Arctic Observing Summit 2016

Theme 1 - International and national strategies for sustained support of long-term Arctic observing

Co-chairs: Dr Andrea Tilche (European Commission); Dr Jeremy Mathis (NOAA)

TWG members: Renuka Badhe (European Polar Board), Hajo Eicken (AOS EOC), Larry Hinzman (AOS EOC), Brendan Kelly (Monterey Bay Aquarium), Jane Wolken (University of Alaska, Fairbanks)

Synthesis paper

In recent years the Arctic region has become increasingly more prominent in the global context. The Arctic is the region of the globe where the climate is changing most rapidly. Although these changes are a source of risks, they are opening up new opportunities. For example, the increasing access to resources (fish stocks/raw materials/oil/gas), opening of new sea routes, increasing tourism, etc. will each play a major role in the Arctic under a changing climate. In addition, changes in the Arctic have global consequences such as sea-level rise, changing weather patterns and more extreme weather events, with socio-economic impacts connected to them. Thus, it is essential that we improve our understanding of the climate dynamics and support regional development on a sustainable basis. The time has come to develop an integrated and multi-disciplinary **Arctic observing system** to identify sustainable and innovative approaches to tackle the challenges that climate change is posing in the Arctic region.

An **Arctic observing system** can only be built around a commitment to long-term support at national and international scales, by Arctic and non-Arctic nations, where the role of institutional (e.g. funding agencies, public administrations) and non-institutional (e.g. private sector) actors is clearly identified and coordinated.

At present, an **integrated plan** for Arctic observation is required to develop an effective Arctic observing system.

The white papers and short statements submitted to the Arctic Observing Summit (AOS) *International and national strategies for sustained support of long-term Arctic observing* thematic session will serve as a basis for discussion (***Appendix 1***). The input provided by these contributions focused on the following questions:

- Which elements of an Arctic Observing System require sustained and stable support?
- How can research-oriented observations transition to operational observations?
- How can non-institutional funds be secured?
- How to build a plan in which both national and international initiatives can efficiently share resources?
- How to build a plan, which is supported by innovative funding mechanisms that delivers sustainability, integration and excellence?

Several diverse contributions were submitted (see attached table). Overall these contributions outlined the possible directions in which the **Arctic observing system** might evolve, and the challenges associated with its development. As with every complex process, there are a multitude of angles from which this process may be viewed. With reference to the subject of this thematic session, the Thematic Working Group proposes to cluster the input from these contributions into three reference areas: *observing systems, international coordination* and *support strategies (sustainability)*.

Observing Systems

Multi-disciplinary research and knowledge is key to supporting the decision-making process for the development

of strategies to adapt to, and mitigate the consequences of climate change in the Arctic Region and support Arctic-related economic and societal activities. An integrated and multi-disciplinary Arctic observing system should lead to better-informed decisions and better-documented processes within key sectors (e.g. local communities, natural resources, shipping, tourism, fishing, etc.). However, great effort and resources are still needed to fill the gaps associated with observation networks, observation technologies, and observing platforms.

It will be essential to increase the temporal and geographic coverage, and applicability of observational data in the Arctic, support standardisation and calibration/validation activities, and improve the inter-operability of Arctic observation data.

A first step should be integration of the existing pan-Arctic monitoring networks by building additional capacity and adding monitoring parameters to current programmes.

An interesting, although more complex, strategy that has been proposed is the creation of a network for Arctic supersites. Ensuring coordination of co-located in situ, airborne and satellite observations could be a way to sustain research driven observations by making them routine operational observations. Moreover, by establishing a governance structure and a joint international funding system of these selected sites, this would guarantee access, interoperability, data sharing and sustained long-term observations.

In any case, the implementation of an open data policy has to be pursued. Users should have access to free, open and high quality data. This is a pre-requisite to foster the development of pan-Arctic and global value-added service and provide societal benefits.

International coordination

International coordination and scientific cooperation is necessary, as complex logistical constraints prevent any single entity or country from developing and maintaining an Arctic Observing System on its own. In this context it is key to combine national strategies and international initiatives in order to move toward a coordinated, sustained and improved Arctic Observing System. There are positive examples at the sub-regional level that focus on specific sectors. Resources should be used to improve the coordination of national and international efforts that support initiatives at the pan-Arctic level. Initial efforts could aim to identify mechanisms of information exchange and strategies to secure sustained operability.

Added values that can be easily envisaged are the improvement of the cost-effectiveness of data collection and a more rapid uptake of new technologies and methodologies.

A shared observation system may also contribute to the maintenance of peace in the Arctic Region. On this point, it is widely recognized that science diplomacy in the Arctic region is essential to achieving public transparency.

