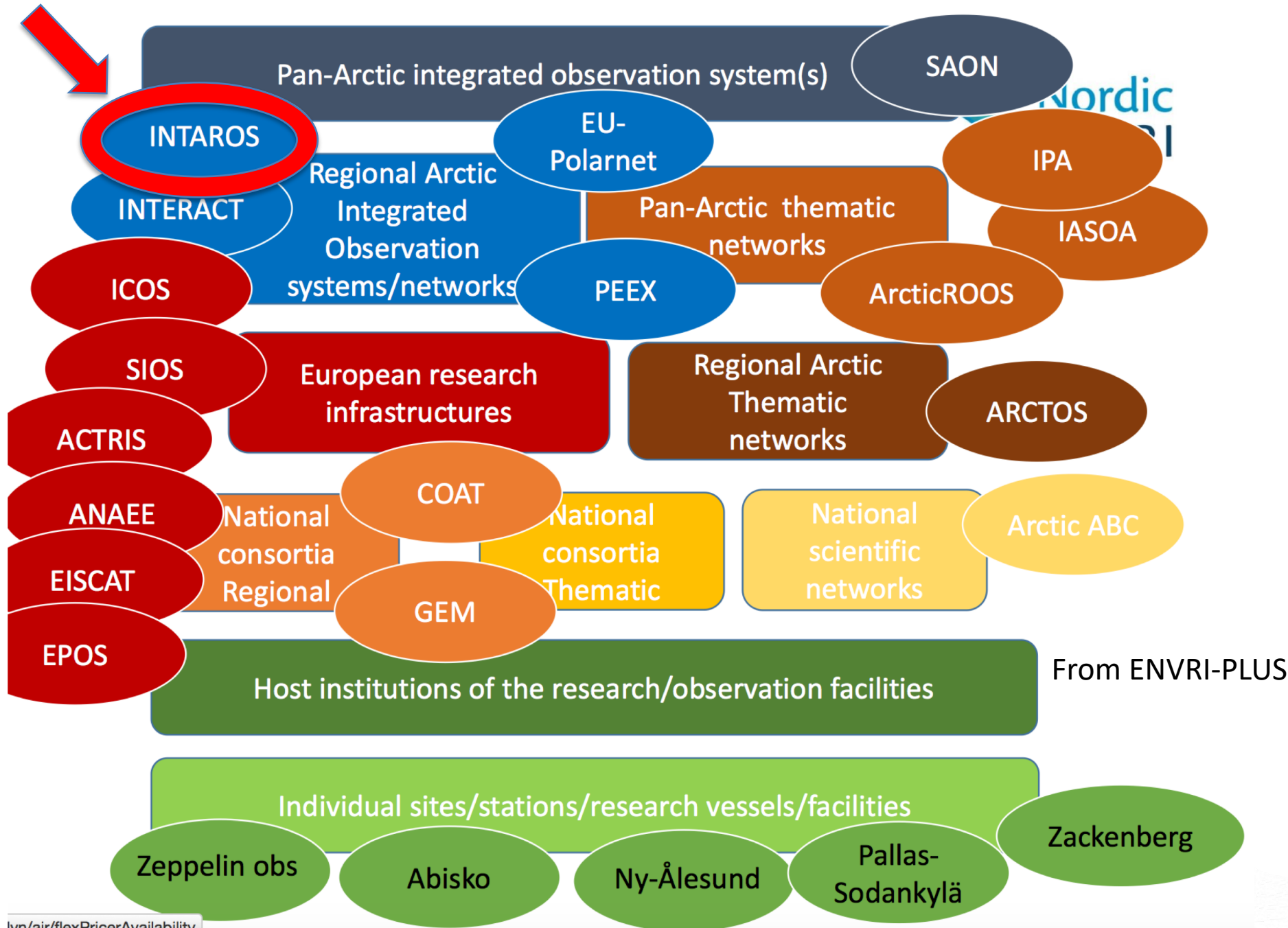
INTAROS Workpackage structure



Organization at EU level: EU's Arctic project cluster 2016-2021



Other infrastructure projects:
ACTRIS, ICOS, SIOS, ENVRI PLUS, ++



INTAROS WP2:

Exploitation of existing observing systems

Task 1. Analyze strengths, weaknesses, and gaps of the existing observation networks and databases.

Task 2. Exploit selected datasets in order to increase the quality and number of data products

Task 3. Enhance standardization of data and metadata to ensure that best practices are followed, and integrate sparse in situ data into established networks, preparing their delivery to the iAOS

Task 4. Synthesis and recommendations.

