

Arctic Observing and Monitoring

Current Programs and Future Needs

26th Annual Summit
Pacific North West Economic Region
17-21 July, 2016

Maribeth S. Murray,
Arctic Institute of North America
University of Calgary





THE ARCTIC OBSERVING SUMMIT 2013-2016

Progress Towards an Integrated, Multipurpose, International Arctic Observing System



The biennial **Arctic Observing Summit (AOS)** is a Sustaining Arctic Observing Systems (SAON) task. SAON is an Arctic Council Initiative. The AOS is coordinated by the International Study of Arctic Change, (ISAC Program Office, the ISAC Science Steering Group and ISAC partners).

A Pan-Arctic Observing System must be:

- **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

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.

The AOS must be **connected** with global observing systems.

(from: ISAC Science Plan 2010)



ISAC Components

Observing, Understanding, and Responding to Arctic Change

Arctic change is a matter of urgency. As laid out in the previous chapters, the ISAC science program requires strong observing, understanding and responding to change components in order to meet its objectives. The speed of change and the rapid evolution of our knowledge of how changes are materialized and how they interact require a flexible approach. Flexibility will

ensure continued acquisition of the necessary scientific data and will ensure that these data are effectively translated into information that is useful for meeting the scientific and societal challenges of arctic change. The individual components of ISAC are described below along with ways for using the results from different activities within ISAC to inform one another.



Figure 18. Wavy-cliff near the Verandei oil terminal, Perchona Sea (Ogrodov 2005).

Pan-Arctic Observing System

Critical to achieving ISAC objectives is the documentation of arctic change at multiple spatial and temporal scales, and across all system components. This is too large a task for any one nation and therefore requires a multinational commitment to long-term, multi-disciplinary, system-scale observing programs to record past, present, and future changes. These observing programs must be sustained to establish meaningful time series, and they must be flexible enough to respond to changing scientific requirements, new insights and shifting theoretical, methodological, and political frameworks. They must be integrated into an international, pan-Arctic Observing System that will build upon and grow from efforts initiated prior to and in the context of the International Polar Year (NRC 2006). Examples of such initiatives include the recent European Union Sixth Framework Integrative Project "Developing Arctic Modeling and Observing Capabilities for Long-Term Environmental Studies" (DAMOCLES),

the U.S. interagency Study of Environmental Arctic Change (SEARCH) Program. Other related arctic observing efforts are those of the Arctic Net Networks of Centres of Excellence Canada, the Japan Agency for Marine-Earth Science and Technology (JAMSTEC), the Russian-American Long-Term Census of the Arctic (RUSALCA), and some of the activities of the International Union for Circumpolar Health (IUCH) to note just a few. Such existing platforms and programs form a solid foundation for collection of the observations required for ISAC. Over the long-term, the design of the Arctic Observing Systems should ultimately draw on the data generated through it, as well as from modeling activities and the needs for responding to change.

