Title
Dr.
Last Name of PRESENTING Author
Jawak
Middle Name or initials of PRESENTING Author
D.
First Name of PRESENTING Author
Shridhar
Email of PRESENTING Author
shridhar.jawak@gmail.com
Country of PRESENTING Author
India
Institution, organization or general address
National Centre for Antarctic and Ocean Research, Goa, India
Theme
Sub-Theme 1: The need for the Observing System
Author list (in order)
*Jawak, Shridhar; Wankhede, Sagar; Luis, Alvarinho
Poster title (brief)
Need of monitoring glacier facies of Arctic glaciers using high resolution remote sensing data
Abstract - text box
Glaciers can be called keyholes to the climate. A glacier responds to its climate by undergoing changes, which are studied for several purposes including climate change, hydropower production, and natural hazard forecasting. Mass balance models are the idealized methods for studying such glaciological changes. However, these studies often rely on measurements such as in situ discharge data or measured mass balance. These measurements neglect the spatial small-scale variability on a glacier and thus, are insufficient for calibration and validation of distributed mass balance models. An analysis of glacier facies presents an opportunity to include small-scale spatial variability into these models. Facies are direct representatives of the state of a glacier and an assessment of the number, kind and volume of available facies can be translated to the overall health of the glacier. Remote sensing presents an opportunity for studying glaciers that provide little to no access. Very high-resolution satellites allow detection of minute spatial differences resulting in precise facies delineation and thus, can generate data for void sites of distributed mass balance models. The Arctic contains several physically monitored glaciers

but a large number of small and large glaciers remain unaccessed. Continuous operational monitoring of these glaciers using very high-resolution sensors will create a database that can be used to accurately calibrate distributed mass balance models. These models can then be paired with meteorological data to determine the climatic variation. Such a monitoring system will boost current Arctic glaciological studies as well as enable improvement of current study models.

Title
Dr.
Last Name of PRESENTING Author
Buch
Middle Name or initials of PRESENTING Author
First Name of PRESENTING Author
Erik
Email of PRESENTING Author
erik.buch@eurogoos.eu
Country of PRESENTING Author
Denmark
Institution, organization or general address
EuroGOOS, Avenue Louise 231, 1050 Brussels, Belgium
Theme
Sub-Theme 1: The need for the Observing System
Author list (in order)
Erik Buch, Michael Tjernström, Shaun Quegan, Andreas Ahlstrøm, George Heygster, Thomas Soltwedel, Finn Danielsen, Geir Ottersen, Truls Johannesen, Stein Sandven
Poster title (brief)
INTAROS mapping of requirements for observations in the Arctic
Abstract - text box
The ambition of INTAROS Initial Requirement Mapping was to define the high-level requirements of an integrated Arctic Observing System (iAOS) based on identification of the major societal drivers of a sustained observing system in the Arctic region, driven by issues affecting the entire area and expressed through international agreements (i.e. climate, environment, biodiversity, sustaining ecosystem services, improving the livelihoods of indigenous and local communities, support to maritime safety, etc.).

It was decided to focus on the individual thematic areas - meteorology, terrestrial, cryosphere, sea ice and ocean – separately with the purpose of capturing the special requirements, phenomena and essential variables to observe within each of them. It is very well known that these thematic areas are closely interconnected and have different levels of maturity in scientific understanding of the phenomena, definitions of essential variables and observing capacity. It is therefore a big challenge to INTAROS to use the collected information to design an integrated

multipurpose and multiplatform observations system to optimises efforts and costs.

The detailed analysis of phenomena and observation requirements for the entire region given in this report reveals the following conclusions:

- The Arctic is a region very sensitive to environmental changes. There is a very close interrelation and delicate balance between the five thematic areas (atmosphere, terrestrial, cryosphere, sea ice and ocean). This has a great impact on physical, chemical and biological processes in the area.
- Due to the hostile environment, there is a great lack of basic observations in the Arctic that can support scientific understanding of key processes. Most of the existing data are collected via time limited research project. This lack of process knowledge is reflected in big errors in forecasting models – operational as well as climate.
- It is therefore crucial to establish a sustained Integrated Arctic Observing System that in the short timeframe can increase fundamental scientific and in a longer timeframe can secure a robust basis for decision making to the benefit of the people living in the Arctic, the environment, the broader international society, and commercial activities.
- It is foreseen that a future Arctic observation system will rely heavily on satellite observations supplemented more traditional in-situ platforms.
- In all countries around the Arctic, there are community based observing systems that represent a strong potential for further development. Existing activities shall form the natural basis for a future more intensive and integrated sustainable Arctic Observing System.

