International Conference for Research Infrastructures 2018

Parallel Theme 1: Internationalization of Research Infrastructures

Arctic Research Infrastructure: Multipurpose, International and Open Access

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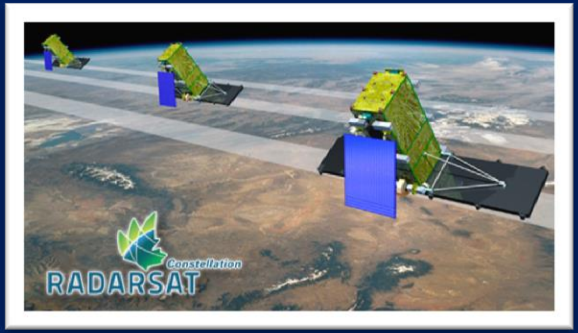
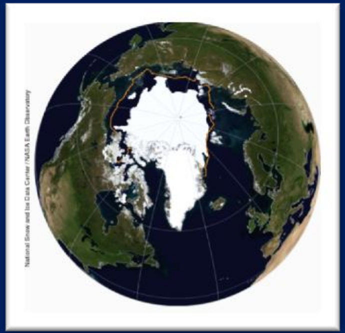
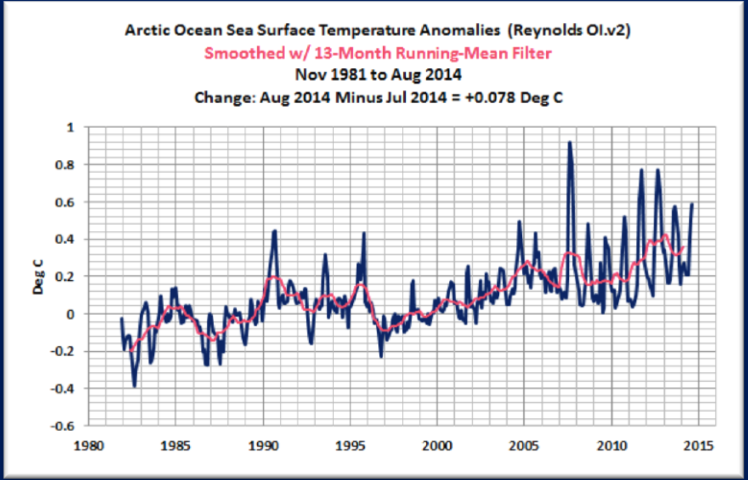
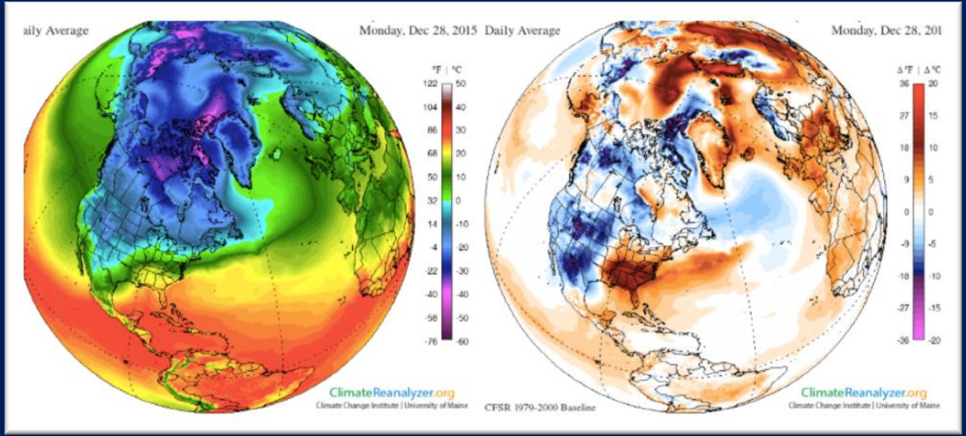
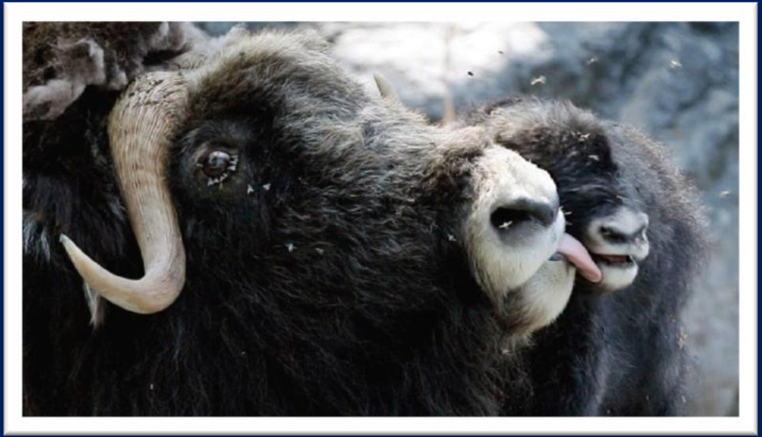