3 QUESTIONNAIRES, to collect the info needed **TO ASSESS:**

- A.** The Arctic existing in situ observing systems (58)
- B.** The Arctic in situ data collections: existing and exploited (149)
- C.** The Arctic satellite products: existing and exploited (29)

The questionnaires were web-based, open to all partners and collaborators through the INTAROS internal web page



Content of the survey

QUESTIONNAIRE A: Arctic existing *in situ* observing systems

General info

Sustainability

Data
management

Data usage

QUESTIONNAIRE B: Arctic existing *in situ* data collections

General info

Uncertainty
characterization

Not to be answered,
if the data belong to
one of the listed
observing systems

Data
management

Data coverage,
resolution, timeliness,
and format

Metadata
specifications,
documentation

Sustainability

Data usage

QUESTIONNAIRE C: Arctic satellite products

General info

Data coverage, resolution,
timeliness, and format

Uncertainty
characterization

Metadata specifications,
documentation

Data management

Data usage



Observing systems and data collections are assessed towards the FAIR principles

1. Findable – supports search and discovery
2. Accessible – download options (full datasets, subsets)
3. Interoperable – standardized metadata and interfaces
4. Reusable – rich metadata, data licenses & provenance

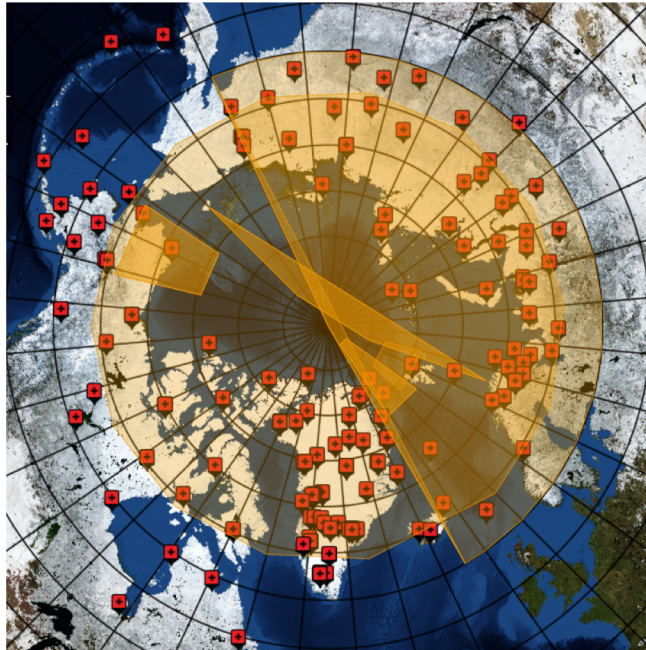
Data collected* or estimated during INTAROS will be managed according to the FAIR principles¹:

¹ Wilkinson et al. 2016. The FAIR Guiding Principles for scientific data management and stewardship. Sci. Data 3:160018 doi: 10.1038/sdata.2016.18.