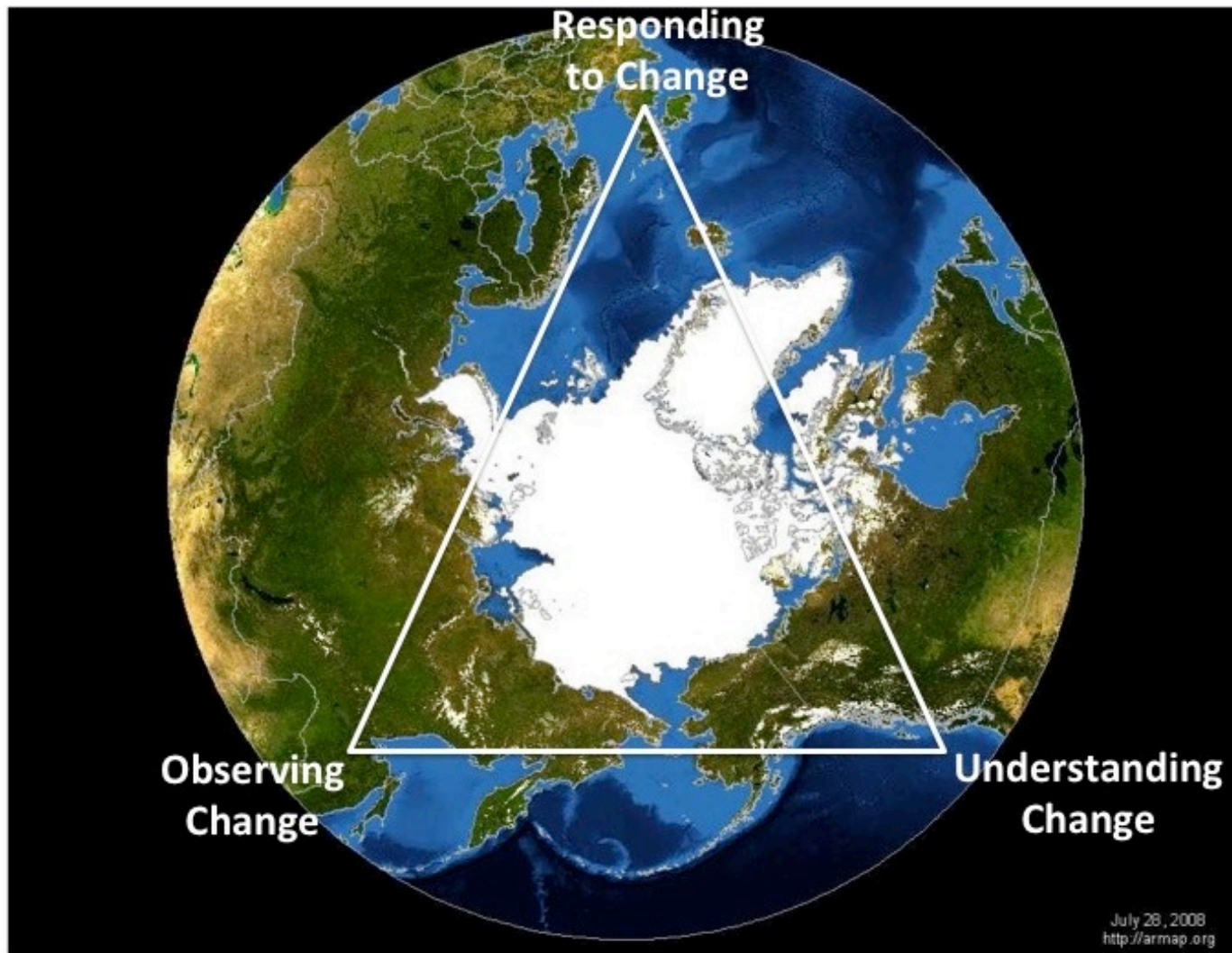
New efforts to enhance already existing observation activities and infrastructure that form the basis for the Arctic Observing System must be relevant to addressing ISAC questions

about system-level arctic change. Such enhancements should focus on current gaps. There is a particular need for:

- better spatial coverage of the terrestrial sphere,
- improved efforts on the subarctic seasonal ice zones,
- more information on the marine biological system, including higher trophic levels,
- hypothesis targeted monitoring of biodiversity and ecosystem resilience
- focused efforts on paleodata collection,
- data collection for studies of the human dynamics relevant to arctic environmental change.

International collaboration in synthesis activities indicates that there are also gaps in observations of the atmospheric boundary-layer characteristics (SEARCH 2008), and of the broader features of the vertical structure of the atmosphere. Other observation needs with immediate global relevance include increased information on ice sheets, freshwater input to the Arctic

Observing, Understanding, Responding



Implementing an Observing System

Observing Change:

An international, integrated, comprehensive, and sustained arctic observing system responsive to scientific and societal needs for information on arctic change.