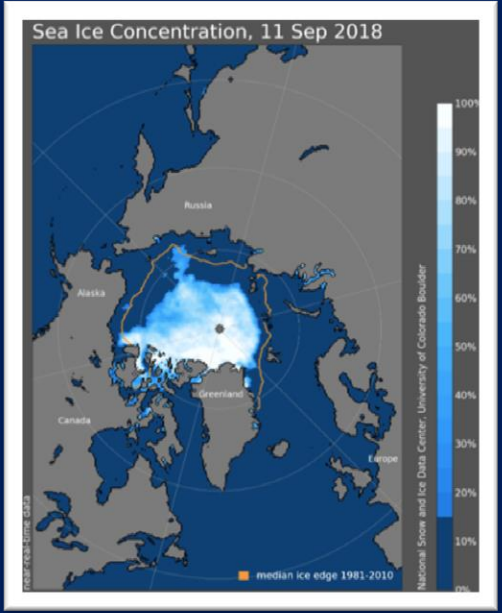


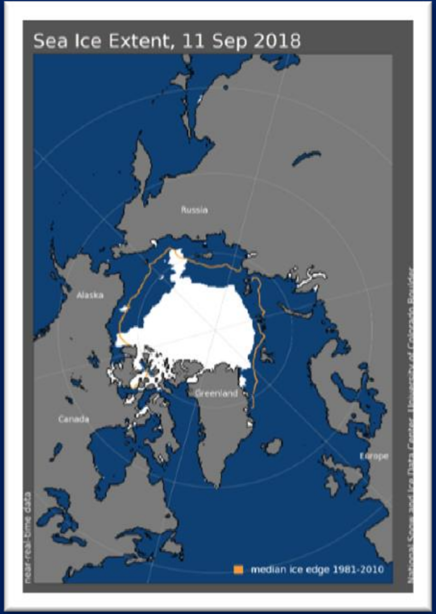
A Changing Arctic

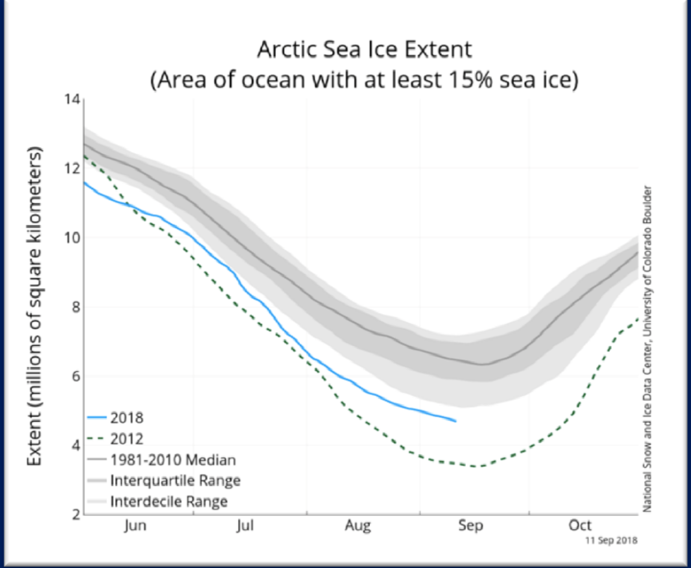


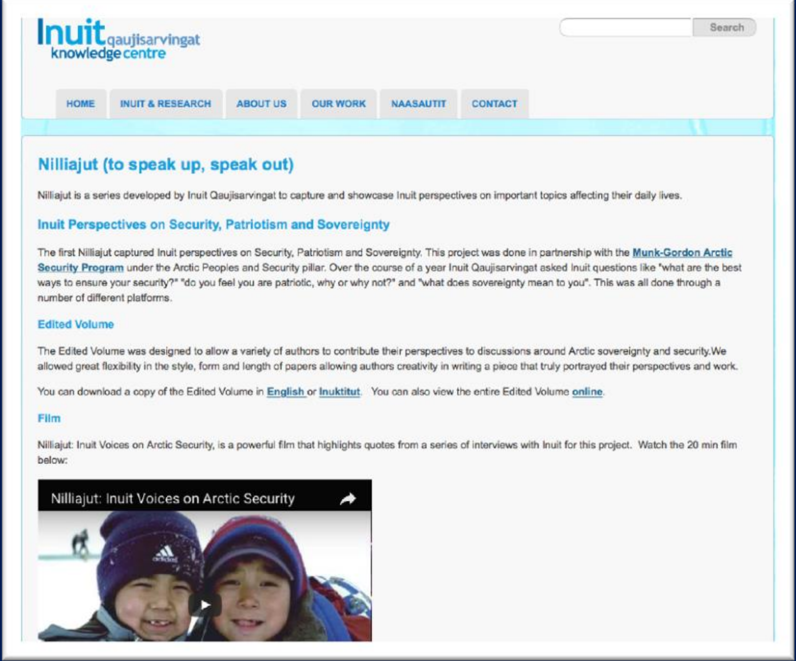












