



ARCTIC OBSERVING SUMMIT

Report on the AOS 2014
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THE ARCTIC OBSERVING SUMMIT 2014

Background

The AOS is a biennial event held in conjunction with the Arctic Science Summit Week (ASSW). The AOS is led by the International Study of Arctic Change (ISAC) and is a task of the Sustaining Arctic Observing Networks (SAON) process¹. SAON is led by the Arctic Council and by the International Arctic Science Committee. The AOS contributes to the SAON process through the synthesis of Arctic knowledge, engagement of a broad stakeholder community in dialogue around Observing System development design, implementation and long term support, the identification of gaps and priorities for observing, and application of observational data to real world problem solving.

The inaugural Arctic Observing Summit (<http://www.arcticobservingsummit.org/>), held in April 2013 in Vancouver, B.C., Canada, and supported in part by ONR Global, brought together representatives of a cross-section of the Arctic community to deliberate on community-driven, science-based guidance for the design, implementation, coordination and sustained operation of an international network of Arctic observing systems. The second AOS (April 5-11, 2014), held in conjunction with the Arctic Science Summit Week (ASSW) in Helsinki, Finland, and also partially supported by ONR Global drew participants from across the academic spectrum, from government, public and private sectors, aboriginal organizations and non-governmental organizations, illustrating the perceived need, interest, and urgency to contribute to, and derive benefits from, an integrated, comprehensive, and adaptive Arctic observing system that incorporates both the best of earth/space technologies, and community-based observing and local and traditional knowledge where appropriate. A sustained Arctic observing system also requires commitment and dialogue with international partners, funders, communicators, and community and policy leaders.

¹ [HTTP://WWW.ARCTICOBSERVING.ORG/INDEX.PHP?OPTION=COM_CONTENT&VIEW=ARTICLE&ID=105&ITEMID=100016](http://www.arcticobserving.org/index.php?option=com_content&view=article&id=105&Itemid=100016)

Need for an Integrated Arctic Observing System

The Arctic system is a complex of interwoven biological, chemical, human, and physical components with linkages and feedbacks to the Global System that are still not well understood. It is however clear that Arctic Change, in all its dimensions has both local and global repercussions (Christiansen, Romanovsky et al. 2011, Hovelsrud, Poppel et al. 2011, Brigham 2013, McGuire, Hinzman et al. 2013, Whiteman, Hope et al. 2013, Overland 2014). The circumpolar North is experiencing some of the highest rates of environmental and ecological change on Earth. Distant drivers of change, and recent expansion of industrial activities and development into northern regions, are already generating unprecedented scientific, social, economic, and governance challenges.

Understanding Arctic change in all its dimensions, requires timely and reliable information to inform decision-making for planning, mitigation, management, conservation and sustainable development. Such information can only be obtained through comprehensive, problem-focused observation that addressed both scientific and societal concerns. Advances in technology, computation power, communications and cyber-infrastructure, and a growing international and collaborative scientific network have contributed to ushering in a new age of near-real-time information capture, modeling and forecasting. Earth observing systems, from satellite imagery and remote sensing, to ground-based autonomous data loggers and monitoring station networks, have come of age for contributing to cost-effective and long-term observation of the Arctic. Now it is critical to turn these advances to best use through the development of an efficient, effective, flexible and adaptive observing system that truly is built upon input from the broadest possible constituency of stakeholders, data producers and users, and system architects and designers.

BUILDING MOMENTUM FROM AOS 2013 to AOS 2014

Prior to the inaugural AOS (2103 Vancouver), participants contributed perspectives and white papers on issues related to Arctic observation and on four selected themes:

1. **Status of the Current Observing System:** goals, objectives, capabilities, challenges, and sustainability;
2. **Observing System Design and Coordination:** inter-operability, integration and implementation;
3. **Stakeholder Perspectives:** on observing system design and integration; and
4. **Mechanisms for Coordination:** of support, implementation and operation of a sustained and relevant Arctic observing system.

These white papers served as the foundation for developing themes for the Summit, focusing discussion during the event and leading to recommendation for AOS 2014. The papers are available for download at <http://www.arcticobservingsummit.org/aos-2013-white-papers> with a selection also published in a special issue of the peer-reviewed journal *Arctic* (V. 68, No. 5, Supp.1) <http://arctic.journalhosting.ucalgary.ca/arctic/index.php/arctic/issue/view/281>. The special AOS *Arctic* journal issue is open-access and all of these peer-reviewed papers will be freely accessible online (some currently available online early as of early March) and available in hardcopy format.

