# Collaborating towards a pan-Arctic Observing System of System: perspectives from the Arctic PASSION project

Michael Karcher and the Arctic PASSION team

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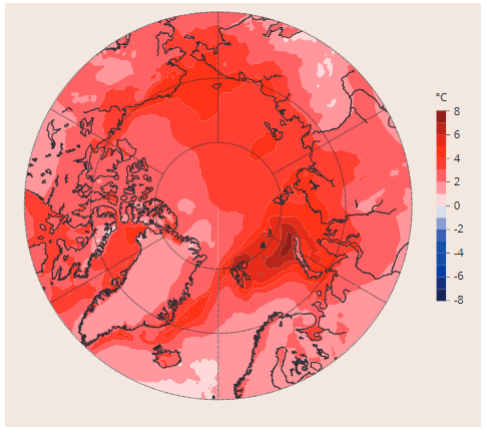


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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101003472

# Arctic Change and Arctic Observing

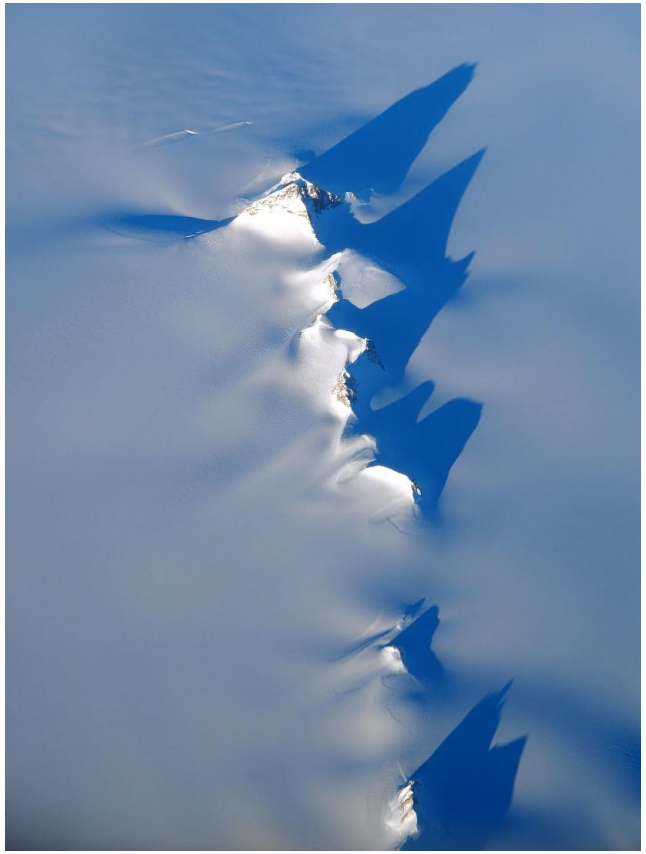
## What do we face? What are the needs?

- Facing a Changing Arctic environment
- Changes impacting the livelyhood of people living in the Arctic and societies outside the Arctic
- Need best available data and knowledge to make knowledge-based decisions
- Need for well coordinated, user-driven integrated observing system of systems
- More holistic approach, also from the scientific perspective
- Observing system still fragmented, lack of data interperability, lack of inclusion of consented Indigenous and local knowledge
- Equity in access to and shaping the observing system for all people

# ARCTIC PASSION

Pan-Arctic Observing System of Systems: Implementing Observations for Societal Needs

- European Commission H2020 Program
- 4 years, 15 Mio Euro, 18 countries
- > 40 partner institutions and Indigenous Communities
- July 2021 – June 2025
- Website: www.arcticpassion.eu
- Coordination: Alfred Wegener Institute for Polar and Marine Research



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# Overall objectives - what we want to achieve

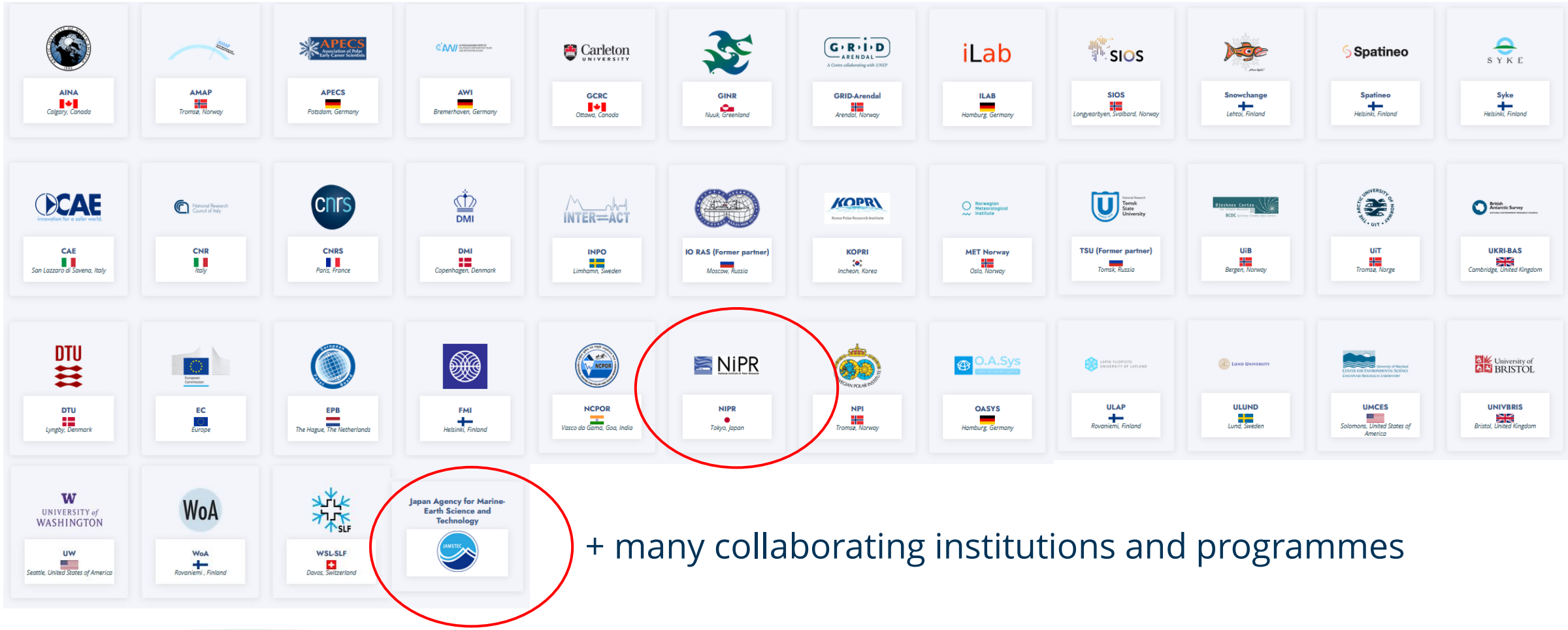
- Co-create a **coherent, integrated and sustainable pan-Arctic Observing System of Systems**
- Meaningful collaboration with **Arctic communities, Indigenous Peoples and organisations;**
- **Expand monitoring capabilities**, also through **broad inclusion of Indigenous Knowledge and Local Knowledge**;
- Improve **data interoperability** and simplify access to 'application-ready' environmental data for the benefit of all users;
- **Improve monitoring** to **support predictions, risk assessment**, **inform** and **guide mitigation and adaptation** and **sustainable development**
- Develop **Pilot Services and support SAON to upgrade Arctic GEOSS into a 'GEO initiative'**
- Initiate **SAV Expert Panels** and develop SAVs in **support of SAON's ROADS** program