Existing Research Infrastructure (a few examples)

Network of northern research stations in Canada

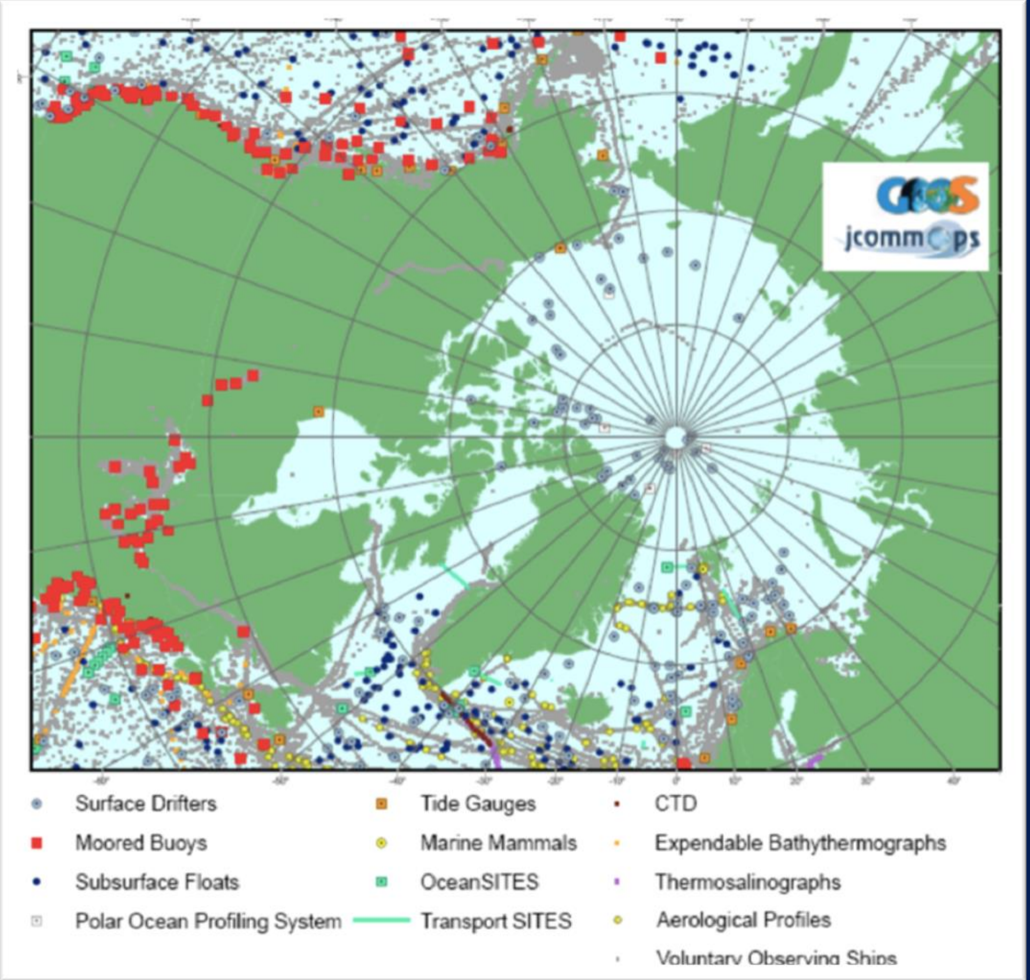
Research vessels with icebreaking capacity