The AOS 2014 built on the AOS 2013 themes and recommendations. It was held in conjunction with ASSW at the University of Helsinki (Kumpula Campus) and co-organized by ISAC, the Finnish Meteorological Institute and the Thule Institute. Designated themes for 2014 were:

1. **Stakeholders and Arctic Observation:** exploring stakeholder needs and experiences in Arctic observing, including system design, implementation and operation, and information dissemination;
2. **Science Coordination for Improved Arctic Observing:** national and international efforts to support Arctic observing;
3. **Technology and Innovation;** improve and promote dialogue and cooperation between the Arctic research community and those engaged in the innovation and development of environmental observing technologies;
4. **Remote Sensing Solutions;** key issues of remote sensing for arctic observation including gaps in current and future EO missions, readiness for operational use of Arctic satellite data; co-financing of missions, ways in which space observation may serve the people on the ground, and identification of the most pressing observing requirements of the scientific community;

5. Data Management, Accessibility, and Interoperability

In both 2013 and 2014 Summit participation was broad with participants from a diverse array of backgrounds, representing funding agencies, northern residents, policy makers, industry and the private sector, science planners and a variety of scientific disciplines and in 2013, from 17 different nations (Figures 1-3). In 2013 speakers included members working on the technology powering observing systems, data management and accessibility, biodiversity and natural systems, hydrology, climate, social sciences, community health, contaminants and many others. The AOS program balanced international and national level perspectives with the interests of northern residents and Indigenous Peoples, particularly from Alaska and Northern and Arctic Canada. There was strong representation from China, Japan, and South Korea, including several plenary presentations, highlighting the importance of Arctic observing programs for operational weather forecasts in eastern Asia as well as growing economic interests in the Arctic particularly with respect to resource development and shipping activities.

AOS 2014 included over 340 participants (double from 2013), more countries (30 in 2014 versus 17 in 2013) and new areas of expertise including Education and Outreach, Economics, Geography and Space Science, and expansions within Health, Engineering, and other Natural Sciences, for example. Within-country and within-region participation improved with respect to the country hosting the AOS (Canada in 2013, then Finland in 2014) and including nearby nations, regions and Indigenous Peoples. However, proportionally, diversity in the representation of some groups was more limited in 2014, including local governments, Aboriginal and Northern Peoples organizations, the private sector, museums, and some large international organizations, although the location was important to balance the participation across the circumpolar North (e.g. Americas in 2013; improved representation from Europe and Asia in 2014; Figure 1). Within countries, participation often included different types of groups, organisations and institutions, even from non-Arctic countries such as Germany and Japan.

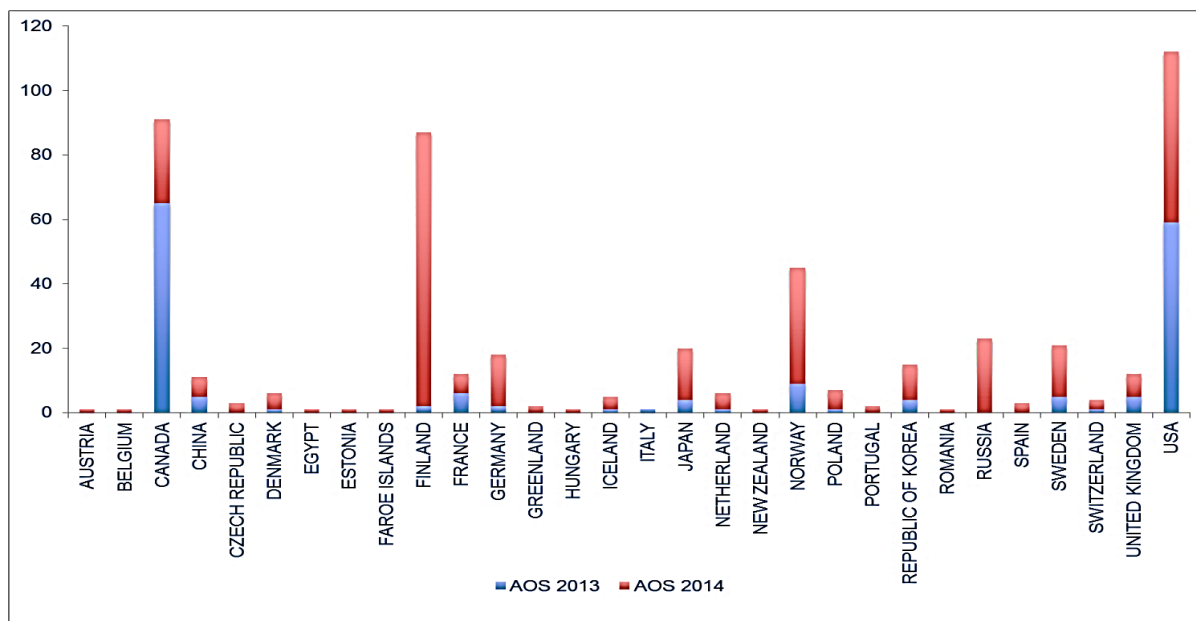


Figure 1. Total numbers of participants in AOS 2013 (Vancouver, Canada, $n = 172$) and AOS 2014 (Helsinki, Finland, $n = 342$), grouped by their country or major territory of origin.

