

Towards structured coordination of sustained observations of Arctic change: An update from the Arctic Observing Summit 2018

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Abstract

Understanding, predicting, and responding to a rapidly changing Arctic requires sustained observations that capture variability and transformative change of the Arctic systems with all its major components. A key challenge for researchers, Arctic communities, and others tasked with effective responses to such change is to achieve structured coordination of numerous individual observing activities and networks. These have different regional and thematic foci. Many are driven from the bottom-up by research interests, while others are mission-oriented operational networks. The Arctic Observing Summit (AOS) is an effort that seeks to help coordinate such disparate activities and support efforts such as the Sustaining Arctic Observing Networks (SAON) initiative. We report on progress as part of an AOS 2018 working group focused on implementation and optimization of sustained observations. Drawing on the Framework on Ocean Observations, our group identified effective approaches and barriers to integration of different observation requirements and activities/platforms into a coherent observing framework. Case studies for benthic communities, sea ice prediction, and permafrost highlighted the importance of allowing for independently driven activities to coalesce into a uniform framework. This in turn requires clearly defined requirements that ideally serve multiple societal benefits. Such clear definitions also aid private-public partnerships and the development of new observing system business models. Prerequisite to better coordination is a comprehensive, international assessment that describes the current set of systems, community-based networks, sensors, networks, and surveys that are used to observe the Arctic today. Pieces of such an endeavor are starting to emerge, and SAON may serve as a home for integrating and building

upon these pieces. Essential to this goal is the development of a knowledge map that collates and connects observing resources to societal benefits, helps identify and prioritize essential variables, data management needs, and critical products and services. The AOS 2018 calls for the launch of an optimization and implementation team of experts that would conduct such an effort under the auspices of SAON. We explore different elements of such a team's portfolio of tasks.



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AOS: Addressing a need to coordinate observations

- Sustained observations capturing variability & transformative change are needed to understand, predict, and respond to rapid Arctic change
- Structured coordination of numerous individual observing activities & networks (a mix of research, operational, or community-based efforts) is a central challenge
- The Arctic Observing Summit (AOS) seeks to coordinate such disparate activities from the bottom up & support the Sustaining Arctic Observing Networks (SAON) initiative, its numerous partner nations & working groups

- AOS 2018 Working Group Implementation & Optimization drew on Framework on Ocean Observations to identify effective approaches & barriers to integration of different observation requirements & activities/platforms into a coherent framework
- Case studies for benthic communities, sea ice prediction & permafrost, as well as the INTAROS Observing Assessment Framework highlighted the importance of (i) allowing for independently driven activities to coalesce into a uniform framework, (ii) clearly defined requirements that serve multiple societal benefits
- Such clear definitions also aid private-public partnerships & development of new observing system business models

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AOS Input: Brief Community Statements

- >70 [AOS 2018 Brief Statements](#) were submitted by the broader research and stakeholder community as input to AOS 2018
- 20 were linked to Implementation & Optimization Working Group (WG2)
- Select titles & authors include:

Bradley & Obbard: Coastal sea ice: a case study in observing system analysis

Buch et al.: Arctic GOOS

Christensen et al.: Circumpolar Biodiversity Monitoring Programme (CBMP)

Gallo & Sylak-Glassman: Toward a Pan-Arctic Observing System: Analysis of Current Observational Gaps and Issues

Kelly et al.: Arctic Futures 2050; Advancing Arctic Observing in an Open Science/Policy meeting

Nassar et al.: The Atmospheric Imaging Mission for Northern Regions: AIM-North

Pirazzini et al.: Assessment and Exploitation of the existing Arctic observing systems under the INTAROS project

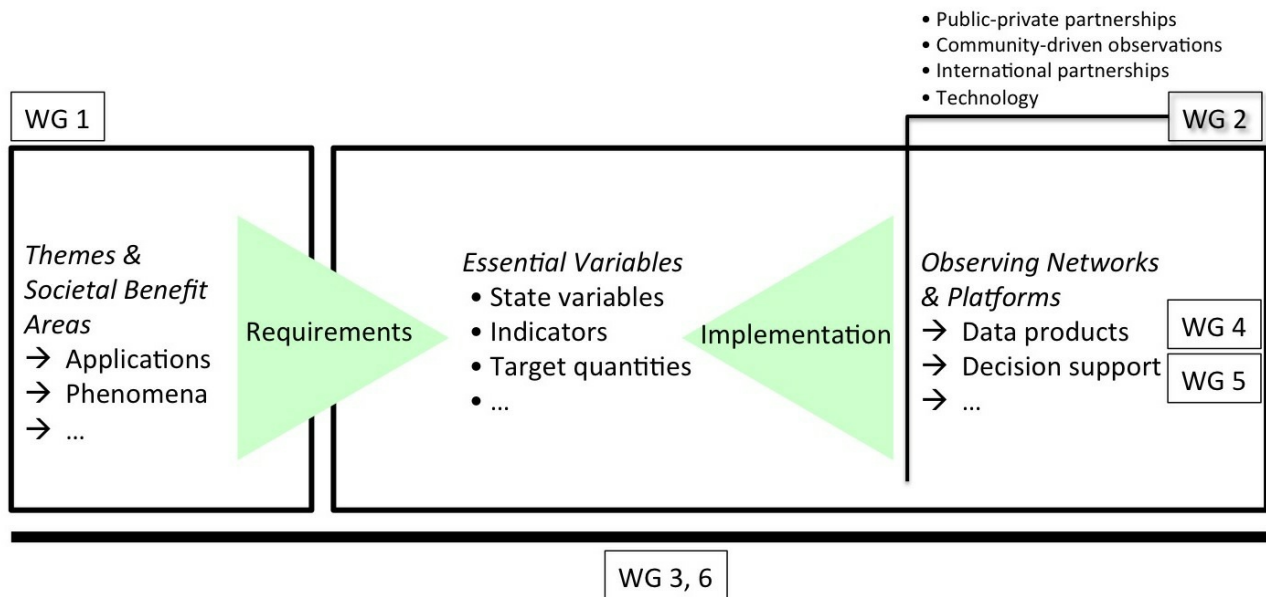
Qiu et al.: A Cold Regions Information Service Approach for Societal Benefits