Understanding Change

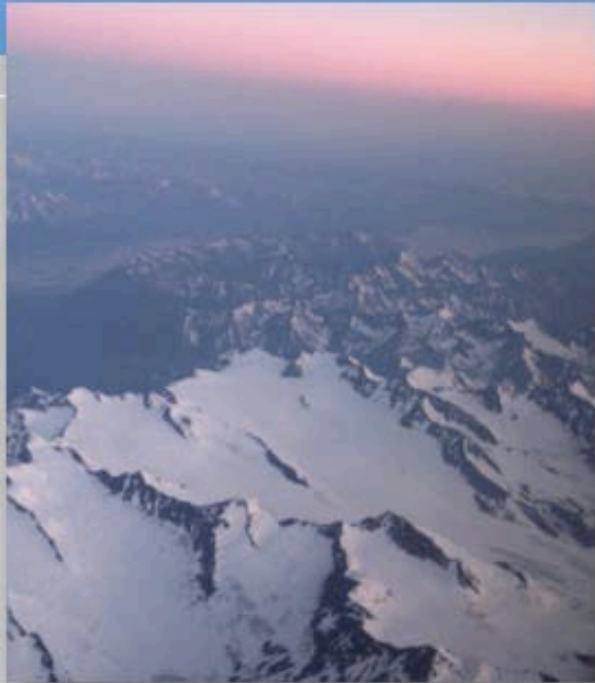
To improve projections of the arctic system and identify emerging issues.

Responding to Change

Developing and communicating science for problem solving, managing, and adapting to future arctic changes.

ARCTIC OBSERVING SUMMIT 2013 AND 2014

REPORT ON SUMMIT ACTIVITIES AND RECOMMENDATIONS



International Study of Arctic Change
International Program Office
Arctic Institute of North America
University of Calgary



Arctic Observing Summit 2013-2014

The 2013 and 2014 Arctic Observing Summits: A Sustaining Arctic Observing Networks Task led by the International Study of Arctic Change in partnership with:

International Arctic Science Committee (IASC)

Sustaining Arctic Observing Networks (SAON)

Study of Environmental Arctic Change (SEARCH)

ArcticNet Network of Centres of Excellence

World Meteorological Organization (WMO)

International Arctic Research Centre, University of Alaska Fairbanks (IARC)

Arctic Institute of North America, University of Calgary (AINA, Canada)

Finnish Meteorological Institute (FMI)

Swedish Polar Research Secretariat (SPRS)

Inuit Circumpolar Council, Canada (ICC Canada)

Arctic Climate Change, Economy and Society (ACCESS)

International Network for Terrestrial Research and Monitoring (INTERACT)

European Environment Agency (EEA)