Title

Last Name of PRESENTING Author

Koyama

Middle Name or initials of PRESENTING Author

First Name of PRESENTING Author

Tomoko

Email of PRESENTING Author

koyama.tomoko@nipr.ac.jp

Country of PRESENTING Author

Japan

Institution, organization or general address

National Institute of Polar Research

Theme

Sub-Theme 1: The need for the Observing System

Author list (in order)

*Koyama, Tomoko; Stroeve, Julienne

Poster title (brief)

Greenland precipitation analysis from the Arctic System Reanalysis (ASR): 2000-2012

Abstract - text box

The Arctic System Reanalysis (ASR) is a recently developed, multi-agency, university-led retrospective analysis (reanalysis) of the Greater Arctic. Monthly precipitation data over Greenland derived from ASR version 1 (ASRv1) are compared with gauge-based precipitation measured by the Danish Meteorological Institute (DMI) and precipitation retrieved from the Precipitation Occurrence Sensor System (POSS) at Summit. The ASRv1 precipitation generally agrees with the corrected DMI gauge-based precipitation measured at coastal or near-coastal stations in Greenland. In contrast, ASRv1 precipitation at Summit, i.e., in a higher continental environment, is overestimated compared with the POSS observations. Statistical analysis is performed in order to examine features of the collection of information including seasonality. Utilizing a boxplot approach, similar seasonal variability in ASRv1 precipitation is found among stations that are geographically close. The interquartile ranges (IQRs) of DMI precipitation show similar variations to those of ASRv1, but the variability of the median values is not always comparable. The North Atlantic Oscillation (NAO) index, which is associated with changes in temperature and rainfall in Europe and North America, and ASRv1 precipitation are moderately correlated over northern Greenland, the North

Atlantic, and the Greenland Sea regions (0.32-0.49). It is suspected that local wind events have a larger influence on precipitation where smaller correlations occur. Suggested future work to understand discrepancies between ASRv1 and DMI precipitation fields in Greenland coastal regions is to include case studies of local wind events and corresponding precipitation variations utilizing in-situ measurements during both strong positive and negative NAO phases. At high-altitude and inland areas, further observations are needed to confirm the ASRv1 overestimation.

Title

Last Name of PRESENTING Author

Bochkarev

Middle Name or initials of PRESENTING Author

First Name of PRESENTING Author

Nikita

Email of PRESENTING Author

nikboch@list.ru

Country of PRESENTING Author

Russia

Institution, organization or general address

Yakut Scientific Centre, Siberian Branch of the Russian Academy of Sciences

Theme

Sub-Theme 1: The need for the Observing System

Author list (in order)

Bochkarev Nikita*

Poster title (brief)

Market behavior and competition environment in Yakutia, Russian North

Abstract - text box

Russian North, including Republic Sakha (Yakutia), is the only Arctic region without true market economy, especially when compared with others developed Arctic economies. It is widely known that Russian state experiences strong lack of competition in many aspects. However, the situation is even worse in the North due to the remoteness, small population, hence attractiveness for business. Besides, substantial part of former soviet people still does not know what the free market and related issues are.

In recent years, the opportunities of the Russian authorities for social protection significantly decreased. Presumably, in these conditions the Arctic people are about to face the need for more self-sufficiency, particularly to increase the entrepreneurial activity.