Sandven et al.: The in situ component of Arctic observing systems – opportunities and challenges in implementation of platforms and sensors

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Implementation Working Group

- Working Groups (WGs) at AOS covered range of topics from societal benefits to observing infrastructure
- Implementation & Optimization WG active at the intersection between system missions/requirements & implementation - including prioritization of essential variables



Private - public partnerships & collaboration with industry

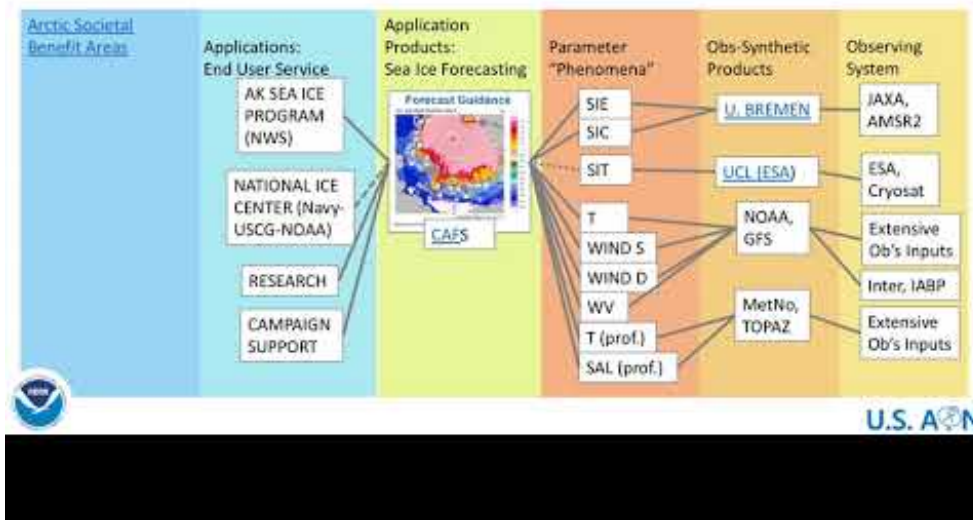
- Implementation WG explored fostering of public-private partnerships to drive innovation & sustain observations
- Early stages of collaboration need to identify whether researchers want development & access to equipment or access to data that meet specific requirements
- Consortium approaches with multiple industry and research institution partners need to be advanced to better integrate features, sensors & infrastructure

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Observing frameworks

- Modified Global Ocean Observing System Framework for Ocean Observations ([GOOS F00](#)) served as template to explore coordination of disparate observations

Example for mapping of observing “value tree” related to sea ice forecasting (US AON Sea Ice Forecasting Task Team)



<https://youtu.be/igwyp8ztbt8>

- Other relevant frameworks are Value Tree Analysis ([STPI & SAON, 2017](#)) & INTAROS Assessment (Pirazzini et al., 2018)

Template for tabular assessment – CAFS Experimental Forecast System

Name of the observing system:

Societal benefits	Applications	Phenomena	Essential variable	Observing platform	Observing network	Data repository
Weather/Climate, Infrastructure & Operations, Natural Resources, Fundamental Understanding	Sea Ice Forecasting	Sea Ice Conc. Sea Ice Ext. Sea Ice Th. Temp. Wind S Wind D. Water Vap, Ocean T profile Ocean Salinity profile	Sea Ice	AMSR2 Cryosat2 Various	GTS	Various

Scores from 1 to 6 (low – 1; high – 6)

In color scale: score 1, score 2, score 3, score 4, score 5, score 6.

Sustainability	Implementation costs
Scientific and expert support	Costs for installation
Funding support	Costs for maintenance and development
Site representativeness	Costs for data management

- Next a knowledge map covering key areas of the societal benefit to observing system implementation space will need to be prepared

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Key conclusions & AOS Call to Action

From AOS 2018, the Arctic Science Ministerial, and engagement of SAON Board & Committees the following needs & actions emerge:

- A comprehensive, international inventory of the current set of Arctic systems, sensors, networks & surveys
- A knowledge map that connects observation inputs to societal benefits; serves as guide to assess & prioritize new observations, data management needs & development of products & services
- Creation of an international team of experts working under SAON to complete tasks, in particular generate an Arctic observing roadmap that builds on existing assessments & identifies gaps
- Transform AOS from a biennial meeting into an ongoing process that feeds into SAON activities, in particular the Committee on Observations & Networks (CON)
- Initiate within different partner nations support & action to stand up an implementation & optimization task force to address actions outlined above

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Sustained observations: Alaska Native expertise



- Video drawing on AOS 2018 and Arctic Science Ministerial to illuminate motivation, potential outcomes & Call to Action through an Indigenous experts lens

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