Support strategies (sustainability)

Strategies to provide sustained support of an Arctic observing system should move in two directions, one that could be defined as “bottom-up” and a second one “top-down”. Both strategies are necessary to support an Arctic observing system.

The “bottom-up” strategy begins with demonstrating the short and long term benefits of observations at environmental, social and economic levels in order to attract non-institutional stakeholders through a user-driven approach. There are several very innovative and interesting examples based on the use of observation data for producing a suite of indices and indicators targeting current and near-term priorities for observing

networks and systems. Such an approach has proven to be effective in addressing decision makers and non-expert stakeholders. The demonstration of the practical value of observations is a way to secure funding for their sustained production. What is not clear is if a similar approach can be extended to any area of interest. Another important resource is the support that indigenous communities and the use of traditional knowledge can provide.

The “top-down” strategy optimizes the actual resources by developing strategies to coordinate, and improve interagency (national) and international support and collaboration. An example is the enhancement of the interoperability capacity between the existing and emerging international distributed data sharing networks (such as GEOSS). Of course, developing cost-effective business models is recommended as well. A clear example is the space-based infrastructures which are fundamental assets for the observation of the Polar Regions. Even though space proven technology and access to space is becoming more reliable and affordable, building, launching and operating space based infrastructure remains a significant investment of substantial risk. Sharing the risk and investment amongst the different space agencies and stakeholders, and agreeing on complementarities and synergies among different space programs would be desirable and necessary to ensure long term monitoring.

Concluding remarks

The discussion that the TWG wishes to steer at AOS 2016 is part of an exercise that started at the first AOS in 2013 and will continue, and evolve in the future. The inputs summarised here were triggered by a set of questions that were in great part answered but, at the same time, gave rise to new questions:

- The need for both mitigation and adaptation efforts has strongly come to the forefront in the Arctic as a consequence of the increased and transformed role of the Arctic in the debate on climate change. Should this aspect be taken into consideration when developing strategies to attract non-institutional stakeholders? If the answer is Yes, how?
- It is a fact that improved predictive capability is needed across a range of scales to diagnose impacts of climate change and pollution on the Arctic regional climate and air quality, and its feedback on global climate and the wider Earth system. How relevant are "Arctic" climate services in driving the development of an Arctic observing system?
- Do we need a new governance to steer the process?
- How do pan-Arctic initiatives such as the Sustaining Arctic Observation Networks (SAON) and the Cold Region Initiative of GEO fit in this scenario?

We look forward to the discussions at AOS 2016 that will take place in Fairbanks to answer to these questions, and many others, in order to contribute at best to the development of an integrated plan for Arctic observation and to set the ground for the next AOS.

Appendix 1 - List of AOS 2016 white papers and short statements reviewed for this synthesis. Cluster group categories are as follows: A= Observing Systems; B= International Coordination; and C= Support Strategies (sustainability).

	Authors(s)	Title	Type	Reference Subject	Cluster Group
1	Moore, Sue E.; Grebmeier, Jacqueline M.	The Distributed Biological Observatory: Linking Physics to Biology in the Pacific Arctic Region	WP	Biodiversity On-going initiative Sustainability (good practice example)	C
2	Arnold, S.R.; Brock, C.A.; Law, K.S.	Air Pollution in the Arctic: Climate, Environment and Society (PACES)	SS	Air Pollution On-going initiative Earth system modelling	A
3	Houssais, Marie-Noelle; Law, Kathy; Babin, Marcel; Rousseau, Denis-Didier	French Arctic Initiative (Chantier Arctique): contribution to an Arctic Observing System	SS	Observing Systems On-going initiative International coordination and support strategies	A
4	Biebow, Nicole; Willmott, Veronica; Rousseau, Denis-Didier; Quesada, Antonio; Schoener, Wolfgang	The role of EU-PolarNet in sustaining Arctic Observations	SS	International and multi-stakeholder coordination On-going initiative Sustainability	B+C
5	Vlasova, Tatiana; Petrov, Andrey N.; Nymand Larsen, Joan; Volkov, Sergey; Khropov, Alexander; Lytkin, Ivan	Monitoring Arctic Sustainability: International Experiences and Agenda to Develop Arctic Sustainability Indicators	SS	Sustainability On-going initiative	C
6	Larsen, J.; Hinzman, L.; Loseto, L.; Mathis, J.; Olseng, C.; Pulsifer, P.; Rachold, V.; Reiersen, L.	The Sustaining Arctic Observing Networks (SAON): Status	SS	Observing Network and Systems On-going initiative International coordination Open Data policy	A+B
7	Rigor, Ignatius G.; Clemente-Colón, Pablo; Reinking, Curtis; Keith, David; Reams, Micki	The International Arctic Buoy Programme (IABP) – A Model for Sustaining Arctic Observing Networks	WP	Ocean observations On-going initiative International coordination and support strategies (good practice example)	A+C
8	Straneo, Fiamma; Heimbach, Patrick; Hamilton, Gordon; Sergienko, Olga	Greenland Ice Sheet Ocean Observing System	WP	Ice sheet – ocean interaction New initiative Sustainability	A
9	Shupe, Matthew	Broad Coordination Needed to Address Atmospheric and Coupled-system Gaps in the Central Arctic	SS	Atmosphere, sea-ice and ocean obs. New initiative International coordination and support strategies	A