→ founding on and collaborating with previous and ongoing international efforts

# Who we are: Institutional partners


+ many collaborating institutions and programmes

# Who we are: Institutional partners




+ many collaborating institutions and programmes

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# Who we are: Arctic communities

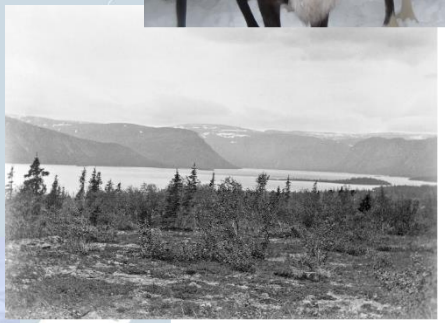



Photo credits: anticlockwise starting on top: Ikaagun Engagement, Mika Honkalinna, Tero Mustonen, Nuunoq Frederiksen, Tero Mustonen, Risto Semenoff, Snowchange (3), Steffen Olsen (center).

# Areas of activity: what we do

- Enhancing instrumentation and coordination
- Inclusion of different knowledge systems
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- Contributing to developing a clearer and more equitable international Structure for Arctic observing

O. Rempel

# The Structure of Arctic PASSION

**Strengthening core observing system elements**

## Pillar A

**Core observing systems elements and Services**

**Work Package-1**
Establishing an adaptive and more complete Arctic observing system

**Work Package-2**
Bringing the Arctic Data System to action

**Work Package-3**
Supporting a smart Arctic Observing System by model-based impact assessments

**Work Package-4**
Innovating user-driven Arctic EuroGEO Pilot Services

**Decision-making support**

## Pillar B

**Societal, science policy and decision-making support**

**Work Package-5**
Assessing Societal Benefits and Economic Impacts

**Work Package-6**
International Cooperation and Clustering for essential Arctic Integration

**Work Package-7**
Supporting coherent Policy and decision-making

**Synthesis and outreach**

## Pillar C

**Synthesis, integration, and outreach**

**Work Package-8**
Co-developing an integrated and sustainable pan-AOSS

**Work Package-9**
Connecting the pan-AOSS with society through communication, dissemination, and engagement

# Areas of activity: what we do

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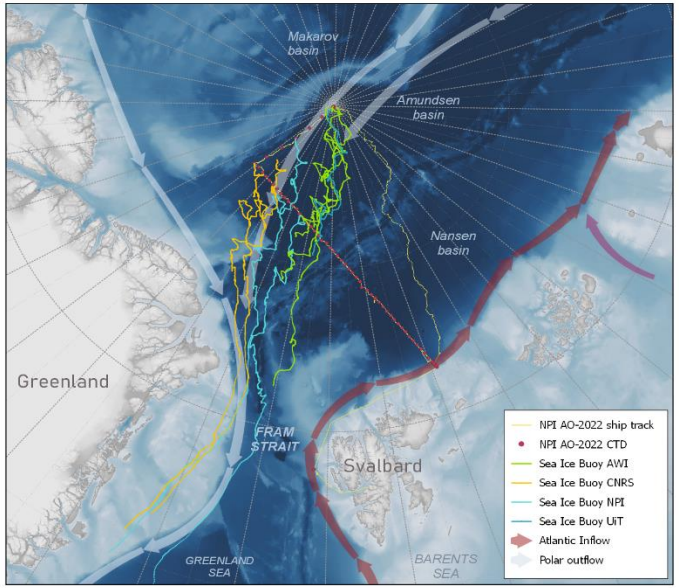
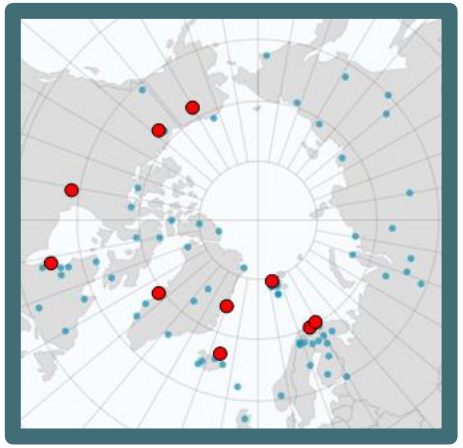
# Enhancing instrumentation and analysis

- New multi-disciplinary moorings
- New sensor and instrumentation developments for marine and atmosphere
- Deployment of drifting buoys
- Building unified snow/ice interface detection for IMBs
- Building of a microwave observation operator for sea ice
- Improving monitoring of glacier runoff and calving front positions




Sundfjord, NPI

# Establish key terrestrial environmental monitoring sites



| | | | Western Arctic Research Centre (WARC) | CEN Whapmagoostui-Kuujjuarapik Station | Toolik Field Station | Arctic Station | Zackenberg Research Station | Kevo Subarctic Research Station | CNR Arctic Station "Dirigible Italia" | Rif Field Station | NiBio Svanhovd research station | Churchill Northern Studies Centre (CNSC) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Category | Parameter | | | | | | | | | | |
| Climate | Meteorology | Air temperature | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO |
| Climate | Meteorology | Air humidity | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO |
| Climate | Meteorology | Air pressure | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO |
| Climate | Meteorology | Wind velocity | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO |
| Climate | Meteorology | Wind direction | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO |
| Climate | Meteorology | Precipitation | YES | YES | YES | YES | YES | YES | NO | YES | YES | NO |
| Climate | Energy balance and radiation | Short Wave incoming | NO | YES | YES | YES | YES | NO | YES | NO | YES | NO |
| Climate | Energy balance and radiation | Short wave outgoing | NO | YES | YES | YES | YES | NO | YES | NO | NO | NO |
| Climate | Energy balance and radiation | Long wave incoming | NO | NO | YES | YES | YES | NO | YES | NO | NO | NO |
| Climate | Energy balance and radiation | Long wave outgoing | NO | NO | YES | YES | YES | NO | YES | NO | NO | NO |
| Climate | Energy balance and radiation | Net radiation | NO | YES | YES | YES | YES | YES | YES | NO | NO | NO |
| Climate | Energy balance and radiation | UV-B | NO | YES | YES | YES | YES | NO | YES | NO | NO | NO |
| Climate | Energy balance and radiation | Sensible heat flux | NO | NO | NO | YES | YES | NO | NO | NO | NO | NO |
| Climate | Energy balance and radiation | Latent heat flux | NO | NO | NO | YES | YES | NO | NO | NO | NO | NO |
| Climate | Energy balance and radiation | Soil Heat flux | NO | NO | NO | YES | YES | YES | NO | NO | NO | NO |
| Cryosphere | Sub surface characteristics | Ground surface temperature | YES | YES | YES | YES | YES | YES | YES | NO | NO | NO |
| Cryosphere | Sub surface characteristics | Soil temperature | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO |
| Cryosphere | Sub surface characteristics | Active layer depth | YES | YES | NO | NO | YES | YES | YES | NO | NO | NO |
| Cryosphere | Sub surface characteristics | Permafrost temperature | YES | YES | NO | NO | YES | YES | YES | NO | NO | NO |
| Cryosphere | Snow characteristics | Snow depth | YES | YES | YES | YES | YES | YES | YES | NO | NO | NO |
| Cryosphere | Snow characteristics | Snow density | NO | YES | YES | YES | YES | NO | NO | NO | NO | NO |
| Cryosphere | Snow characteristics | Snow temperature | NO | YES | NO | YES | YES | NO | YES | NO | NO | NO |