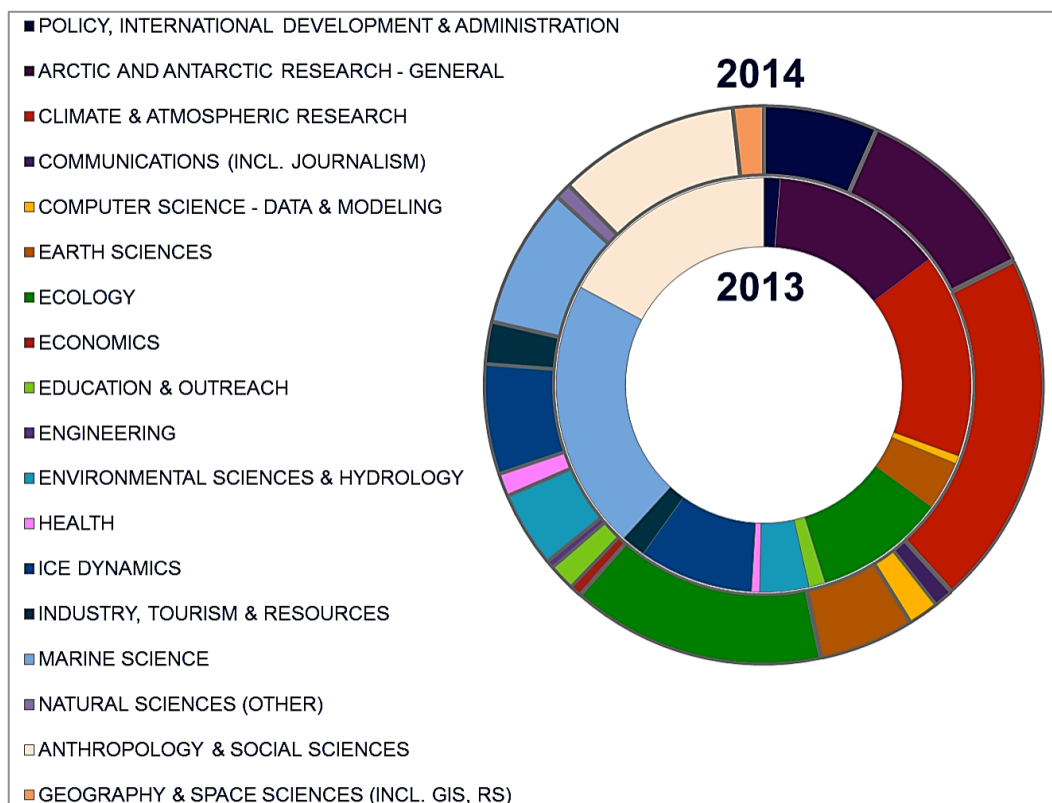


Figure 2. Participants in AOS 2013 and 2014 grouped by their type of organization or sector.