10	Danielson, S.; Hauri, C.; Hopcroft, R.; Lalande, C.; Janzen, C.; McCammon, M.; McDonnell, A.; Stafford, K.; Winsor, P.; Wisdom, S.	A multi-disciplinary and multi-institutional approach to long-term and high-resolution Arctic marine monitoring	SS	Ocean observations On-going initiative Support strategies (good practice example)	C
	Authors(s)	**Title**	**Type**	**Reference Subject**	**Cluster Group**
11	Christensen, Tom; Payne, John; Barry, Tom; Price, Courtney	Circumpolar Biodiversity Monitoring Programme (CBMP)	SS	Biodiversity On-going initiative International coordination Indicators	A
12	Fukasawa, Masao; Enomoto, Hiroyuki; Saito, Sei-ichi, Kawano, Takeshi	New Japanese Arctic Research Project “Arctic Challenge for Sustainability (ArCS)”	SS	Observing Systems On-going initiative Sustainability	A
13	Qiu, Yubao; Savela, Hannele; Key, Jeffrey R.; Menenti, Massimo; Vitale, Vito; Cheng, Xiao, Friddell, Julie E., Larsen, Jan René; Enomoto, Hiroyuki; Guo, Xuejun; Sandven, Stein; She, Jun, Lappalainen, Hanna; Basanta, Raj; Su, Bob; Gabarró, Carolina; Li, Xin; Callaghan, Terry V.; Lawford, Richard; Bérod, Dominique D.; and the GEOCRI Group	Statement on the GEO Cold Region Initiative (GEOCRI)	SS	Observing Network and Systems On-going initiative International coordination and support strategies	A+B
14	McCammon, Molly; Hinzman, Larry	A Call for a Research Clearinghouse in Alaska	WP	Observing Network and Systems New initiative (concept) Sustainability	A+C
15	LeBlond, Paul H.; Ibarguchi, Gabriela	Towards an international scientific observatory at the North Pole	WP	Observing Systems New initiative (concept) International cooperation Science diplomacy	B
16	Grabak, Ola; Arthurs, David; Fleming, Andrew	Polaris: User Needs and High-Level Requirements for Next Generation Observing Systems for the Polar Regions	WP	Observing Systems On-going initiative International and multi-stakeholder coordination	A+C

17	Forbes, Donald L.; Bell, Trevor; LeTissier, Martin; Petrov, Andrey; Pulsifer, Peter; Atkinson, David E.; Eerkes-Medrano, Laura; Nymand Larsen, Joan; Couture, Nicole; Kraev, Gleb; Marino, Elizabeth; Overduin, Paul; Rasmussen, Rasmus Ole; Riedlsperger, Rudy; Schweitzer, Peter; Vlasova, Tatiana; and Wilson, Katherine	CACCON and Partner Knowledge Networks: Arctic Coastal Engagement Network of Future Earth Coasts	WP	Community-based monitoring (CBM) observing systems On-going initiative (pilot in Canada) International and multi-stakeholder coordination	A+B
18	Morison, James; Wilkinson, Jeremy; Alkire, Matthew; Nilsen, Frank; Polyakov, Igor; Smethie, Willam Jr.; Schlosser, Peter; Vivier, Frederic; and Lourenco, Antonio	North Pole as an Indicator of the Changing Arctic Ocean	WP	Observing Network and Systems New initiative International coordination and support strategies Sustainability	C
19	Lee, Craig; Shupe, Matthew; Wilson, Cathy; Bennet, Mia; Hoy, Elizabeth; Kwok, Ron; Macrander, Michael; Nguyen, An T.; Payer, Davis; Schuur, Ted; Starkweather, Sandy; Stearns, Leigh; and Wiggins, Helen	Arctic Observing Open Science Meeting	SS	Observing Network and Systems (report on a US inter-agency meeting)	A