Invitation of ten terrestrial stations & conducting thorough review of existing monitoring

Discussion on how to fill gaps in terrestrial monitoring

Agreement on which instruments and equipment are missing

Discussions of best solutions for each station with instrument distributor

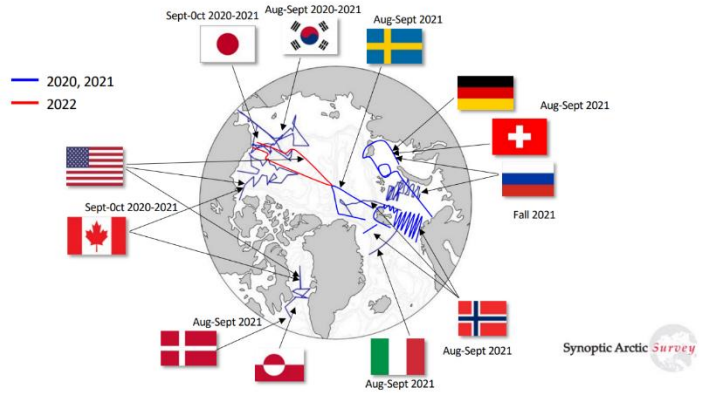
INPA purchases instruments and provides user agreement

Installation of equipment and making data accessible

**More details:** https://arcticpassion.eu/blog/TerrestrialMonitoring

# Enhancing coordination and inclusion

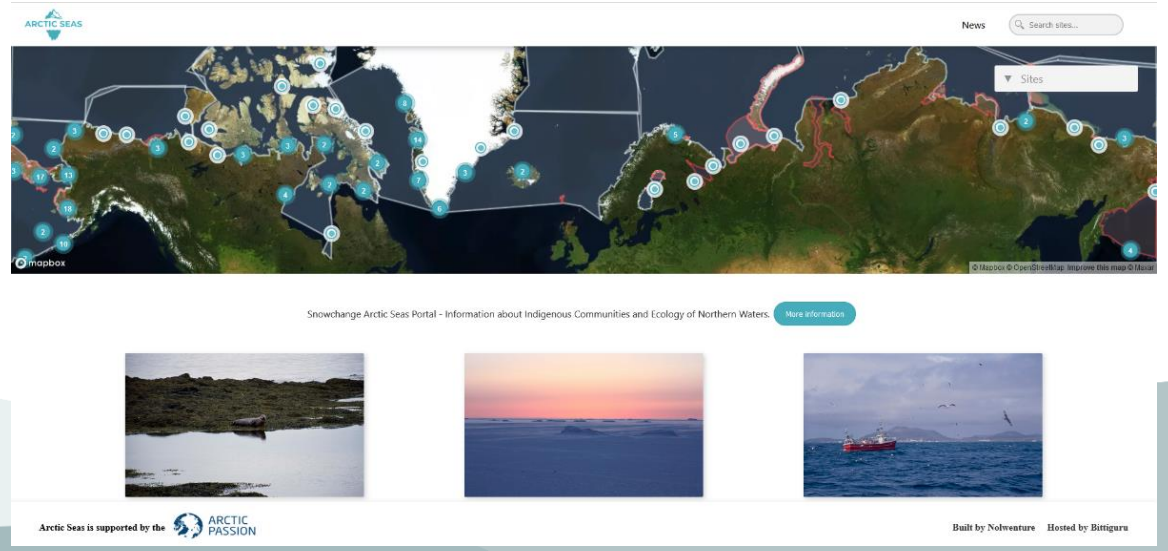
- Advancing the Synoptic Arctic Survey SAS, including preparation for SAS II




International SAS Cruises (12 Nations)

- First assessment on missing elements for an improved Arctic observing system - focus on how CBM networks can contribute actively

- Advancing the visibility of Indigenous marine occupancy, situated locations and knowledge by developing and maintaining the portal arcticseas.org