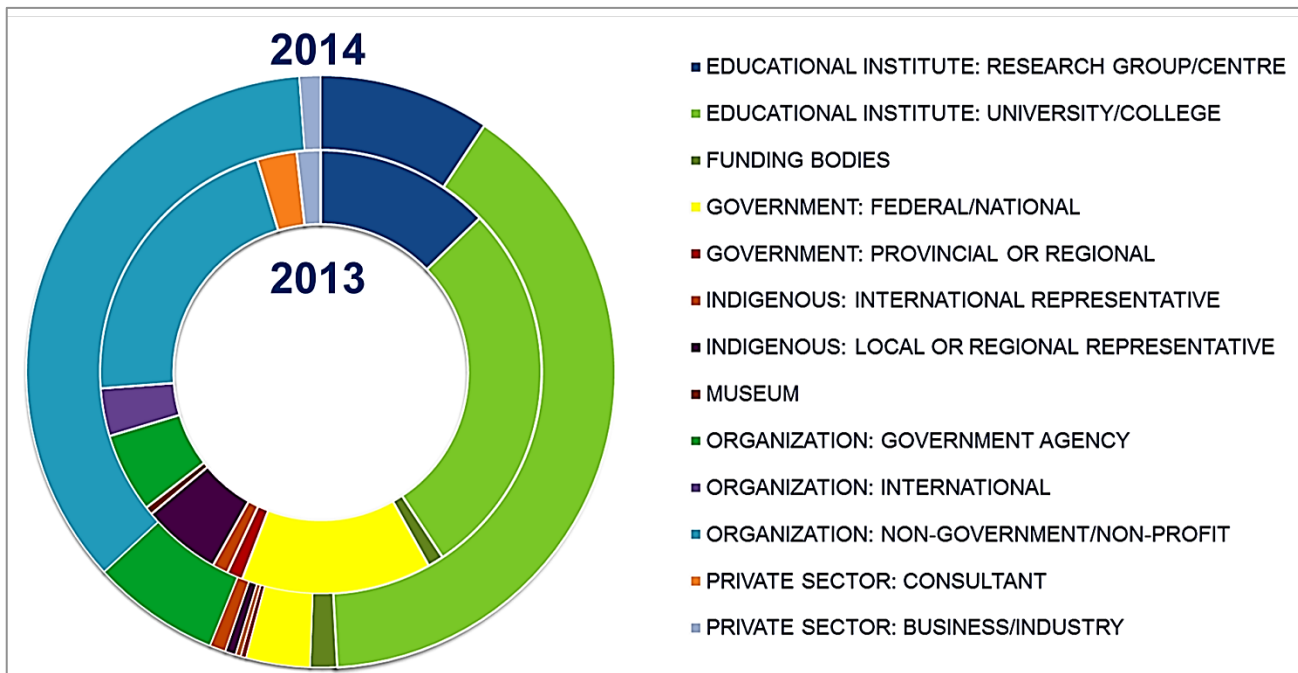


Figure 3. Categories of expertise of AOS 2013 and AOS 2014 participants grouped within their general theme area. Some participants worked in more than one theme area, in some cases including regions beyond the Arctic, while others identified their area of work strictly as polar research.

AOS 2013 AND 2014: RECOMMENDATIONS

Recommendations stemming from AOS 2013 and 2014 on the design, implementation process, engagement of researchers and research users, priorities, and working towards resolving challenges for an integrated Arctic observing system were obtained from Summit breakout groups, during panel discussions, from white papers, and through general participation prior, during and following the Summits. The over 100 recommendations illustrate that circumpolar nations, as well as non-Arctic countries, are ready and willing to contribute to a sustained, coordinated network for Arctic observing. Progress has been made on identifying Arctic observing needs, capacity, priorities, and on building international consensus and strengthening partnerships. Recommendations are summarized in Table 1 and can be grouped into the following thematic areas and related categories:

1. Status of the Current Observing System

- Tasks for System Inventory
- Closing Gaps

2. Observing System Design

- Stakeholder Perspectives on Design, Implementation and Operation
- Other Design Considerations
- Improvements to Existing Infrastructure

3. Stakeholders and Arctic Observation

- a. Communication
- b. Capacity Building

4. Coordination for Improved Arctic Observing

- a. Mechanisms for Coordination
- b. Funding
- c. Technology and Innovation

5. Data

- a. Data Management and Sharing
- b. Data Rescue
- c. Data Products

6. White Papers

- a. Process and Need

7. Other Recommendations

- a. Publications
- b. Policy

There are a series of very specific recommendations and identified tasks associated with each of these thematic areas and categories that will be spelled out in detail in the final publication of AOS 2013/2014. This is currently in preparation and includes proposals for systems designs and the use of new technology, practical issues related to international policy and cooperation, creative solutions to address specific local or global needs, and others

AOS 2016: FAIRBANKS, ALASKA

The next Arctic Observing Summit in 2016 (March 15 - 18) will take place in conjunction with ASSW (March 12-15) at the University of Alaska Fairbanks, (<http://www.arcticobservingsummit.org/aos-2016>) ; in conjunction with ASSW 2016 (<http://www.assw2016.org/>) and other events associated with the US Chairmanship of the Arctic Council including the Arctic Council Senior Officials meeting. A diverse group of experts, stakeholders, and representatives from all sectors is expected and planning is already well underway with the selection of an Executive Organizing Committee and themes derived from recommendations, identified needs and gaps during the previous Summits, and at the 2014 ISAC Town Hall meeting at the Annual Meeting of the American Geophysical Union (December 2014, San Francisco). The proposed themes for 2016 are:

1. **Resources/Funding:** international framework and national strategies for supporting the Arctic observing system.
2. **New and Emerging Technologies:** appropriate spatial and temporal resolutions, interoperability, sensors, accurate and continuous data records, drones, remote sensing, tech for community-based observing, etc.
3. **Global Links:** synchronization with existing and emerging global observing systems (for example GEOSS), linkages in sensor tech, observing platforms, observation frequency, spatial resolution, data repositories, etc.

4. **Stakeholder Engagement and Needs:** dual function observing providing information to stakeholders and supporting scientific research, models of stakeholder engagement, evaluation of data and information transfer approaches, public/private partnerships, coordination, common standards, etc.
5. **Interfacing traditional Knowledge and Environmental Science:** development of concrete activities and demonstration projects, new frameworks for exchange of ideas, expertise, best practices for joint planning.

Plans are underway to create opportunities to contribute new perspectives and white papers to facilitate the generation of solutions and to guide discussions related to these themes at AOS 2016.