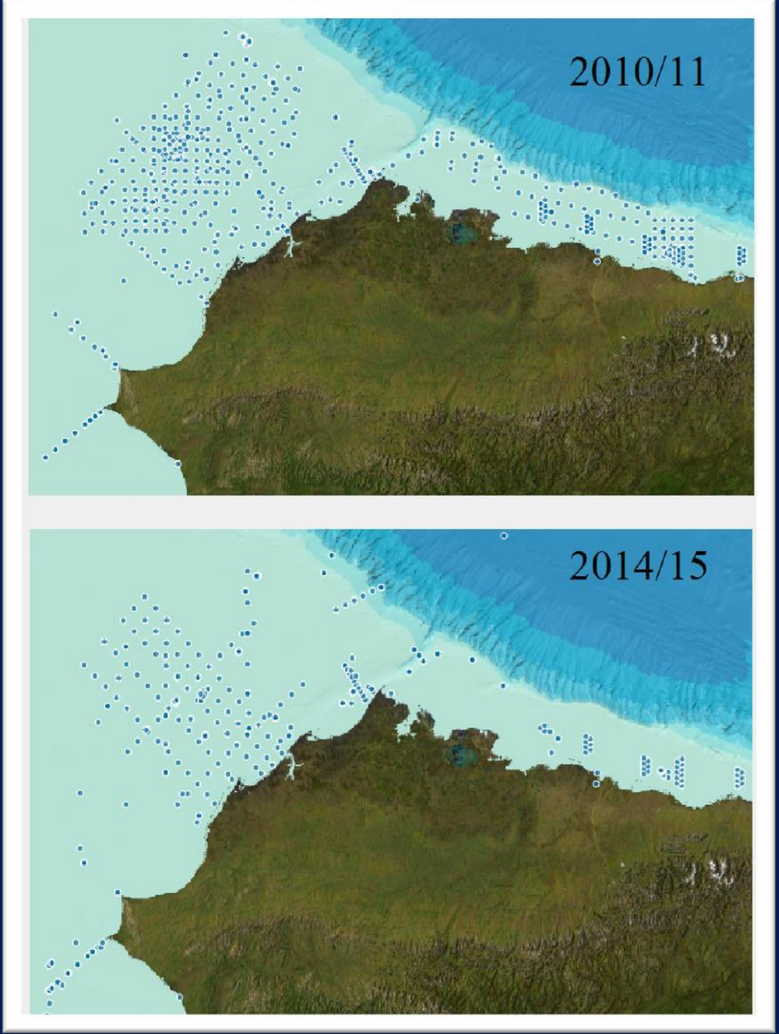
International Network for Terrestrial Research and Monitoring in the Arctic

Table 1. Major U.S. infrastructure (space-based, aircraft, ocean-based, field stations) needed to accomplish the five-year Arctic research plan. For each infrastructure element, its use, availability, and relevant sections of the plan are identified.