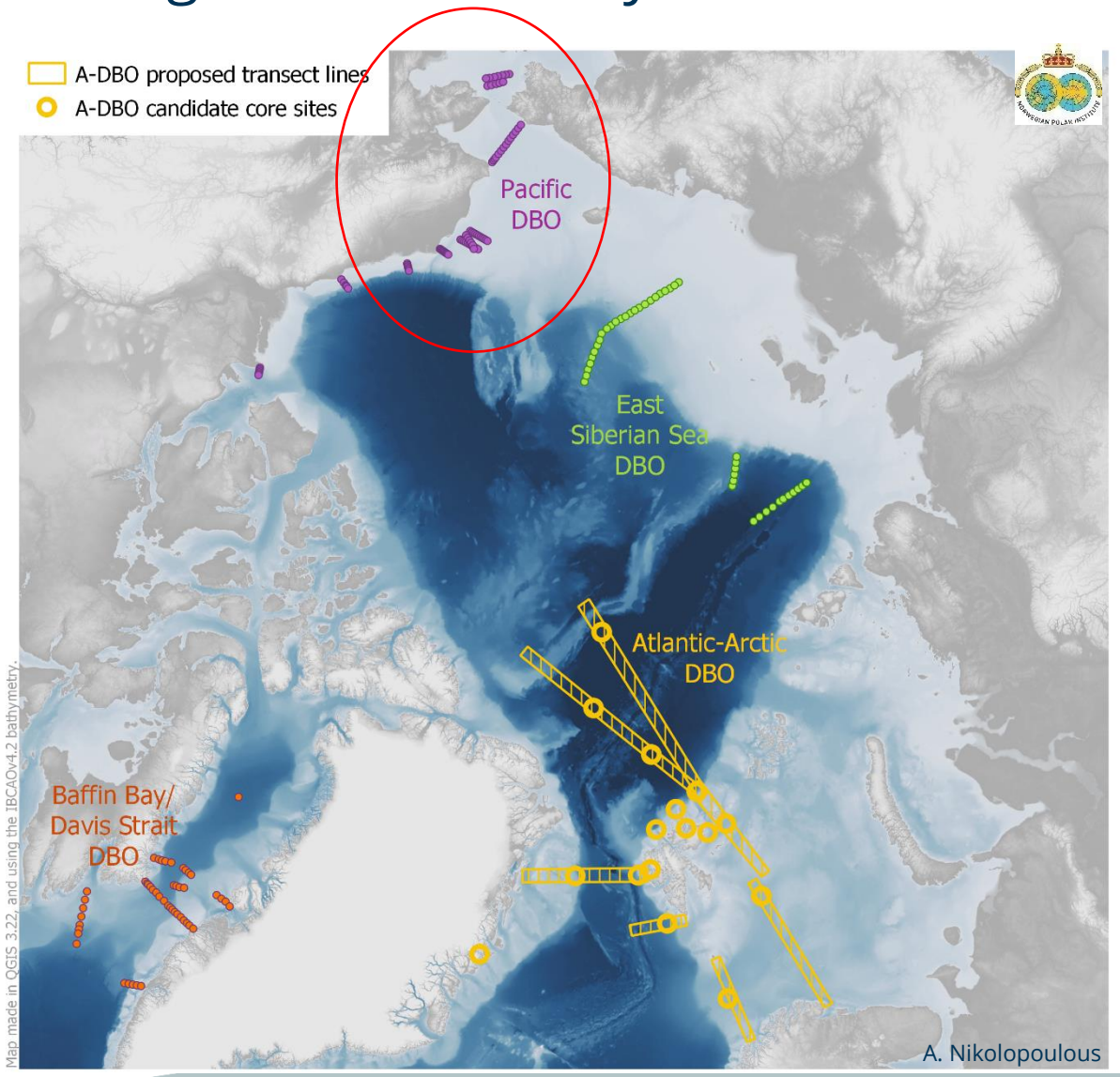



Snowchange

# The Atlantic-Arctic Distributed Biological Observatory A-DBO

-> a comprehensive marine observing system for climate and environment

- Identify key locations for collaborative monitoring and research
- Joint and open planning - better use and sharing of infrastructure
- Better and more open sharing of data, common protocols for data processing and handling
- Create win-win situations between institutions with long-term funding and mandates, and those working on project basis with more focused research objectives




Preliminary A-DBO map, to be further refined

# Areas of activity: what we do

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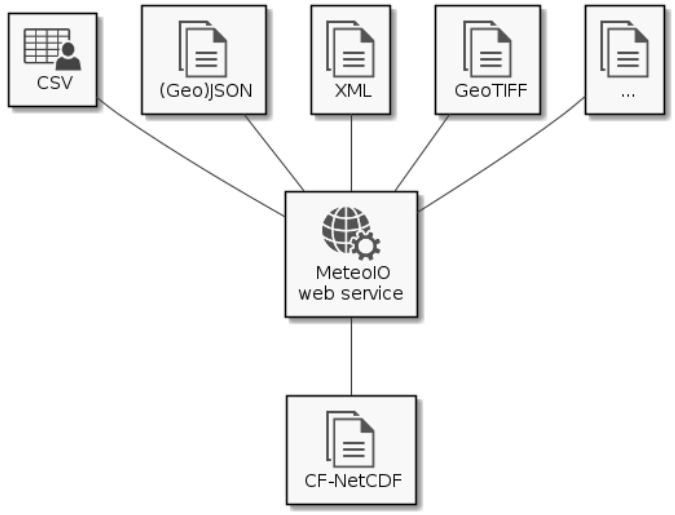
- Mapping the Polar Data
  - creation of maps and interactive visual representations of the underlying data.
  - currently > 81 aggregating data centres/catalogues
- Synthesis of the Arctic Data System
- Building of an Arctic Window of Copernicus (aligned with the ArcticHub)
- Transformation of data to standardized form
- FAIR Data and Service provision
- Long term data preservation



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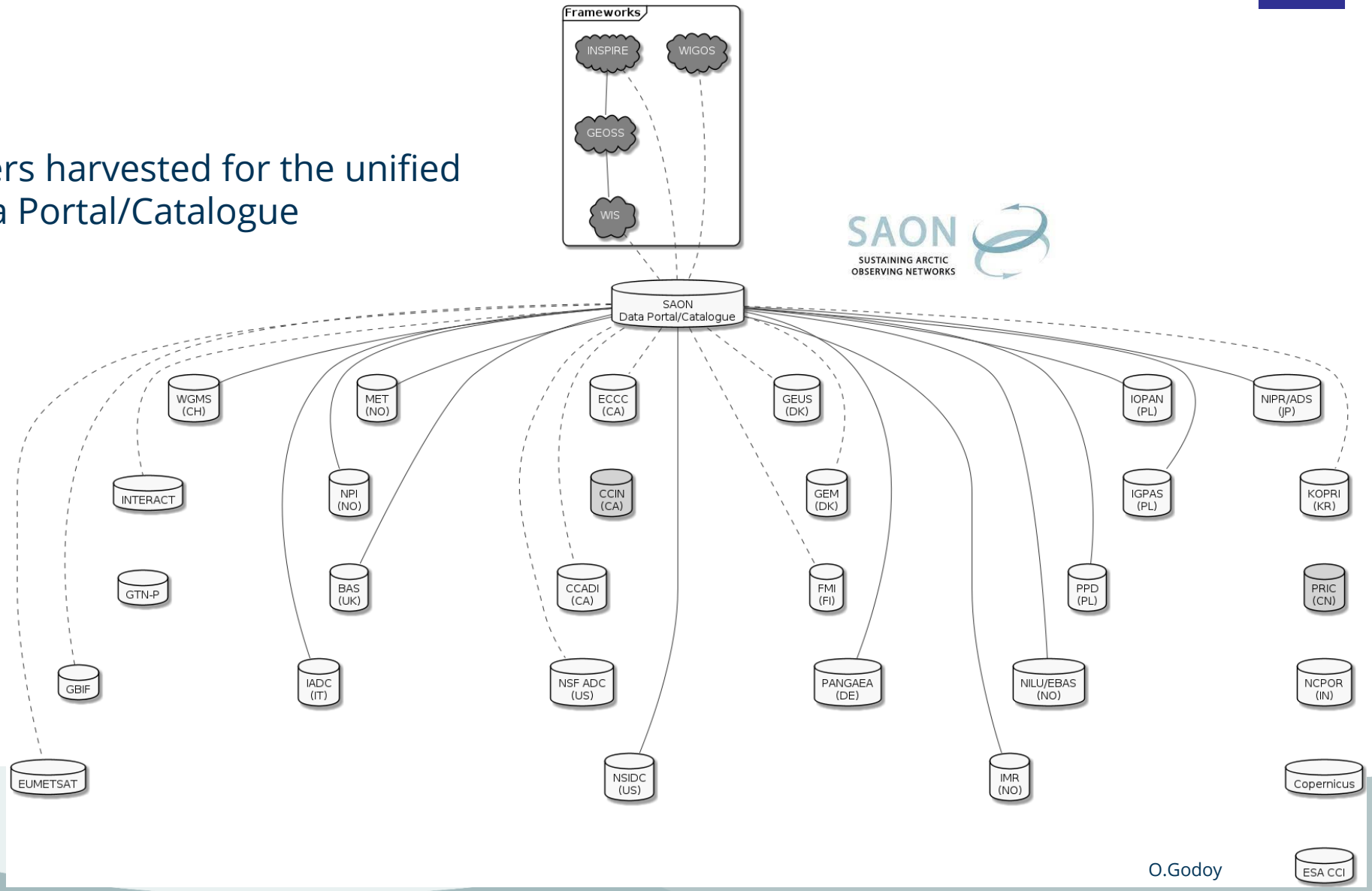
Norwegian Meteorological Institute