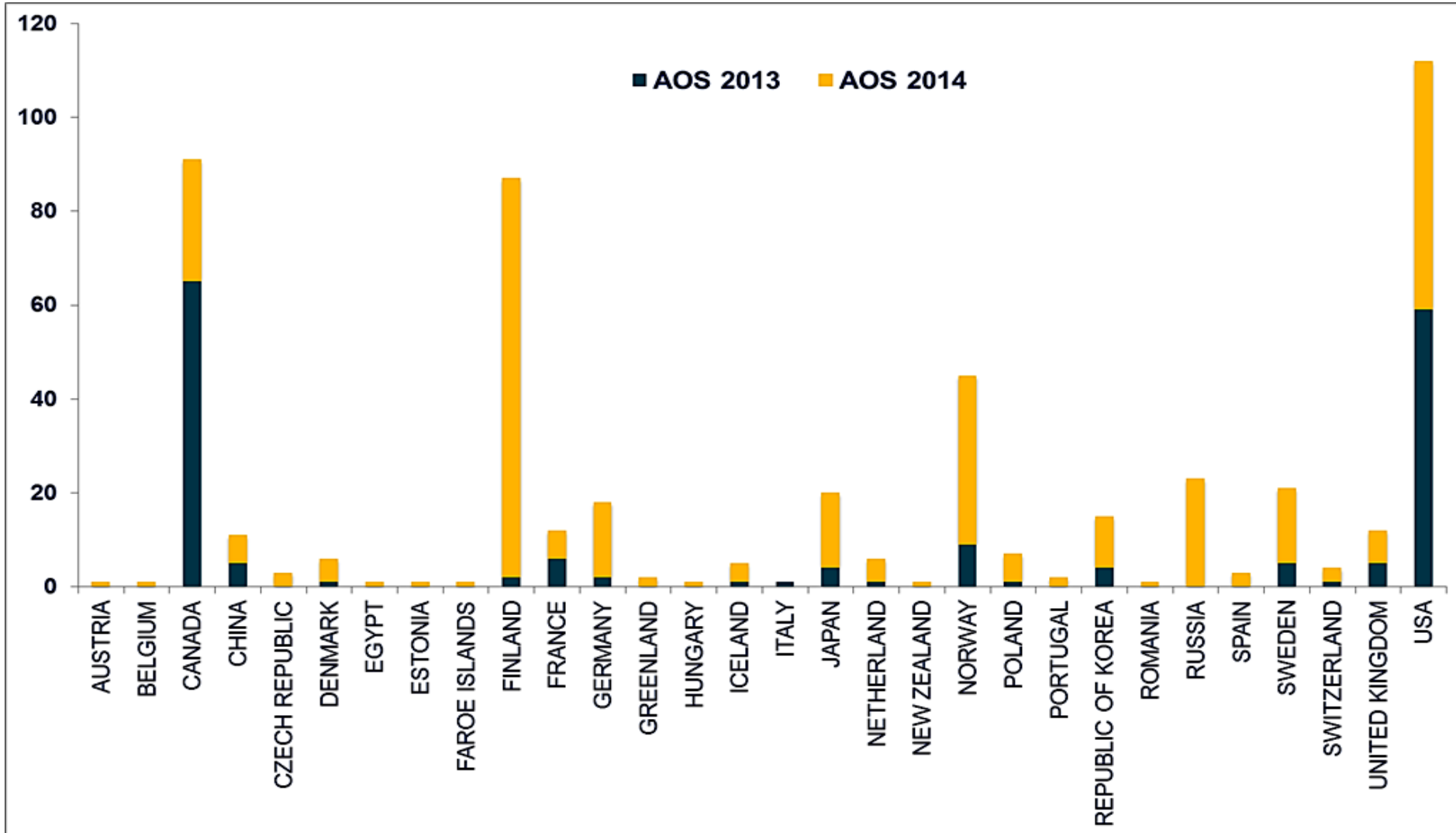
Snowchange Cooperative

National Institute for Polar Research, Japan (NIPR)

International Participation



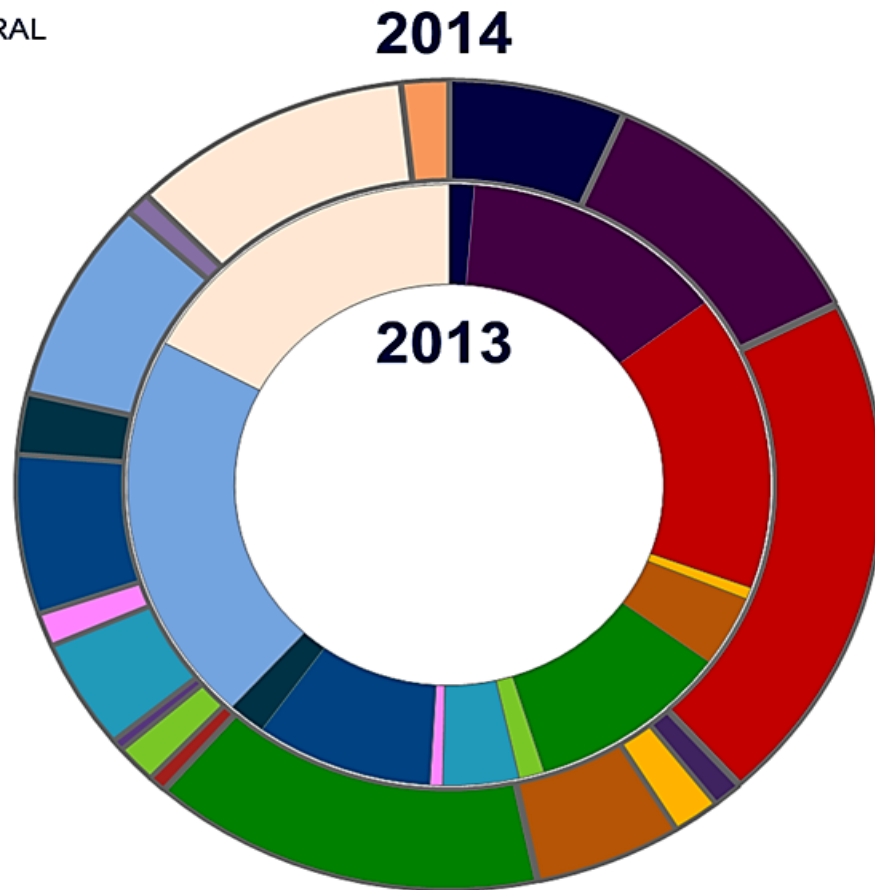
2013 – 172 participants, 17b countries, 2014 – 342 participants, 29 countries