The ISAC Program Office and the Executive Committee are currently working towards building representative participation from Arctic and non-Arctic nations, all sectors, and currently underrepresented groups (e.g. Figures 1 - 3). The initial call to invite perspectives and white paper contributions will be announced in Spring/Summer 2015.

The AOS continues to be a key platform and forum for SAON and the Arctic community to address the observation needs of stakeholders, and to foster international communication and the coordination of long-term observations for improving understanding and responding to system-scale Arctic change. 2016 promises to move the process further ahead, and lead to some concrete activities that will improve our observational initiatives around the pan-Arctic.

ABOUT THE INTERNATIONAL STUDY OF ARCTIC CHANGE

The International Study of Arctic Change (ISAC) is a long-term, international, multi-disciplinary Arctic environmental change program established in 2003 by the International Arctic Science Committee (IASC) and the Arctic Ocean Science Board (<http://www.arcticchange.org/>). The core components of ISAC include observing, understanding and responding to Arctic environmental change. A science plan for ISAC was published in 2010 (Murray 2010), the intent of which was outline an open-ended international research program and a framework for comprehensive study of arctic environmental change in all its dimensions. ISAC builds upon existing efforts to further our understanding of past, present, and expected arctic change to carry over new insights into the public and the decision-making arenas. ISAC is an iterative program growing from the successes of past arctic science programs and those initiated during the International Polar Year (IPY). The science plan provides background information on recent arctic changes and frames science questions to guide integrated research. ISAC includes both basic science and applied science and connects with national and international efforts to observe, understand and respond to pan-Arctic environmental change. The Arctic Observing Summit is part of the implementation of the Observing Change component of the ISAC Science Plan.

Appendix 1.

Upcoming and published articles (peer-reviewed white papers and technical reports) in the AOS Special Issue of the journal *Arctic* (Supplement) online and as hardcopy, Spring 2015. Arctic [Suppl. 1] vol. 68(5), 2015: (<http://arctic.journalhosting.ucalgary.ca/arctic/index.php/arctic/issue/view/281>)

TITLE	AUTHORS	STATUS
FULL ARTICLES		
Introduction: The Arctic Observing Summit 2013	Martin Jakobsson, Hajo Eicken, and Craig Lee	Published online
Observing the Changing Health of Circumpolar Peoples	Kue Young, Susan Chatwood and Peter Bjerregaard	Published online
The U.S. Arctic Observing Viewer: A Web-Mapping Application for Enhancing Environmental Observation of the Changing Arctic	William F. Manley, Allison G. Gaylord, Ari Kassin, Ryan Cody, Walter A. Copenhaver, Mike Dover, Ryan Font, David H. Lin, Roberta Score, Sandra Villarreal and Craig E. Tweedie	Accepted October 31, 2014; in press
Multipurpose Acoustic Networks in the Integrated Arctic Ocean Observing System	Peter N. Mikhalevsky, Hanne Sagen, Peter F. Worcester, Arthur B. Baggeroer, John Orcutt, Sue E. Moore, Craig M. Lee, Kathleen J. Vigness-Raposa, Lee Freitag, Matthew Arrott, Kuvvet Atakan, Agnieszka Beszczynska-Moeller, Timothy F. Duda, Brian D. Dushaw, Jean Claude Gascard, Alexander N. Gavrilov, Henk Keers, Andrey K. Morozov, Walter H. Munk, Michel Rixen, Stein Sandven, Emmanuel Skarsoulis, Kathleen M. Stafford, Frank Vernon and Mo Yan Yuen	Accepted October 20, 2014; in press
A Framework for Prioritization, Design and Coordination of Arctic Long-term Observing Networks: Perspectives from the U.S. SEARCH Program	Olivia Lee, Hajo Eicken, George Kling and Craig Lee	Accepted November 5, 2014; in press
Arctic Ocean Bathymetry: A Required Geospatial Framework	Martin Jakobsson, Larry Mayer and David Monahan	Accepted December 8, 2014; in press
REPORTS		
The European Plate Observing System and the Arctic	K.A. Atakan, L.W. Bjerrum, H. Bungum, J. Dehls, A.M. Kaynia, H. Keers, H.P. Kierulf, T. Kværna, V. Maupin, T. Langeland, C. Lindholm, L. Ottemöller, M. Sørensen, and M.Y. Yuen	Published online