Within the framework of the interdisciplinary project “Comparative analysis of the sources of incomes and the problem of poverty in traditional communities of northern regions of Russia, the USA and Canada” (granted by Russian Foundation for Basic Research, 2017-2019) we aim at a comprehensive study of the phenomenon of poverty among native communities of the northern regions and the development of effective mechanisms to overcome it. The part of the research is a study of factors

affecting the income and the costs of local people. We are striving to use the wide range of methods, including non-standarts such as game theory tools, assessing market behavior. We are also conducting surveys and interviews of indigenous residents, in order to compare local people self-awareness in 3 Arctic countries.

Title
Dr.
Last Name of PRESENTING Author
Murray
Middle Name or initials of PRESENTING Author
S
First Name of PRESENTING Author
Maribeth
Email of PRESENTING Author
murraym@ucalgary.ca
Country of PRESENTING Author
Canada
Institution, organization or general address
Arctic Institute of North America, University of Calgary
Theme
Sub-Theme 2: Implementing and Optimizing a pan-Arctic Observing System
Author list (in order)
Murray, Maribeth S., *Christoffersen Vossepoel, S., Pulsifer, P., Arthurs, D., Parrott, J., Nickels, S., Liang, S., Barnard, C., Chu, B., Carpendale, S., Duguay, C., Hebert, C., Forest, A., Friddell, J., Maloley, M., Papykiriakou, T., Parkes, G., Scassa, T., Taylor, F., and Vincent, W.

Poster title (brief)
The Canadian Consortium for Arctic Data Interoperability: A New Data Network Initiative for Canada

Abstract - text box
The Canadian Consortium for Arctic Data Interoperability is developing an Arctic Research Data Infrastructure predicated on a vision to support and grow a research community that fully engages Inuit; that isproperly governed so as to enhance individual, local, regional, national, and international initiatives in data management and research; and that builds capacity across a network of linked data centres with common standards, practices, tools, and expertise. It will facilitate data discovery and description, enabling data to be shared across systems for upload, analysis, and visualization. It will support efficient, effective use of data, allowing Canada to better realize the benefits of our decades of investment in Arctic research and observation. It will support Inuit self-

determination, enabling informed actions for managing decision making around multiple issues. It will support operational activities by making information from space-based technologies more accessible and usable for those charged with search and rescue, ensuring safe transportation and protection of life, environment, and infrastructure in Canada's Arctic. It will support the flow of necessary information for Arctic policy development and, where there are economic opportunities, provide access to needed data for ensuring sustainable development, improving monitoring, and minimizing environmental impact.

Title
Dr.
Last Name of PRESENTING Author
Fenty
Middle Name or initials of PRESENTING Author
Gouverneur
First Name of PRESENTING Author
Ian
Email of PRESENTING Author
Ian.Fenty@jpl.nasa.gov
Country of PRESENTING Author
United State of America
Institution, organization or general address
NASA Jet Propulsion Laboratory/California Institute of Technology
Theme
Sub-Theme 2: Implementing and Optimizing a pan-Arctic Observing System
Author list (in order)
Fenty*, Ian and Willis, Joshua

Poster title (brief)
Autonomous Profiling Floats May Be Useful for Sustained Arctic Ocean Observations
Abstract - text box
Melting of the Greenland Ice Sheet represents a major uncertainty in projecting future rates of global sea level rise, a critial climate issue that will affect hundreds of millions of people in the 21st century and beyond. Much of the present uncertainty about future sea level rise is related to a lack of knowledge about how ocean warming will impact Greenland's marine-terminating glaciers. Since 2016, NASA's Oceans Melting Greenland mission (OMG) has been making extensive measurements of ocean properties near Greenland glaciers using airborne expendable instruments (AXCTDs). Each summer, each of our ~250 AXCTDs provides a single vertical profile of ocean temperature and salinity in the ocean's upper 1000 meters. In 2017, we added airborne-deployable autonmous robotic ocean profiling floats (ALAMOs) to our instrument portfolio. ALAMOs are 10X more expensive than AXCTDs but have the potential to collect up to 200X more vertical profiles of ocean properties during their 1-2 year lifetimes. Importantly, ALAMOs continue to collect ocean data when

trapped beneath sea-ice which is normally only possible using expensive instrumented oceanographic moorings, ice-breaking vessels, or by lowering instruments through holes drilled in the sea-ice. Being far less expensive and easier to deploy over large areas than these alternatives, we propose that ALAMOs (or similar autonomous robots) should be considered as cost-effective additions to any long-term, sustained Arctic Ocean Observing System.