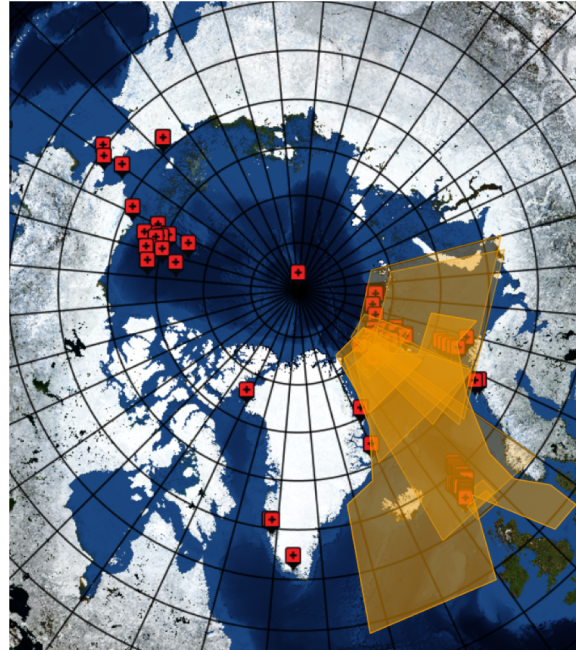


Overview of surveyed data

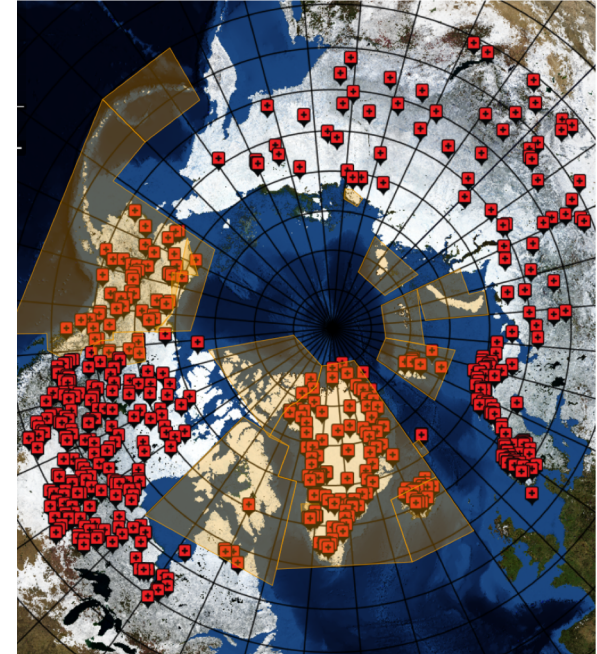
Atmosphere



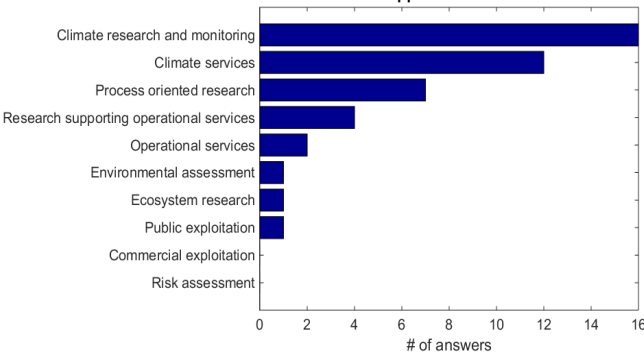
Ocean and sea ice



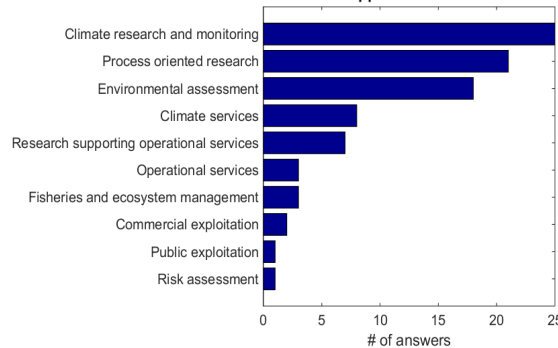
Land and terrestrial cryosphere



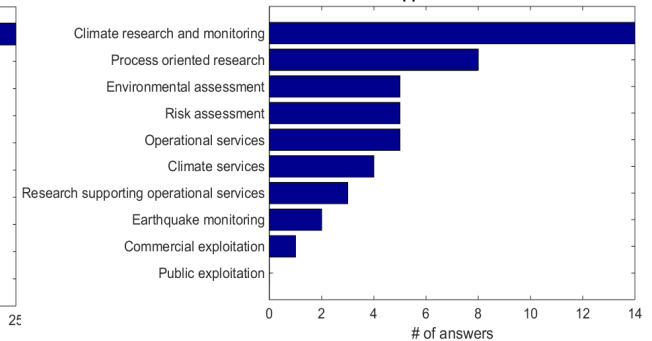
Application areas



Application areas



Application areas



Results: Sustainability and data management

Ocean and sea ice (25)

Observation System	Platform	Sustainability	Data Management	Data repository
		support	ss*	ervation
CONCLUDING REMARKS: <ul style="list-style-type: none"> It is a major problem that in-situ observing systems lack sustainability. We recommend development of multi-disciplinary observatories using well proven and robust instrumentation mounted in sea floor installations, bottom anchored oceanographic moorings, and drifting ice-tethered platforms. Need to develop and adapt technologies and sensors to make biogeochemical and biological observations feasible. There are many gaps in the data coverage in the Arctic, but the gaps in biogeochemical observations are particularly important. In the Arctic there are limiting factors in accessing data in the same way as in other regions. 				
R/V Håkon Mosby	Vessels	5 5 N/A	3 4 2 3 2 3	NMDC
SAVN (Faeroe National History Museum)	Community Based	missing	missing	
SIOS Airborne Infrastructure	Airborn Sensors	3 4 N/A	2 2 2 2 2 3	
UNIS ocean observing System	Fixed Moorings	4 4 N/A	2 2 2 2 2 3	

*(for terrestrial stations only)



Questionnaire A open to external collaborators on 16 April 2018

Accessible at: <https://intaros.nerisc.no/node/651>

1.5 Domain of the observing system

6 responses



Accessible at: <https://intaros.nerisc.no/node/651>

A follow up project for the Norwegian Ministry for Climate and Environment will make the surveys dynamic and easy to update. This will be used by SAON/AMAP to follow the development of Arctic observing.



Atmosphere:

Thule High Arctic Atmospheric Observatory - INGV & ENEA

INTAROS (Italy)