The Contributions of Community-Based Monitoring and Traditional Knowledge to Arctic Observing Networks: Reflections on the State of the Field	Noor Johnson, Lilian Alessa, Carolina Behe, Finn Danielsen, Shari Gearheard, Victoria Gofman, Andrew Kliskey, Eva Krümmel, Amanda Lynch, Tero Mustonen, Peter Pulsifer and Michael Svoboda	Published online
Coordination and Sustainability of River Observing Activities in the Arctic	J.W. McClelland, S.E. Tank, R.G.M. Spencer and A.I. Shiklomanov	Published online
Institutional Dimensions of Sustaining Arctic Observing Networks (SAON)	Paul Arthur Berkman	Under revision
A Global Cryosphere Watch	Jeffrey Key, Barry Goodison, Wolfgang Schöner, Øystein Godøy, Miroslav Ondrás and Árni Snorrason	Accepted August 29, 2014; in press
The Need for an Arctic Wildlife Health Observation Network	Susan Kutz, Manon Simard, Sylvia Checkley, Catherine Soos, Craig Stephen and Padraig Duignan	Under revision
Circum-Arctic Collaboration to Monitor Caribou and Wild Reindeer	Don E. Russell, Anne Gunn and Robert G. White	Accepted January 26, 2015; in press

REFERENCES CITED

- Brigham, L. W. (2013). "Arctic marine transport driven by natural resource development." Edited by Saara Majuri. Christiansen, H., V. Romanovsky, S. Smith, P. Kuhry, H. Lantuit, J. Brown, H.-W. Hubberten, A. Lewkowicz and P. P. Overduin (2011). "Permafrost: a critical component of the Arctic cryosphere with global linkages." Hovelsrud, G. K., B. Poppel, B. van Oort and J. D. Reist (2011). "Arctic societies, cultures, and peoples in a changing cryosphere." *Ambio* **40**(1): 100-110.
- McGuire, A., L. Hinzman, J. Walsh, J. Hobbie and M. Sturm (2013). "Trajectory of the Arctic as an integrated system 1." *Ecological Applications* **23**(8): 1743-1744.
- Murray, M. S. A., L., Cherkashov, G., Cuyler, C., Forbes, B., Gascard, J.C., Haas, C., Schlosser, P., Shaver, G., Shimada, K., Tjernström, M., Walsh, J., Wandell, J., Zhao, J. (2010). International Study of Arctic Change: Science Plan. Stockholm, ISAC International Program Office.
- Overland, J. E. (2014). "Atmospheric science: Long-range linkage." *Nature Climate Change* **4**(1): 11-12.
- Whiteman, G., C. Hope and P. Wadhams (2013). "Climate science: Vast costs of Arctic change." *Nature* **499**(7459): 401-403.



Arctic Observing Summit 2014

Helsinki, Finland

University of Helsinki

& Finnish Meteorological Institute

9-11 April 2013

Program

Wednesday, 9 April 2014

Exactum Room A111 (Lars Ahlfors Auditorium), University of Helsinki Kumpula Campus

9:00 to 17:45

8:00 to 8:45 Registration at Finnish Meteorological Institute, Erik Palménin aukio 1

Thursday, 10 April 2014

Exactum Room A111 (Lars Ahlfors auditorium), University of Helsinki Kumpula Campus

9:00 to 17:30

Friday, 11 April 2014

*University Main Building (Great Hall) (Unioninkatu 34) – **Please note new location***

9:00 to 12:00

Wednesday, 9 April 2014

Exactum Room A111 (Lars Ahlfors Auditorium), University of Helsinki Kumpula Campus

8:00-8:45 **Registration and Coffee**

Introduction

9:00-9:30 **Welcome and Opening Comments**

Petteri Taalas, Finnish Meteorological Institute, Finland

Peter Schlosser, International Study of Arctic Change, ISAC Science Steering Group

9:30-10:00 **Keynote 1: New Approaches to Observation**

Doug Wallace, Dalhousie University, Canada

10:00-10:30 **Keynote 2: Observing Systems: Arctic to Global Perspectives**

Jacqueline MacGlade, United Nations Environmental Program

10:30-11:00 **Coffee and Tea Break**

Lobby: Brainstorm Auditorium in the FMI Dynamicum

Session 1: Stakeholders and Arctic Observation

The session will explore stakeholder needs and experiences in Arctic observing, including system design, implementation and operation, and information dissemination. Keynote speakers and a panel discussion will present views from an array of different stakeholders, including scientists, government agencies, Indigenous peoples and industry. The session will also include a focus presentation and discussions on experiences and views from European indigenous peoples, including scientific- and traditional knowledge use in salmon management.

11:00-11:30 **Focus Presentation:** Best practices and monitoring experiences from the Snowchange Cooperative and Siberian Indigenous partners.

Tero Mustonen, Snowchange Cooperative, Finland

Vyacheslav Shadrin, Yukaghir Council of Elders, Russian Federation

11:30 -12:00 **Focus Dialogue:** The use of science and traditional knowledge in salmon management.