- Data centers harvested for the unified SAON Data Portal/Catalogue




O.Godoy

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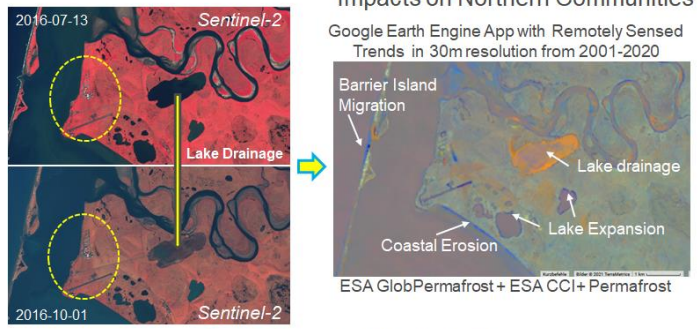
# Co-created Pilot Services to support emergency preparedness, food security, responses to climate and socio-economic changes

PS1: ‘Event Database of CBM Using Oral Histories, IK and LK’ (Snowchange)

Ph.: Snowchange

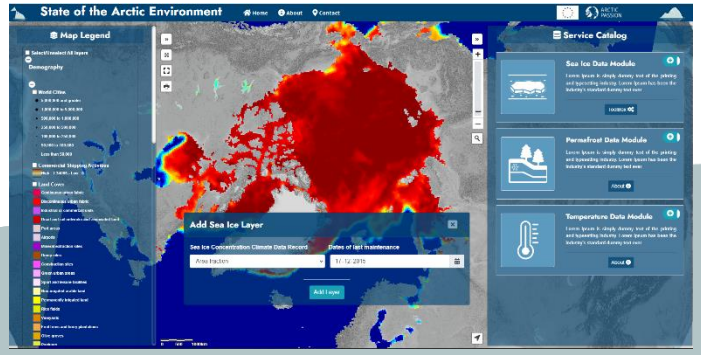
PS2: 'Pan-Arctic requirements-driven Permafrost’ (AWI)




G. Grosse & A.Irrgang, AWI

Village of Point Lay, Northern Alaska

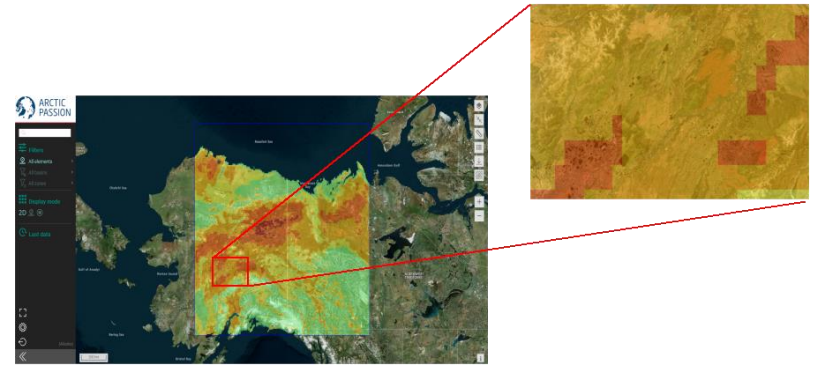
PS3: ‘State of the Arctic Environment’ (NPI)



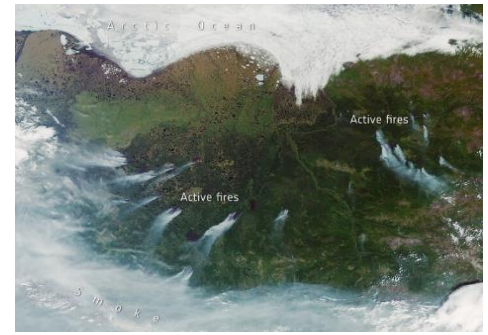

A. Sundfjord, NPI

# Co-created Pilot Services to support emergency preparedness, food security, responses to climate and socio-economic changes

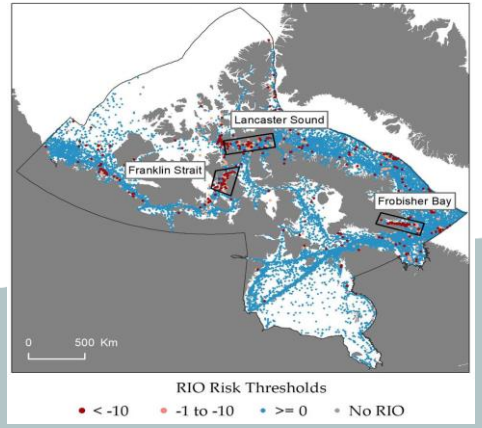
PS4: ‘Integrated Fire Risk Management - INFRA’ (CNR)



PS5: ‘Local Atmospheric Pollutant Forecast Service’ (JRC)




PS6: ‘Improving Safety for Shipping in the Polar Seas Service’ (BAS)



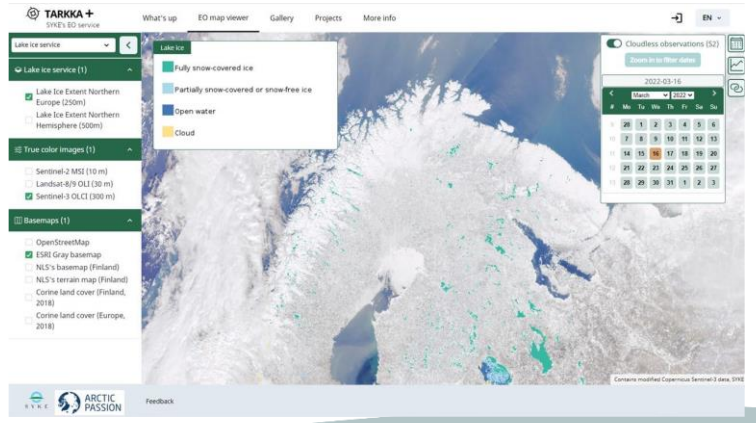

J. Dawson & A. Cook, U Ottawa

# Co-created Pilot Services to support emergency preparedness, food security, responses to climate and socio-economic changes

PS7: ‘CBM for Arctic marine climate change, noise pollution & impacts on marine living resources’ (GINR/DMI)

S. Olsen, DMI

PS8: 'Lake Ice Service for Arctic Climate and Safety’ (SYKE)




K. Heinila, SYKE

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# Shared Arctic Variables (SAVs)

Concept based on SAON ROADS and Arctic Observing Summit (AOS).