Infrastructure	Use	Availability	Section
Space-based *Existing satellite missions critical to Arctic research*			
NOAA satellite missions	Weather and key climate variables.	Available through 2017.	3.1–3.4
Defense Meteorological Satellite Program (DMSP)	Mapping sea ice with passive microwave.	Available through 2017.	3.1–3.4
NASA Earth Observing Satellites	Detailed studies of sea ice, clouds, and other Arctic parameters.	Many are past design life.	3.1–3.4
Joint Polar Satellite System (JPSS)	Next-generation weather satellite.	SUOMI-NPP has planned operational life to 2017; other satellites are in planning stages.	3.1–3.4
USGS Landsat-5 and -7	Agriculture, geology, forestry, regional planning, mapping, global change research, emergency response and disaster relief, education.	Landsat-5 launched in 1984 and still in operation, but data acquisition limited by an electronics problem. Landsat-7 launched in 1999 and still in operation. Minimum design life of 5 years.	3.1–3.4
SAR (Synthetic Aperture Radar)	Sea ice and glacier geophysics and mapping; Marine transportation support; Oceanography; Mapping—vegetation, geology, topography.	No U.S. SAR instruments available. Foreign SAR data (e.g., RADARSAT, TerraSAR-X, COSMO SkyMed) are available for purchase.	3.1–3.4
Satellites planned for launch by 2017			
USGS/NASA LandSat Data Continuity Mission (LDCM)	Agriculture, geology, forestry, regional planning, mapping, global change research, emergency response and disaster relief, education.	Launch in 2013.	3.1–3.4
NASA Global Precipitation Measurement (GPM)	Measure snowfall and heavy rain.	Launch in 2014; Limited footprint over polar regions.	3.3
NASA/DLR (Germany) Gravity Recovery and Climate Experiment (GRACE) follow-on	Arctic oceanography, changes in ice mass, terrestrial water storage.	Launch in 2017.	3.1–3.4
NASA Soil Moisture Active Passive (SMAP)	Soil moisture, freeze thaw patterns, and potentially sea-ice mapping.	Launch in 2015.	3.1–3.4
NASA ICESat 2	Altimetry over land and sea ice to measure changes in thickness.	Launch in 2016.	3.1–3.4

Gaps in Infrastructure





- Sustained observations in U.S. Maritime Arctic (Oct-Sep)
- Measurement sites driven by scientific, regulatory, logistic constraints
- Research, industry & regulators struggle with lack of sustained observations due to boom-bust cycles of resource development

Barriers to Cooperation

Capacity

Technology

Human

Limitations on Data Management

Cost

Scaling up from the project level

Coordination of Funding

Long-term operation and maintenance

Data management

Competition

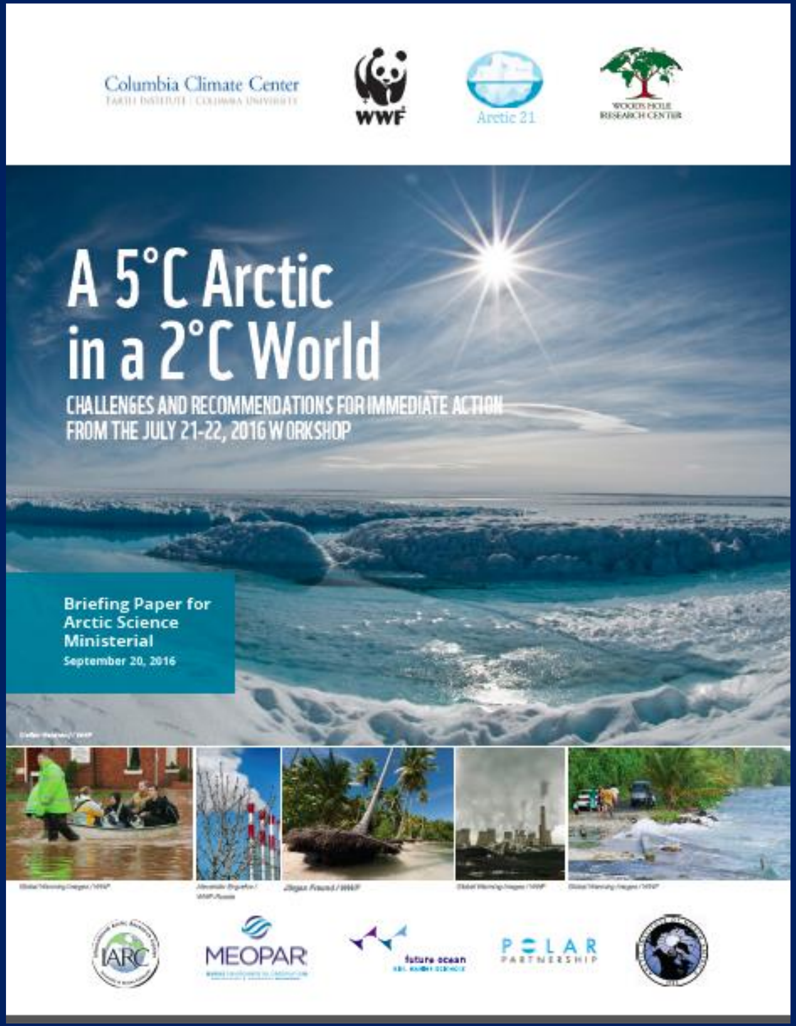
At the national level

At the International level

Current reward system and the need for distributed infrastructure

Wicked Problems

- What will the Arctic look like in 2ºC world?
- How will Arctic change impact the global community?
- How directly does Arctic change influence lower latitudes? In what ways?
- Is this Arctic change trajectory irreversible?
- Can we project future scenarios, interactions and feedbacks so as to improve decision making?
- What are Indigenous research priorities and how can we help to address these?