Marine data i Arktis: Fra Kartlegging til kunnskap

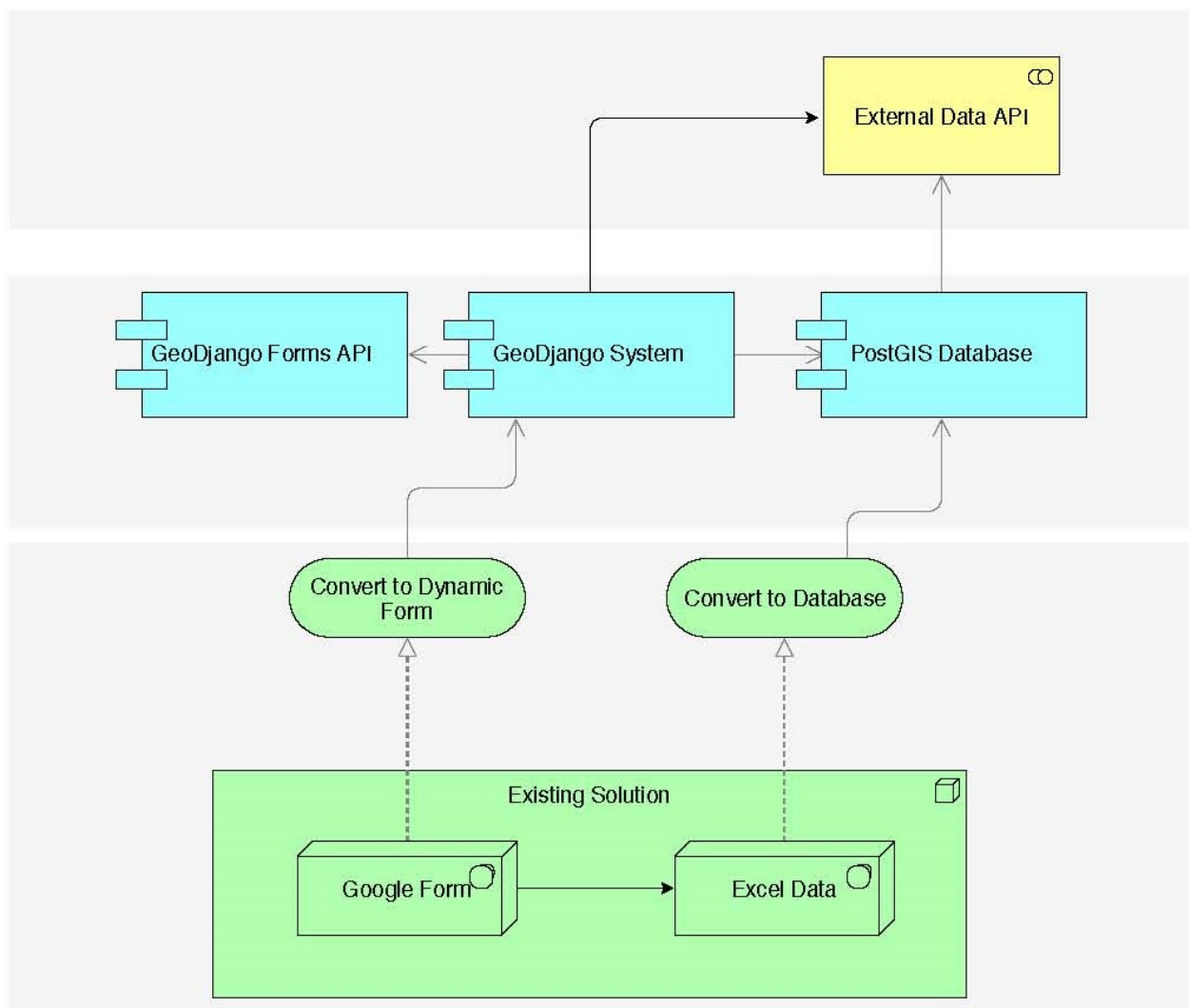
Spesifikke delmål vil være:

- Videreutvikle en metode basert på spørreskjemaer for repeterbar innsamling av informasjon om observasjons- og dataforvaltningssystemer.
- Utvikle metodikk og verktøy for analyse av data fra disse spørreskjemaene.
- Gjennomføre en nasjonal undersøkelse av observasjons- og dataforvaltningssystemer med fokus på havmiljø i Arktis.
- Analysere resultater fra spørreundersøkelsen og evaluere nytteverdi av ulike typer marine data opp mot brukerbehov.