Sets of observables that help tackling local/regional problems (based on science, IK & LK)

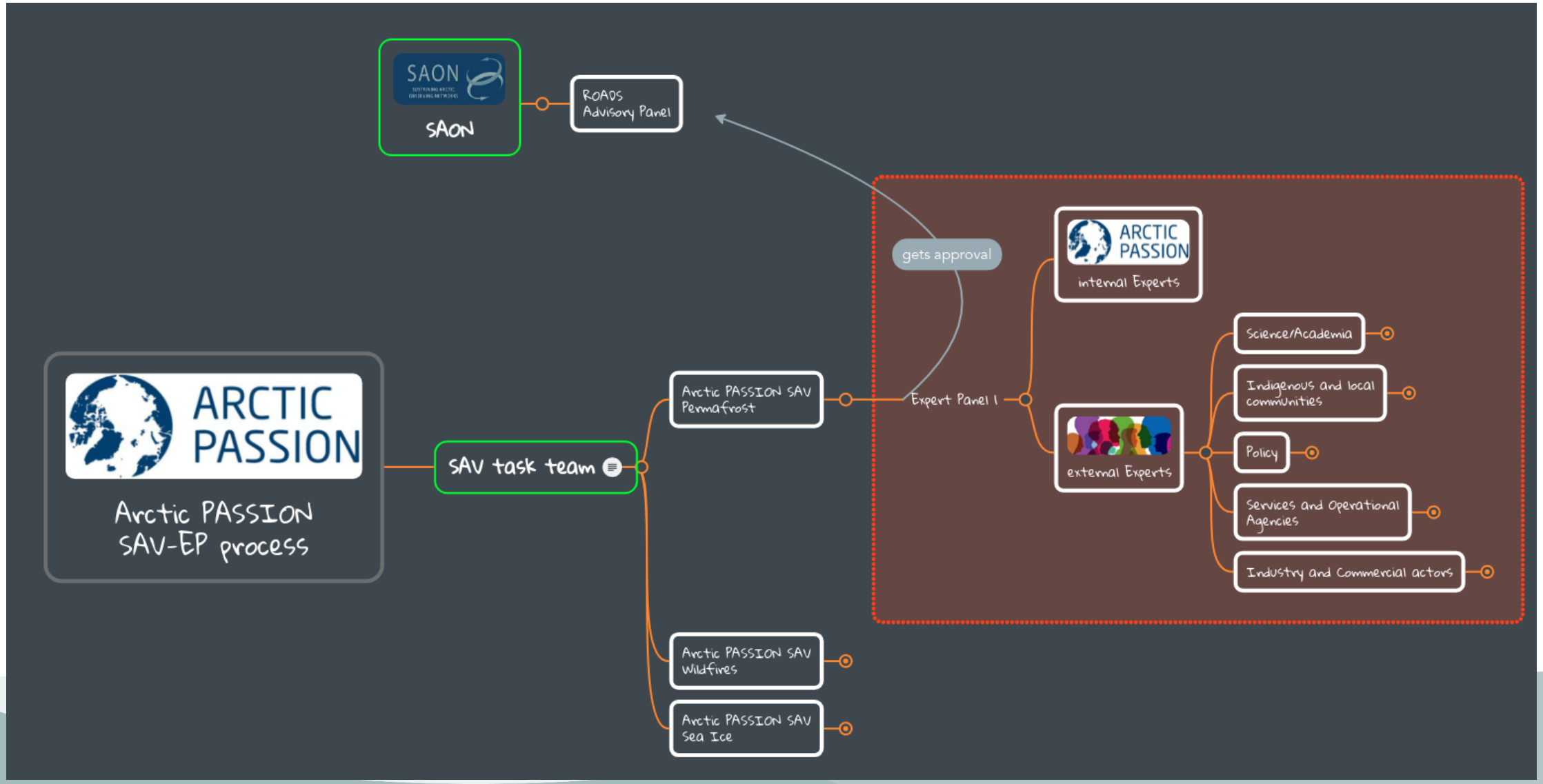
Arctic PASSION with Canadian partners and US RNA CoObs first projects to launch SAV processes



*Three SAV themes of relevance*

- *Permafrost (Living on frozen ground)*
- *Wildfires*
- *Sea Ice*

# SAV s in Arctic PASSION



# Legacy of SAVs

- The process of SAV identification (the sets of observables) for the three themes by the Expert Panels is meant to be finished during the project duration
- Expert Panels will contribute to identifying stewards for the SAVs
- The further development of the SAVs and our experiences with the SAV process will reach beyond the project
- Shared Arctic Variables can play a key role in guiding the development of a more useful Arctic observing system
- Shared Arctic Variables have the potential to empower Indigenous and local communities