Meeting Expectations

- Research Commmunity
- Arctic Council
  - Scientific Cooperation
  - Search and Rescue
  - Open and Interoperable Data
- Arctic Indigenous people
  - Adaptation and desired futures
  - Protection and mobilization of Indigenous Knowledge
- Operational Agencies
- Private Sector
- Global Community
  - Adaptation and desired futures

Scientific Cooperation Agreement enters into force

23 May 2018 Last Updated: 21 June 2018

Swedish research icebreaker "Oden"

The Arctic Council marks a special occasion on 23 May 2018 as the "Agreement on Enhancing International Arctic Scientific Cooperation," signed in May 2017, enters into force.

In 2013, the Arctic Council announced that it would begin work towards an arrangement on improved scientific research cooperation. At that time, it was not a foregone conclusion that this work would lead to the third binding agreement negotiated under the auspices of the Arctic Council; that step was taken at the ninth Arctic Council Ministerial meeting in Iqaluit, Canada in 2015.

During the U.S. Chairmanship of 2015-2017, discussions and negotiations on the developing agreement were co-led by the Russian Federation and the United States, and the final "Agreement on Enhancing International Arctic Scientific Cooperation" was signed by Ministers of the eight Arctic States on 11 May 2017 in Fairbanks, Alaska.

The Agreement enters into force today, 23 May 2018, an occasion that is being celebrated at an event in Ilulissat, Greenland. This means that the Agreement's provisions now have legal force, and will begin to provide concrete support for Arctic scientific activities by, for example, facilitating access to research areas for marine and airborne data collection, supporting full and open access to scientific data, and promoting education and career development for students and early career scientists.

During the Arctic Summer Cloud Ocean Study (ASCOS) a tethered balloon was used to continuously lift a sensor package in the atmosphere between the surface and about 1 km altitude near N87deg, north of the Fram Strait. Photo: M. Tjernström

Solutions: Arctic Observing System

Research Infrastructure must be:

- **Distributed and integrated** one allowing for merging of data streams
- **focused** around central science questions and societal needs
- **relevant** to people's lives, decision making and policy
- **connected** with global observing systems

Observing System Design:

- is **critical**
- the system should be **responsive** to arctic system change
- responsive to needs for improved **understanding** and **adaptation** to and **mitigation** of change.

(from: ISAC Science Plan 2010)

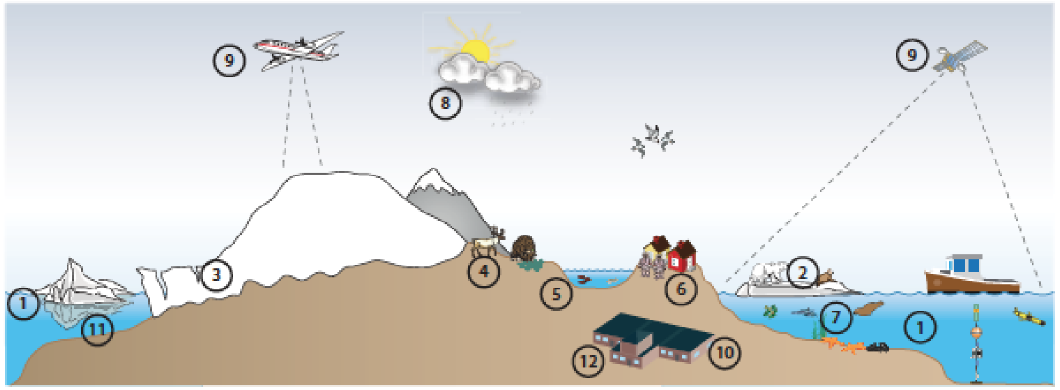


Figure 1. Conceptual model for core monitoring components in the different subprograms across BBOS. It will comprise field stations, vessels, extensive field instrumentation and community-based technologies. BBOS is an integrated baywide environmental observation system, that will enable a sustained year round, near real-time observation of the atmosphere, ice, land and ocean at the scale of an entire ocean basin (Baffin Bay). More information is provided in appendix.