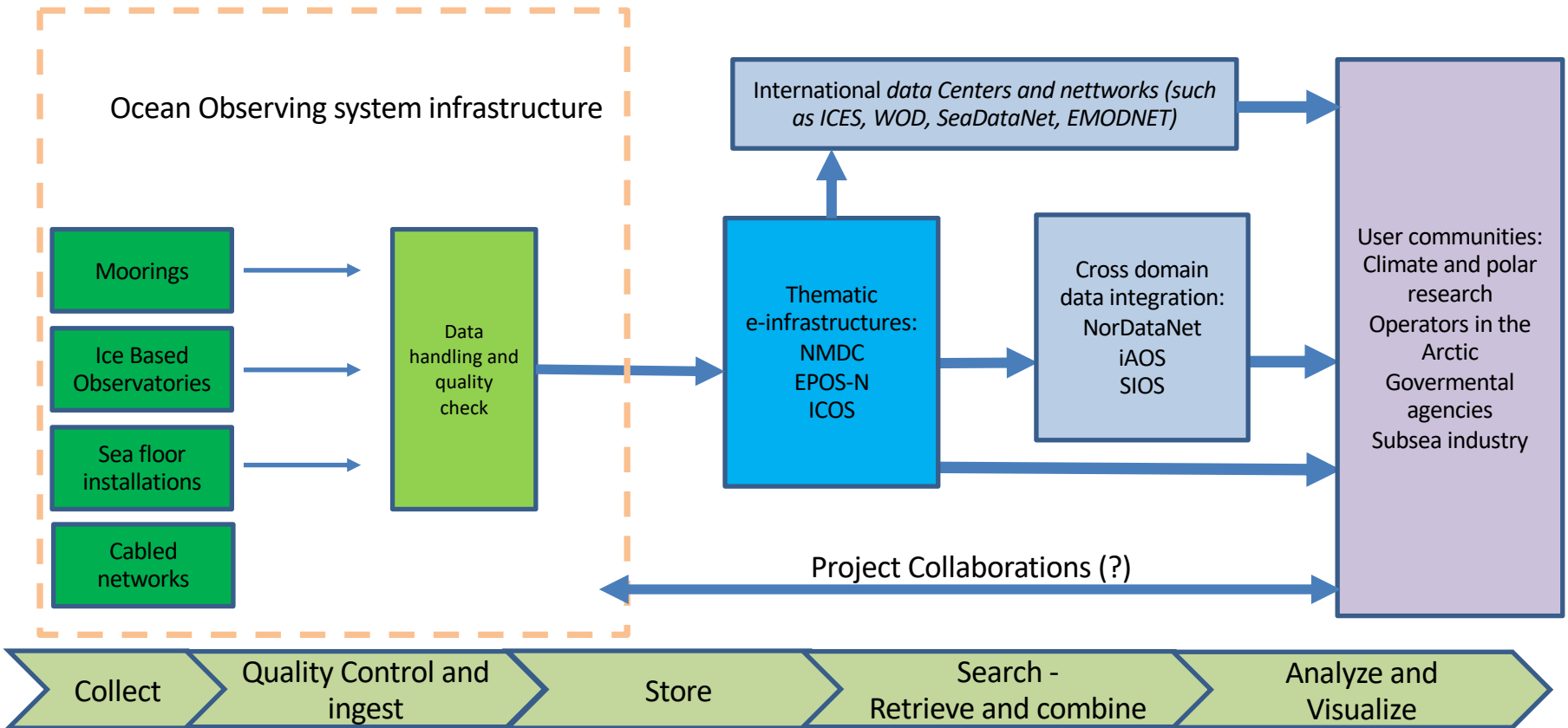


Marine data i Arktis: Fra Kartlegging til kunnskap

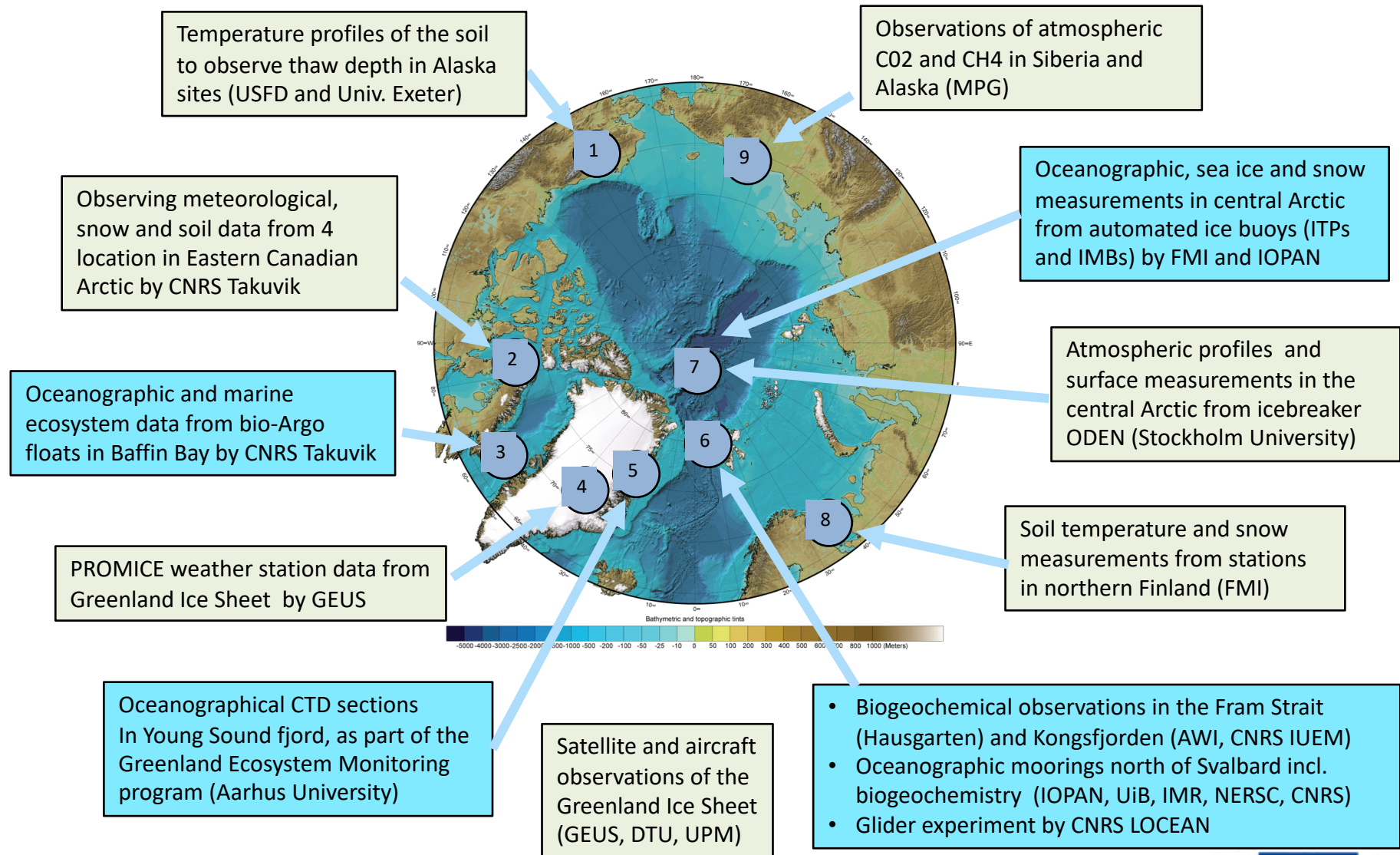
ArcticMap Survey/Questionnaire Conversion/System Overview