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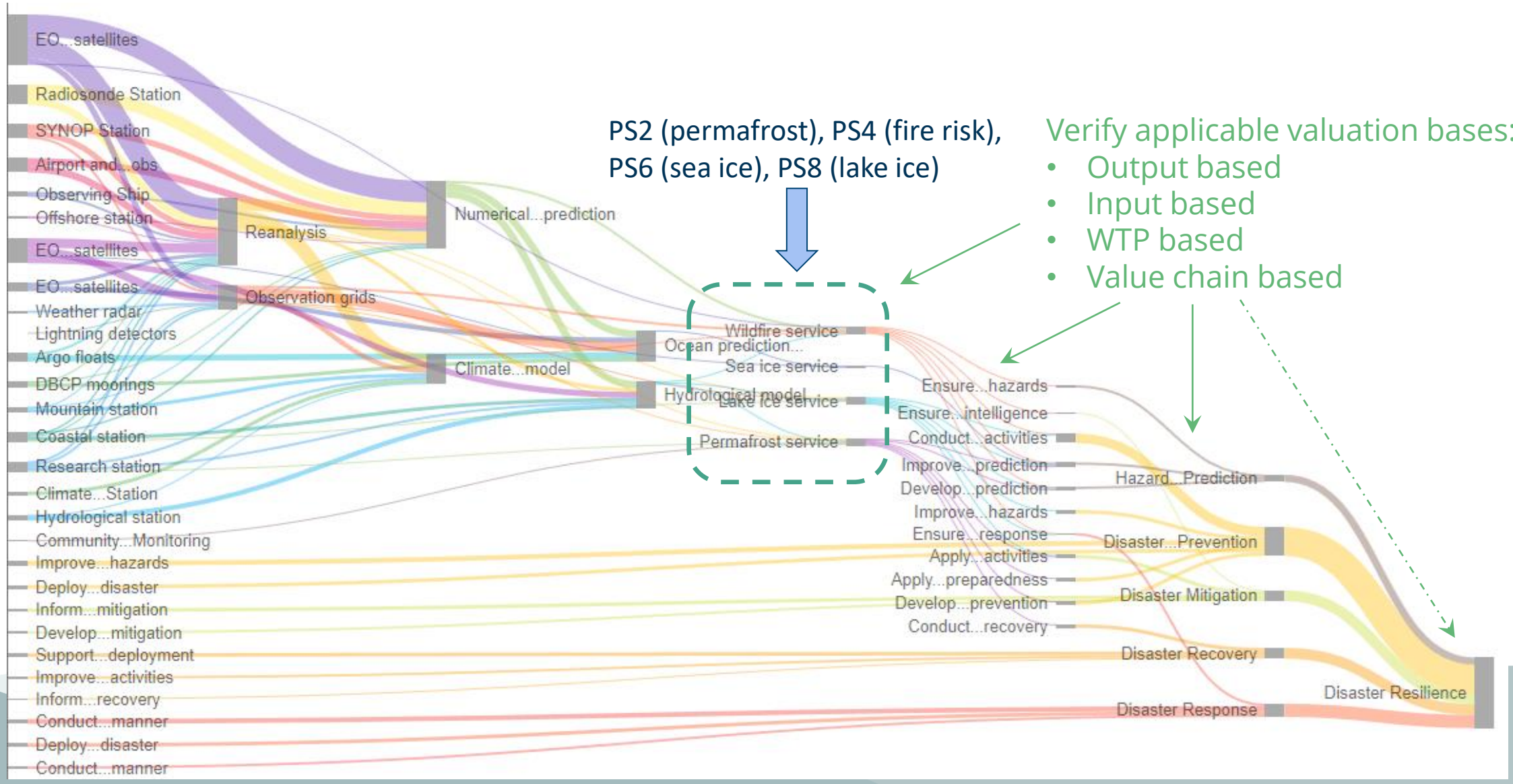
# Value Tree Analysis (VTA) as basis extend from cost attribution to value generation




PS2 (permafrost), PS4 (fire risk), PS6 (sea ice), PS8 (lake ice)

Verify applicable valuation bases:

- Output based
- Input based
- WTP based
- Value chain based

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# International collaboration

A key element of Arctic PASSION is international collaboration with other programmes and projects also beyond the projects of the EU-Polar Cluster and the ESA Polar Science Cluster, such as for example:

- ArcCs II (Japan)
- RNA-CoObs (USA)
- CCADI (Canada)
- K-AWARE (South Korea)
- NCPOR (India)

- SAON
- Arctic Council Working Groups
- Copernicus
- WMO
- …


JAMSTEC

NIPR

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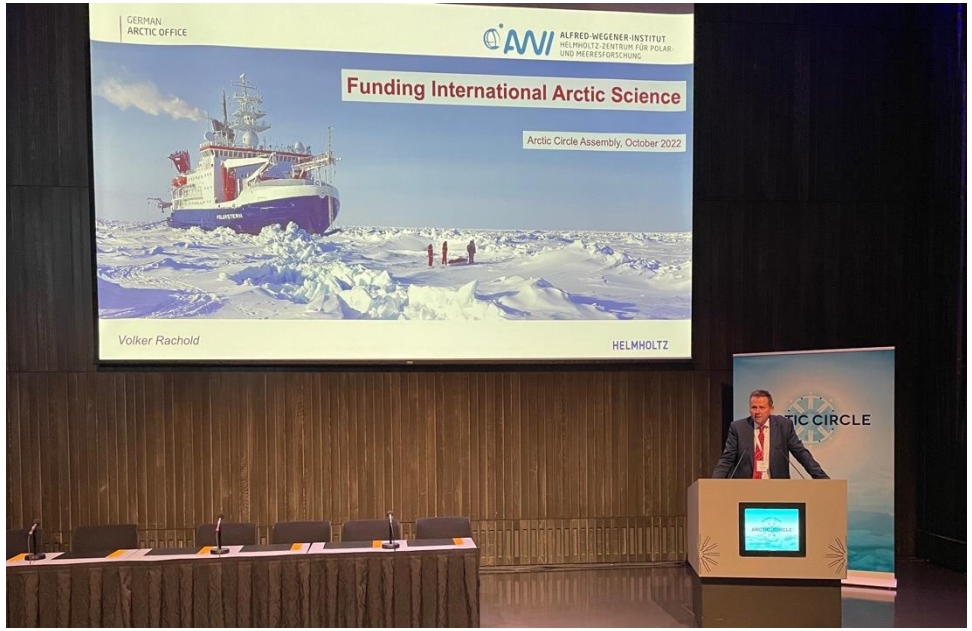
# Furthering the outcome of the Arctic Science Ministerial (ASM) meetings regarding sustained Arctic observations

Volker Rachold

ASM: Washington 2016
ASM2: Berlin 2018
ASM3: Tokyo 2021
ASM4: ~~France and Russia~~

Arctic Science Funders Forum (ASFF)

## Arctic Circle Assembly 2022




Grosfeld

- Breakout Session on International Funding
- Informal Meeting of the ASFF

## ISAR-7

### S21: Funding International Arctic Science

The session will address and discuss the need for stronger international coordination of Arctic science funding.

*Conveners:*

*Volker Rachold, Egill Thor Nielsson, Tetsuo Sueyoshi, Lindsay Arthur, Ágúst Hjörtur Ingþórsson*

March 8, 13:30-15:00 & 15:15-16:45

Venue 6 (NINJAL244)

# Consultations with decision-makers at the sub-national level

Alaska Centre for Climate Assessment and Policy;
City & Borough of Juneau;
Municipality of Anchorage

Environment and Climate Change Canada;
The Government of Yukon;
The Government of Northwest Territories;
The Government of Nunavut;
The Government of Newfoundland and Labrador;
Municipality of Yellowknife, NWT

Ministry for Agriculture, Self-Sufficiency,
Energy and Environment;
Avannaata Municipality

Ministry for the Environment and Natural Resources;
The Environment Agency of Iceland;
Westfjords Regional Development Office;
Municipality of Akureyri;
Municipality of Dalvik;
Municipality of Siglufjordur,
Municipality of Reykjavik (Greater Reykjavik Area)