Disciplinary Expertise

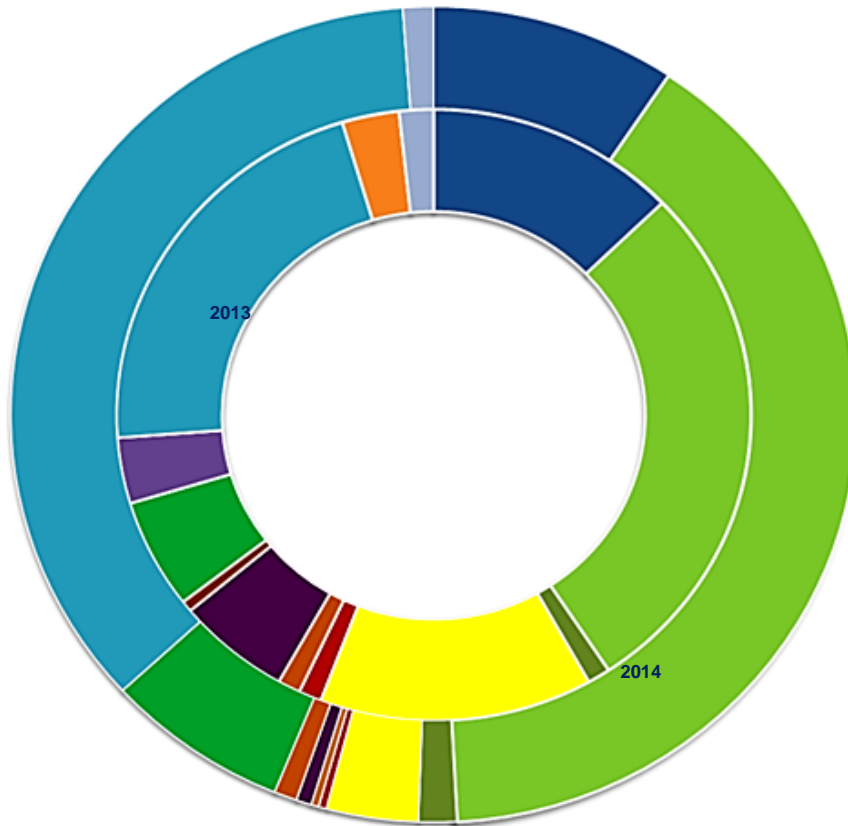


- POLICY, INTERNATIONAL DEVELOPMENT & ADMINISTRATION
- ARCTIC AND ANTARCTIC RESEARCH - GENERAL
- CLIMATE & ATMOSPHERIC RESEARCH
- COMMUNICATIONS (INCL. JOURNALISM)
- COMPUTER SCIENCE - DATA & MODELING
- EARTH SCIENCES
- ECOLOGY
- ECONOMICS
- EDUCATION & OUTREACH
- ENGINEERING
- ENVIRONMENTAL SCIENCES & HYDROLOGY
- HEALTH
- ICE DYNAMICS
- INDUSTRY, TOURISM & RESOURCES
- MARINE SCIENCE
- NATURAL SCIENCES (OTHER)
- ANTHROPOLOGY & SOCIAL SCIENCES
- GEOGRAPHY & SPACE SCIENCES (INCL. GIS, RS)