Components of Ocean Observation systems



INTAROS field activities in 2017-2018



Contribution from INTAROS to in situ ocean observations

Near realtime data:

- 2 IAOOS platforms: 2018-2019-2020 (IOPAN)
- 4-8 SIMBA Ice Mass Balance Buoys (FMI)
- 7 Argo Floats in Baffin Bay with bio-optical sensors (CNRS Takuvik)
- Ferrybox between Tromsø and Longyearbyen (NIVA)
- Glider experiments in the Fram Strait (CNRS LOCEAN)
- AWIPEV observatory in Kongsfjorden, data transmission via cable, BGC variables, pH, CO₂ (CNRS LOV)

Delayed mode data:

- Moorings north of Svalbard with physical and biogeochemical sensors, ULS, acoustic instruments (UIB, NERSC, IOPAN, CNRS-LOCEAN, IMR)
- Observatories in Hausgarten incl. BGC variables, pH, CO₂ (AWI)
- Greenland Ecosystem Monitoring Programme (Univ. Aarhus)
- Contributions from US partners (Alaska Ocean Obs System +)
- Contributions from Japan, China, South Korea

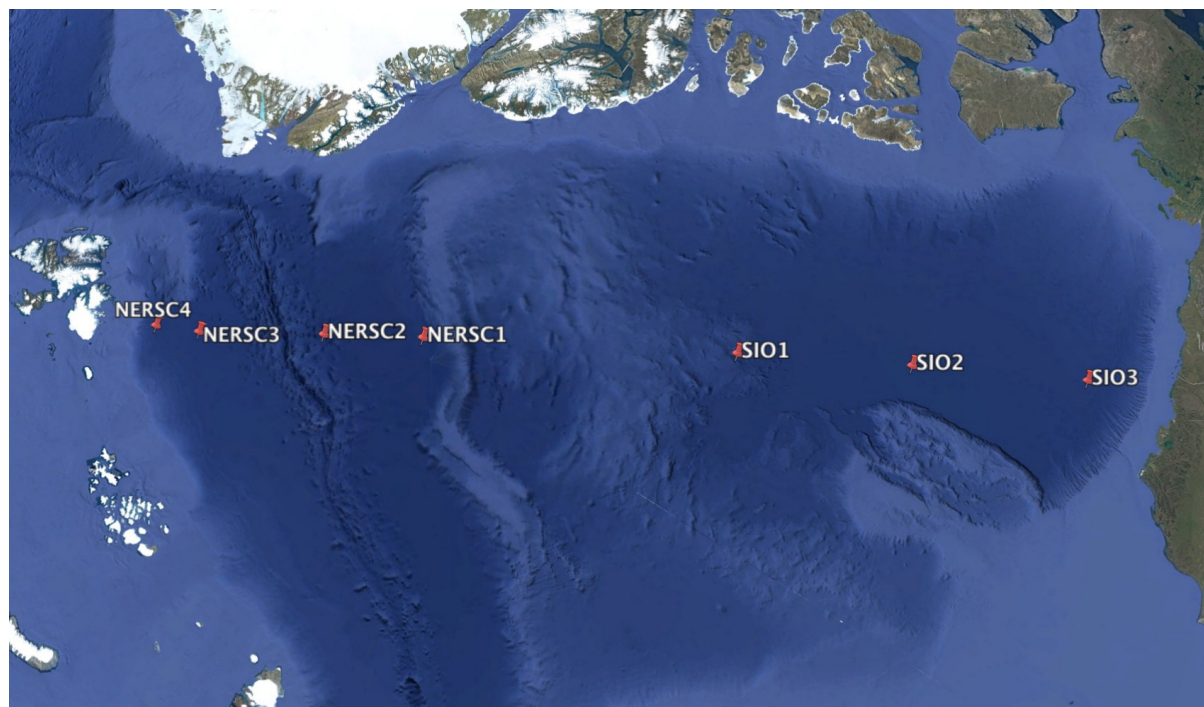


Coordinated Arctic Acoustic Thermometry Experiment (CAATEX)

A joint Norway-USA- Canada project (2018-2022)

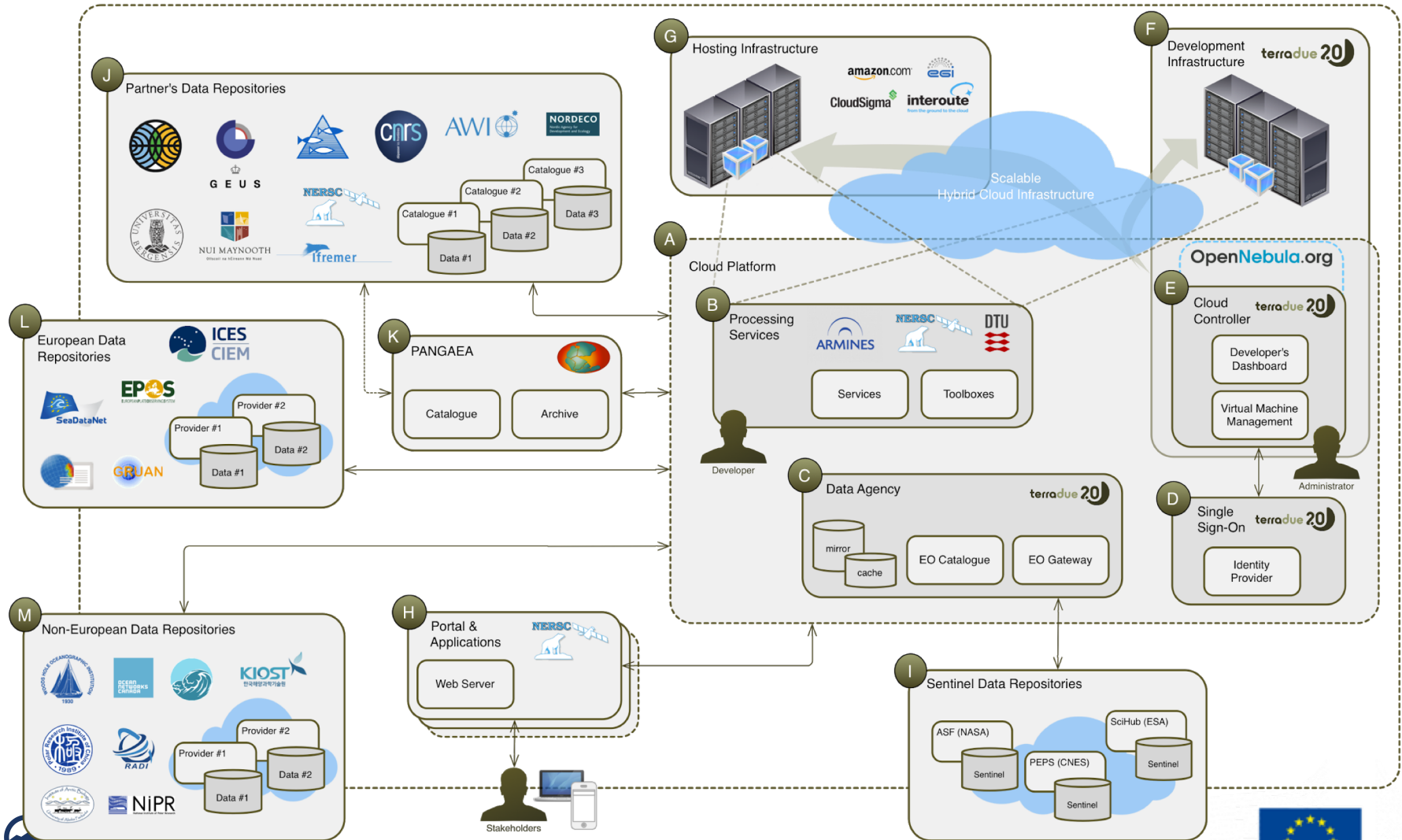
Norwegian part leader: Hanne Sagen (NERSC)

US part leader: Matthew Dzieciuch (SIO)