Moderator: Tero Mustonen, Snowchange Cooperative, Finland

- *Eero Niemelä, Finnish Game and Fisheries Research Institute, Finland*

- *Pauliina Feodoroff, Saa'mi Nue'tt Skolt Sámi Cultural Organisation, Finland*

12:00-13:15 **Lunch**

13:15–14:45 **Panel: Stakeholder Integration in Arctic Observation**

In this panel the focus is on ways in which stakeholder knowledge can be utilized in Arctic observing system design, implementation and operation, including dissemination of collected information and data. There will be short presentations from the panelists, followed by a moderated discussion.

Moderator: Eva Krümmel, Inuit Circumpolar Council Canada

- *Nellie Pokiak, Inuvialuit Settlement Region, Canada*
- *Thomas Jung, AWI, Year of Polar Predictions*
- *Tero Vauraste, Arctic Shipping, Finland*
- *Paul Holthus, World Ocean Council*
- *Finn Danielssen, Nordic Foundation for Development and Ecology, Greenland/Denmark*
- *Jim Gamble, Aleut International Association, USA*

Rapporteurs: Lize-Marié van der Watt, SPRS/ISAC, Sweden

Alexey Maslakov, Lomonosov Moscow State University, Russian Federation

14:45–15:15 **Coffee and Tea Break**

Lobby: Brainstorm Auditorium in the FMI Dynamicum

Session 2: Science Coordination for Improved Arctic Observing

In this session, major national and international coordination efforts to support Arctic observing will be presented and discussed. An introductory keynote will highlight the need for better coordination and efficiencies, and be followed by panelists' short presentations and a moderated discussion.

15:15–15:20 **Opening Remarks:**

Volker Rachold, International Arctic Science Committee (IASC)

15:20–15:45 **Keynote 3: Science Coordination Towards an Arctic Observing System**

David Hik, IASC/University of Alberta, Canada

15:45–17:45 **Panel: Perspectives on Coordination**

Moderator: Tom Armstrong, U.S. Global Change Research Program, Executive Office of the President

- *Cynan Ellis-Evans, NERC Arctic Office, United Kingdom*
- *Anna-Maria Johansson, EC DG Research, European Union*
- *Kirsten Broch Mathisen, Research Council of Norway, Norway*
- *Sergey Priamikov, Arctic and Antarctic Research Institute, Russian Federation*
- *Hiroyuki Enomoto, National Institute of Polar Research, Japan*
- *Kelly Falkner, National Science Foundation, USA*
- *Markku Kulmala, Pan-Eurasian Experiment PEEX, University of Helsinki, Finland*

Rapporteurs: Mikko Strahlendorff, Finnish Meteorological Institute, Finland

Andrey Medvedev, Russian Academy of Science, Russian Federation

17:45 **End Day 1**

Thursday, 10 April 2014

Exactum Room A111 (Lars Ahlfors auditorium), University of Helsinki Kumpula Campus

Session 3: Technology and Innovation

This session on is organized by the Forum of Arctic Research Operators (FARO) in collaboration with the European Polar Board (EPB) and the International Arctic Science Committee (IASC), as a contribution to the AOS 2014 and ICARP III. Ways to improve and promote dialogue and cooperation between the arctic research community and those engaged in the innovation and development of environmental observing technologies will be discussed.

- 9:00-9:10 **Opening Remarks:**
Magnus Tannerfeldt, FARO/Swedish Polar Research Secretariat, Sweden
- 9:10-9:30 **Keynote 4:** Current Issues and the Future of Polar Technology
Simon Stephenson, National Science Foundation, USA
- 9:30-9:50 **Keynote 5:** New Frontiers for Remotely Operated and Unmanned Aerial Vehicles
Rune Storvold, Northern Research Institute Tromsø, Norway
- 9:50-10:10 **Keynote 6:** Reducing the Environmental Footprint of Data Collection in the Field
Kim Holmén, Norwegian Polar Institute, Norway
- 10:10-10:30 **Keynote 7:** State-of-the-art in Deep Field Communications
Matthew Lazzara, University of Wisconsin-Madison, USA
- 10:30-10:50 **Coffee and Tea Break**
Lobby: Brainstorm Auditorium in the FMI Dynamicum
- 10:50-12:00 **Panel:** Perspectives on Technology
Panelists will address barriers to sharing technology in Arctic research, and the technologies that need to be developed to advance knowledge. Audience questions and general discussion follows.

Moderator: Cynan Ellis-Evans, NERC, UK

- *Hyoung Chul Shin, Korean Polar Research Institute, South Korea*
- *Aaron Fisk, Ocean Tracking Network, Canada*
- *Jennifer Mercer, US National Science Foundation*
- *Simon Stephenson, US National Science Foundation*
- *Rune Storvold, Northern Research Institute, Norway*
- *Kim Holmén, Norwegian Polar Institute, Norway*
- *Matthew Lazzara, University of Wisconsin-Madison, USA*

Rapporteurs: Barbara Weber, European Polar Board
Alexey Medvedkov, Lomonosov Moscow State University, Russian Federation

12:00-13:30 **Technology Poster Session**

This poster and display session will allow participants and attendees to highlight their work in any area related to polar and observing technologies. There will be an opportunity to mingle with speakers, panelists and other participants. A sandwich **lunch** with wine and non-alcoholic beverages will be served. The posters will be placed in the entry hall for the duration of the ASSW/ AOS.