Title
Dr.
Last Name of PRESENTING Author
Nassar
Middle Name or initials of PRESENTING Author
First Name of PRESENTING Author
Ray
Email of PRESENTING Author
ray.nassar@canada.ca
Country of PRESENTING Author
Canada
Institution, organization or general address
Environment and Climate Change Canada
Theme
- Sub-Theme 2: Implementing and Optimizing a pan-Arctic Observing System
- OTHER - Topics relevant to Arctic Observing

Author list (in order)
Nassar, R*; McLinden, C; Sioris, C; Mendonca, J; McElroy, CT; Garand, L; Adamovic, M; Adams, C; Boisvenue, C; Drolet, G; Grandmont, F; Johnson, M; Jones, DBA; Kolonjari, F; Lantagne, SM; Martin, RV; Miller, CE; Moreau, L; O'Neill, N; Polavarapu, S; Rochon, Y; Simpson, WR; Strong, K; Tamminen, J; Trishchenko, AP; Vaziri, Z; Walker, KA; and Wunch, D
Poster title (brief)
AIM-North: the Atmospheric Imaging Mission for Northern regions
Abstract - text box
Observing the Arctic is important, but maintaining observation networks can be challenging due to its large area, remoteness and harsh environment. Satellite observations can play a key role in an Arctic observing system, but they have their own challenges. Most Earth observing satellites use a Low Earth Orbit (LEO), which allows observations of the polar regions, but with infrequent revisits (days to weeks). Geostationary (GEO) satellites have an equatorial orbit and can give much more frequent revisits (multiple times per day) for latitudes up to ~50-60°N/S, but cannot view the Arctic. The Canadian government has studied Highly Elliptical Orbit (HEO) satellite mission possibilities for many years, since the HEO vantage point enables 'quasi-geostationary' observations of northern regions like the Arctic. Here we present AIM-North (www.aim-north.ca), an innovative new HEO mission concept under

consideration by the Canadian Space Agency (CSA) that would provide observations of greenhouse gases, air quality gases and solar induced fluorescence from vegetation with unprecedented frequency, density and quality for the north. Observations would span land from ~40-80°N with 3x3 km2 pixels, every ~60-90 minutes during daylight. Although clouds would reduce coverage somewhat, intelligent pointing can help to avoid clouds and reduce data loss. AIM-North observations, multiple times per day at a given location, would assist in understanding and quantifying the emission of CO2 and CH4 from permafrost thaw, Arctic greening and the uptake of atmospheric CO2, and the emission and transport of pollutants from increasing northern resource extraction and transport, which impact both climate and air quality.

Title
Mr.
Last Name of PRESENTING Author
Sandven
Middle Name or initials of PRESENTING Author
First Name of PRESENTING Author
Stein
Email of PRESENTING Author
stein.sandven@nersc.no
Country of PRESENTING Author
Norway
Institution, organization or general address
Nansen Environmental and Remote Sensing Center
Theme
Sub-Theme 2: Implementing and Optimizing a pan-Arctic Observing System
Author list (in order)
*Sandven, Stein; Sagen, Hanne; Buch, Erik; Pirazzini, Roberta; Gustavson, David; Beszczynska-Möller, Agniseszka; Voss, Peter; Danielsen, Finn; Iversen, Lisbeth; Gonçalves, Pedro; Hamre, Torill; Ottersen, Geir; Sejr, M; Zona, Donatella and Dwyer, Ned.
Poster title (brief)
Building multidisciplinary Pan-Arctic observation systems: the INTAROS project
Abstract - text box
The objective of the INTAROS project (Integrated Arctic Observation System) under H2020 is to develop multidisciplinary Arctic observation systems that serve different users and application areas. The hypothesis is that platforms and instruments providing multidisciplinary data (atmosphere, ocean, cryosphere and terrestrial sciences) are more cost-effective and sustainable compared to single-purpose systems. Satellite earth observation (EO) data, which plays an increasingly important role in such observing systems, need to be accompanied by in situ measurements from various other observation platforms. In situ observing systems are much more limited due to logistical and cost constraints. The sparseness of in situ data is therefore the largest gap in the overall observing system in the Arctic. An integrated observing system should include data production from a network of platforms as well as data storage in distributed databases and seamless access to the data. The