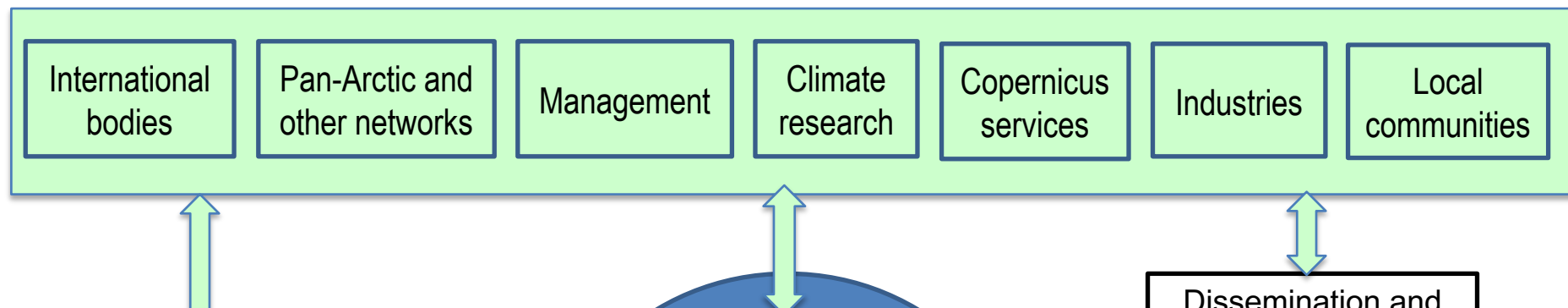


The project will use basin-wide acoustic thermometry and local ice-ocean observations in combination with an eddy-resolving ice-ocean model to produce improved ocean state estimates. This will be used to estimate the Arctic Ocean heat content and to benchmark global climate models.

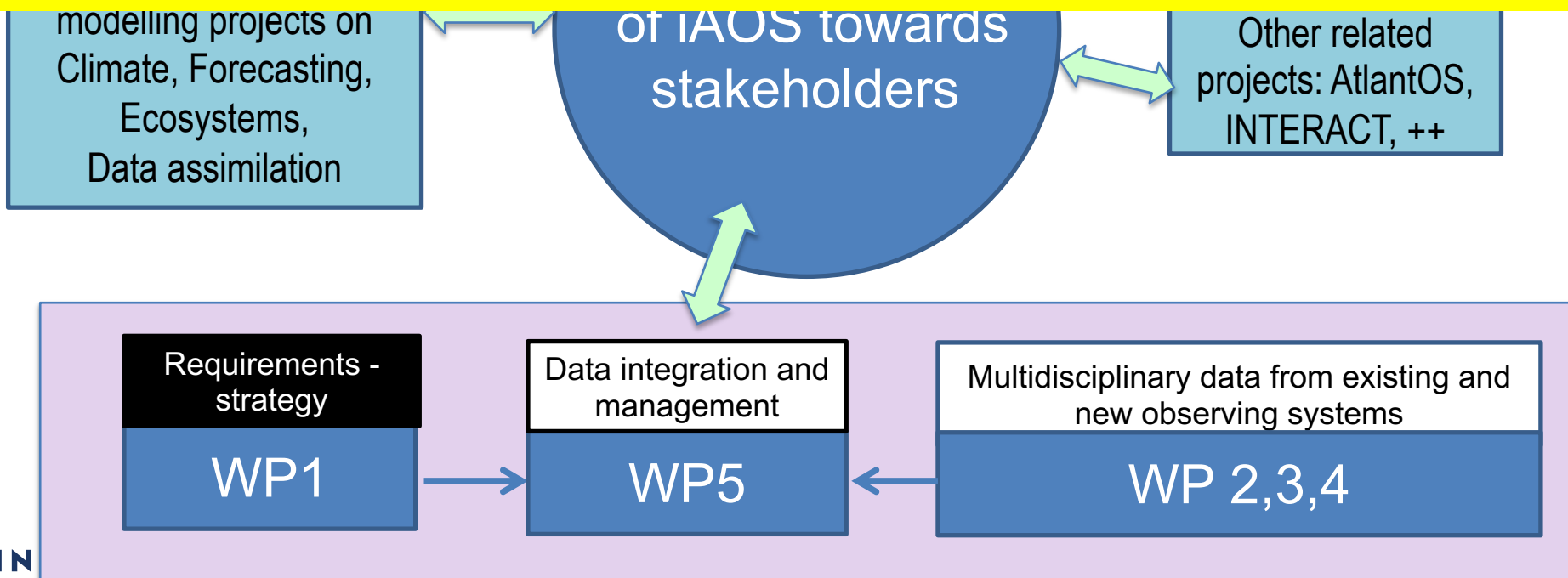
iAOS Platform Architecture



INTAROS as seen from the stakeholders



To obtain sustained funding for observing systems we need stakeholders engagement.





INTAROS partners