Organizations Represented



- EDUCATIONAL INSTITUTE: RESEARCH GROUP/CENTRE
- EDUCATIONAL INSTITUTE: UNIVERSITY/COLLEGE
- FUNDING BODIES
- GOVERNMENT: FEDERAL/NATIONAL
- GOVERNMENT: PROVINCIAL OR REGIONAL
- INDIGENOUS: INTERNATIONAL REPRESENTATIVE
- INDIGENOUS: LOCAL OR REGIONAL REPRESENTATIVE
- MUSEUM
- ORGANIZATION: GOVERNMENT AGENCY
- ORGANIZATION: INTERNATIONAL
- ORGANIZATION: NON-GOVERNMENT/NON-PROFIT
- PRIVATE SECTOR: CONSULTANT
- PRIVATE SECTOR: BUSINESS/INDUSTRY

AOS Themes 2013/2014



AOS 2013 THEMES - Vancouver

1. State of the current observing system
2. System design and coordination
3. Stakeholder needs and perspectives
4. Coordination, support, sustainability, operation

AOS 2014 THEMES - Helsinki

1. Stakeholder engagement
2. Coordination
3. Technology and innovation
4. Remote sensing solutions
5. Data management, accessibility, and interoperability



Results

1. Whitepapers prepared for the AOS 2013 are published as a special issue of *Arctic*
2. Progress identifying Arctic observing needs and capacities, and priority areas for future attention.
1. Progress toward international consensus on coordination including a collaborative, international funding mechanism.
2. AOS 2016

The AOS illustrates that circumpolar nations, as well as non-Arctic countries, are ready and willing participants to contribute to a sustained, coordinated Arctic observing system.



ARCTIC COUNCIL



Overarching Recommendations 2013



- **Improved cross-sectoral and collaborative approaches to the collection and maintenance of data.**
- **Creation of a stakeholder advisory group to provide advice on observational needs.**
- **Better utilization, development and adoption of modern technology for Observing System Design**

Combined Recommendations 2013-14 (100+)



- Create and support a body to **coordinate cyber-infrastructure**.
- Improve **interoperability** among systems and projects.
- Improve **international site accessibility** and data collection.
- Ensure pan-Arctic **coverage and continuity** of programs; improve coverage of the Eurasian sector.
- Improve the **diversity** of participants and develop **inventory** of CBM programs.
- **Link efforts**, standards, methods, variables and indicators in use (e.g. Arctic Council, SAON, GEOSS, WMO, GCW, etc.).
- **Engage stakeholders** at all stages, from assessing needs to creation of solutions-based, useful products.
- Incorporate **technology** for real-time data capture and accessibility; invest in data rescue and baselines.



AOS 2016 - Participation

- 30 Countries
- 417 Participants
- Indigenous Organizations
- Universities
- Research Institutions
- Indigenous Organizations
- Non-profit
- Local, Regional, National Government Organizations
- Funding Agencies
- Private Sector
- International NGOs
- Intergovernmental Organizations

2016 Summit Statement



1. Develop international principles and protocols that establish ethical guidelines for research, for the involvement of Arctic Indigenous Knowledge holders, for the use of Indigenous Knowledge and the co-production of knowledge.
2. Propose to the highest levels of government, the business case for a comprehensive pan-Arctic observing system.
3. Create opportunities for stakeholder engagement as a critical component of an effective pan-Arctic observing system.
4. Coordinate implementation of a pan-Arctic observing system with regional and global observing initiatives, and organize efforts in securing resources for its sustained operation through the leadership SAON initiative.
5. Advance a strategy for international funding. Implementation requires coordination of funding efforts to support a globally connected and internationally accessible network.
6. Prioritize, on an ongoing basis, observations that should be started and maintained over the long-term by operational and other relevant agencies.
7. Develop a broad, globally connected Arctic observing data and information system of systems that is based on open access data and standards.



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 stakeholder needs has to be completed.**
- **Increased coordination among Indigenous, research, operational and private sector entities.**

Partners and Support for AOS Activities

www.arcticobservingsummit.org



European Environment Agency



ACCESS Arctic Climate Change Economy and Society



Arctic Institute of North America