Ministry of Local Government and Regional Development
Norwegian Centre for Climate Services
Troms and Finnmark County;
Tromsø Municipality;
Harstad Municipality;
Tana Municipality;
Vardø Municipality

County Administrative Board of Norrbotten;
Lulea Municipality

Regional Council of Lapland;
Lapland Centre for Economic Development,
Transport and the Environment;
Kuusamo Municipality
Kemi Municipality

P. Tkach/A.Stepien

Scoping Workshop:
"Data-driven subnational decision-making in the Arctic"

Policy Brief:
"Data-driven Subnational Decision-making in the Arctic Towards identifying the key issues"

# Integrating a Gender-Dimension into Arctic Observing Systems



- Gender central to human–environment relations
  - ➢ affects how individuals interact with the environment, observe change, and are involved in relevant local, regional, national and global decision-making bodies

(Pan-Arctic Report on Gender Equality in the Arctic 2021)

- Sex- and gender-disaggregated data rarely collected: gap in our understanding.
- Gender-dimension needed to account for internal diversity
- First systematic application of a gender lens into Arctic observing system elements:
  - ➢ Pilot Services as a start to tackle this dimension

# Synthesis

- Enhancing instrumentation and coordination
- Inclusion of different knowledge systems
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Co-create a coherent, integrated and sustainable pan-Arctic Observing System of Systems

# Recent overall development for a more integrated Arctic Observing System

- Improvements under way - Arctic PASSSION contributes to international efforts
  - Enhanced instrumentation and data interoperability
  - International coordination and planning: DBOs, INTERACT, Arctic GRA, SAON
  - Strengthened European contributions
  - Strengthened SAON SAVs concept has potential to empower local communities
  - Additional Services
  - Unique ‘Event Database of CBM and Indigenous Knowledge and Local knowledge’
  - Policy and decision-making support actions
  - Contributions to more inclusion

# Recent overall development for a more integrated Arctic Observing System

- Work to be done on the international level
  - transparent governance structure for Arctic observing system
  - Integration/collaboration of national observing projects and programmes
  - sustainable funding of observing system
  - equity from start on (funding for Indigenous and local inhabitants or representatives)
  - stronger inclusion of IK and LK in planning and implementation of Arctic Observing system, as well as decision making
  - communication channels so local & regional needs are heard at and involved in (future) observing system governance structure
  - more action needed to make observing system useful for all people (e.g. gender)
  - more holistic approach in Arctic Observing and inclusion of different knowledge systems
  - Overcome pausing of AC and its working groups as well as ASMs

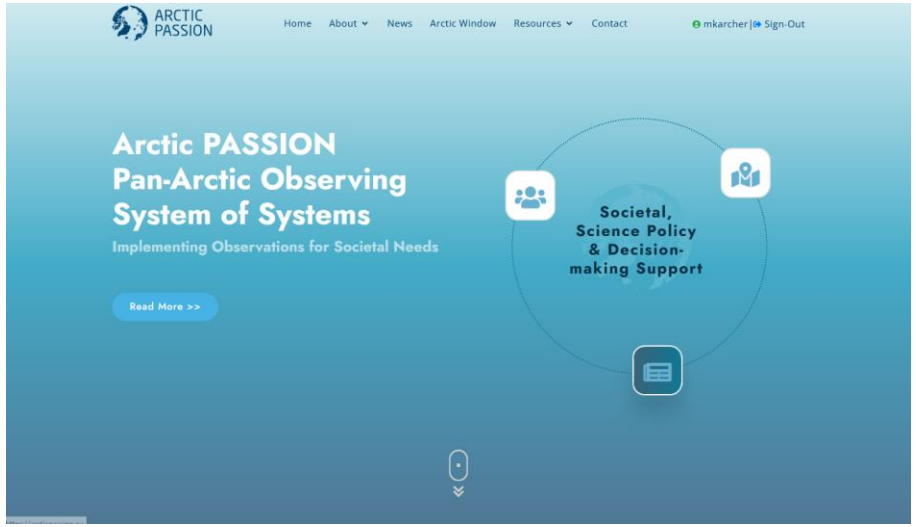
**13:30 – 16:45 8.3.23**
**(S4) Synoptic Arctic Survey – international collaboration for Arctic Ocean transdisciplinary studies**
Main convener: Shigeto Nishino;
Co-conveners: Carin Ashjian, Kumiko Azetsu-Scott, Kyoung-Ho Cho, Jacqueline Grebmeier, Jianfeng He, Motoyo Itoh, Sung-Ho Kang, Are Olsen, Øyvind Paasche, William Williams, Michiyo Yamamoto-Kawai

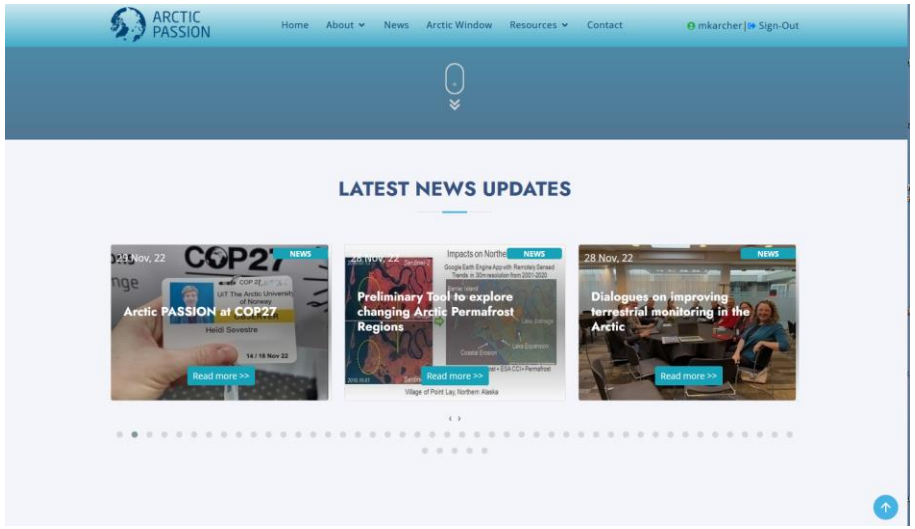
**13:30 – 16:45 8.3.23**
**(S21) Funding International Arctic Science**
Main convener: Volker Rachold;
Co-conveners: Egill Thor Nielsson, Tetsuo Sueyoshi, Lindsay Arthur, Ágúst Hjörtur Ingþórsson

**13:00 – 16:15 9.3.23**
**(S1) High-latitude Fires, Arctic Climate, Environment and health (HiFACE)**
Main convener: Adriana Ford;
Co-conveners: Stephen Arnold, Marianne Tronstad Lund, James Ford, Michael Karcher, Vito Vitale

# ARCTIC PASSION

Pan-Arctic Observing System of Systems: Implementing Observations for Societal Needs




Website:

www.arcticpassion.eu

If you want to collaborate, feel free to contact us!