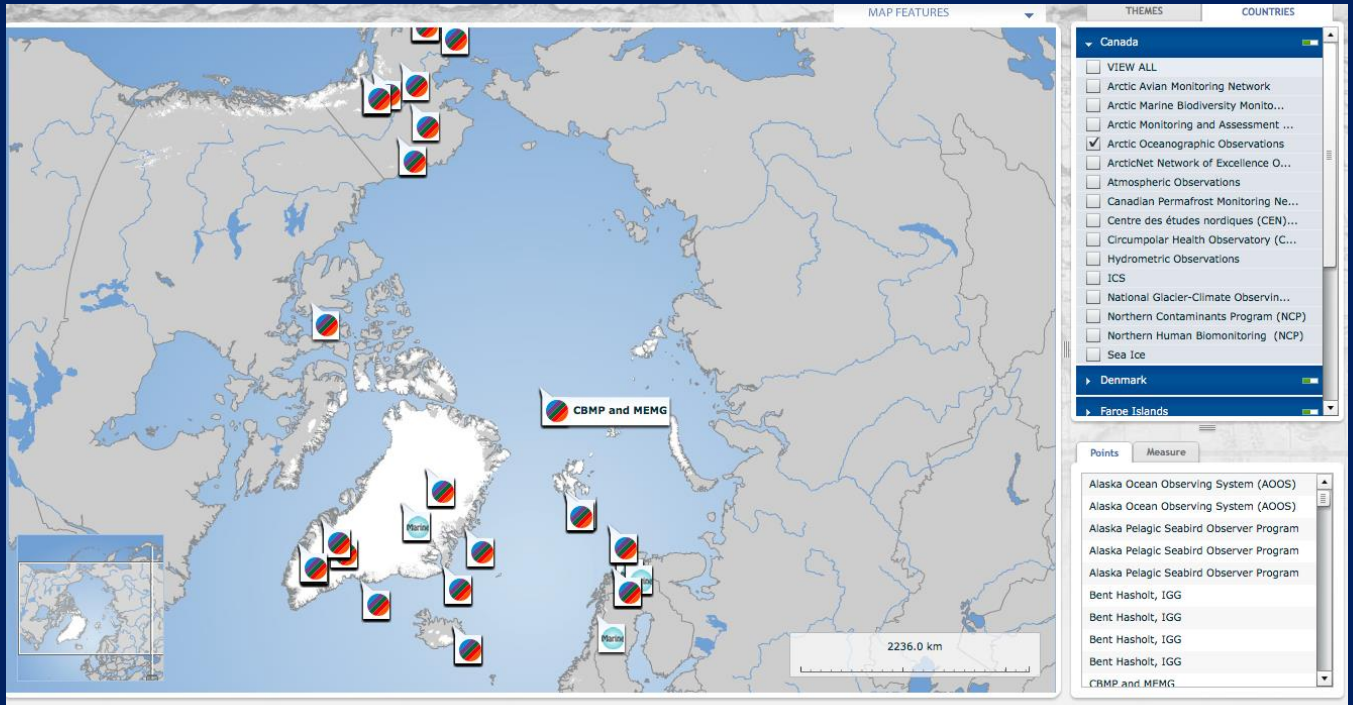
Where are we now?

Components of Arctic Observing system are being implemented (one decade+)

Integration of components into a coherent observing system is underway

Focus has to shift to operationalization of observing system and long-term sustainability

Transformation from pure research observing system to system that also serves others needs (operational, policy, sustainable dev. goals) has to be completed



The Business Case for a Pan-Arctic Observing System
www.arcticobserving.org
Arctic Observing Summit 2018, Davos

- Need
  - Societal Benefits (short, medium, and long-term perspectives)
- Implementing and Optimizing the System
  - Funding and support models: public/private partnerships
  - Technologies and platforms
  - Data management
- Operating Systems and Networks
  - Success stories
  - Use of data and information
  - Data management in support of public/private interests
  - Technology in support of public/private interests
  - Entrepreneurship and sustained observations