Session 4: Remote Sensing Solutions

14:00-14:30 **Keynote 8:** Earth Observation for Terrestrial Arctic Applications
Diane Wickland, NASA, USA

14:30-15:30 **Panel:** Key Issues of Remote Sensing

Panel discussion will focus on key issues of remote sensing for arctic observation including: gaps in current and future EO missions, readiness for operational use of Arctic satellite data; co-financing of missions; space observation may serve the people on the ground; and identification of the most pressing observing requirements of the scientific community.

Moderator: Mark Drinkwater, European Space Agency

- *Peter Breger, Copernicus Services, European Commission*
- *Jouni Pulliainen, Arctic Research, Finnish Meteorological Institute, Finland*
- *Oleg Faloneev, Arctic and Antarctic Research Institute, Russian Federation*
- *Anders Oskal, International Centre for Reindeer Husbandry, Norway*
- *Diane Wickland, NASA, USA*

Rapporteurs: Kari Luojus, Finnish Meteorological Institute, Finland
Anna Nikonova, Russian Academy of Sciences, Russian Federation

15:30-16:00 **Tea and coffee break**
Lobby: Brainstorm Auditorium in the FMI Dynamicum

Session 5: Data Management

16:00-17:30 **Panel:** Key Issues of Data Management

Improved data management to facilitate maximal access and use remains high on the arctic research agenda highlighted recently during both the International Polar Year, and throughout Arctic Observing Summit 2013. Data management is a cross-cutting issue and as such panelists will consider matters raised during both the AOS 2013 and the preceding sessions of the AOS 2014. They will present various perspectives and insights on established or emerging solutions to the challenges of mobilizing data, information and knowledge derived from global, and arctic/polar observing systems. Topics range from innovative policy solutions, to emerging coordination networks, relevant advances in technology and knowledge sharing and transfer.

Moderator: Peter Pulsifer, National Snow and Ice Data Center, USA

- *David Stanners, International Cooperation, European Environment Agency*
- *Yubao Qiu, Group on Earth Observations*
- *Iain Shepard, DG Maritime Affairs and Fisheries, European Commission*
- *Igor Ashik, Arctic and Antarctic Research Institute, Russia*
- *Ryan Mazan, Director of the Nunavut Bureau of Statistics, Canada*
- *Peter Pulsifer, ELOKA, USA*
- *Molly McCammon, Alaska Ocean Observing System, USA*

Rapporteurs: Lize-Marié van der Watt, SPRS/ISAC, Sweden
Mikhail Ivanov, Lomonosov Moscow State University, Russian Federation

17:30 **End Day 2**

Friday, 11 April 2014



University Main Building, Great Hall (Unioninkatu 34) – *Please note new location*

Session 6. Engaging with Policy Makers and Implementation Agencies

9:00-9:45 **Recommendations:** Results from the AOS 2014
Peter Schlosser, Columbia University, USA

9:45-11:20 **Panel:** How can the Arctic Observing System deliver more?

Panelists representing upper levels of governments and governing bodies will address the question of why we need an Arctic Observing System. Panelists are asked to consider five key needs identified during the AOS 2014 and that are presented during the prior Conclusion and Recommendations discussion. Specifically panelists will reflect on: 1) Challenges in addressing identified needs; and 2) How to improve the situation so as to address the needs identified.

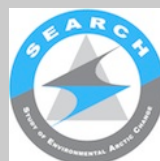
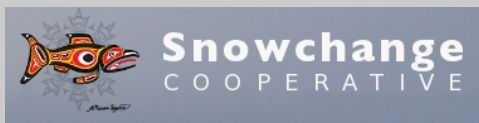
Moderator: *Petteri Taalas, Finnish Meteorological Institute*

- *Petri Peltonen, Ministry of Employment and the Economy, Finland*
- *Andrée Cooligan, Ambassador of Canada to Finland*
- *Takashi Kiyoura, Earth and Ocean Division, MEXT, Japan*
- *Ivan Frolov, Arctic and Antarctic Research Institute, Russia*
- *Barbara Ryan, Director, Group on Earth Observations Secretariat*
- *Mark Drinkwater, European Space Agency*
- *Franz Immler, European Commission*

11:20-11:50 **Panelists' initiatives to improve the Arctic Observing System**

11:50-12:00 **Concluding remarks**
AOS Co-chairs: Peter Schlosser, Eva Krümmel and Mikko Strahlendorff

12:00 **End AOS 2014**



European Environment Agency