INTAROS project also develops tools for data analysis, transformation and visualization, including geo-statistical methods for interpolation of spatiotemporal datasets. The evolution into a sustainable Arctic observing system requires coordination, mobilization and cooperation between the existing European and international infrastructures (in-situ and remote including space-based), the modeling communities and other relevant stakeholders.

Title
Dr.
Last Name of PRESENTING Author
Beszczynska-Moeller
Middle Name or initials of PRESENTING Author
First Name of PRESENTING Author
Agnieszka
Email of PRESENTING Author
abesz@iopan.gda.pl
Country of PRESENTING Author
Poland
Institution, organization or general address
Institute of Oceanology PAS
Theme
Sub-Theme 2: Implementing and Optimizing a pan-Arctic Observing System
Author list (in order)
Beszczynska-Moeller*, Agnieszka; Sandven, Stein; Sagen, Hanne; Voss, Peter; Ahlstroem, Andreas; Johannessen, Truls; Soltwedel, Thomas; and Goeckede, Mathias
Poster title (brief)
Enhancement of in situ observing systems in the Arctic under INTAROS
Abstract - text box
The Integrated Arctic Observation System (INTAROS) is a research and innovation action under Horizon2020. INTAROS aspires to increase the temporal and geographic coverage of in situ observations and add new key geophysical and biogeochemical variables in selected regions of the Arctic. By using a combination of mature and new instruments and sensors in integration with existing observatories, INTAROS aims to fill selected gaps in the present-day system and build additional capacity of pan-Arctic monitoring networks.
Three reference sites have been selected as key locations for monitoring ongoing Arctic changes: Coastal Greenland, paramount for freshwater output from the Greenland ice sheet; North of Svalbard (shelf to deep basin) - the hot-spot for ocean-air-sea ice interactions, and heat and biological energy input to the European Arctic; and Fram Strait - the critical gateway for exchanges between the Arctic and the World oceans. Two distributed observatories: for ocean and sea ice and for terrestrial and atmospheric measurements will be extended with multidisciplinary

observations, still missing from the central Arctic and remote coastal areas. New sensors, integrated platforms and experimental set-ups will be implemented during a two-year long deployment phase (2018-2020) with an aim for sustained use in a future integrated Arctic Observing System. New observations will be used for integration of new data products, demonstration studies and stakeholder consultations, and contribute to ongoing and future long-term initiatives (e.g. OSPAR, SAON, YOPP).

Title
An Arctic Aerosol size distribution dataset
Last Name of PRESENTING Author
Dall´Osto
Middle Name or initials of PRESENTING Author
First Name of PRESENTING Author
Manuel
Email of PRESENTING Author
dallosto@icm.csic.es
Country of PRESENTING Author
Spain
Institution, organization or general address
Institute of Marine Science, National Research Spanish Centre (ICM-CSIC)
Theme
Sub-Theme 2: Implementing and Optimizing a pan-Arctic Observing System
Author list (in order)
*Dall´Osto, Manuel; Tunved, P; Stroam, J; Krejci, R; Beddows, D; Harrison, Roy; Lupi, A; Mazzola, M; Vitale, V; Becagli, S; Traversi, R; Udisti, R; Asmi, E; Massling, A; Skov, H, and Yoon, YJ
Poster title (brief)
Merging major multiplatform field campaigns and a long term monitoring network are essential to develop and constrain numerical models of atmospheric new particle formation
Abstract - text box
This work highlights some of the benefits which can be gained from coordinated networks of Arctic observations. Not only do these yield novel insights into fundamental processes, they also provide the data essential to develop and constrain numerical models of atmospheric new particle formation. The significant costs associated with coordinated multiplatform atmospheric observational strategies return vastly more information than each of the platforms operating independently. Particle Size Distributions (PSD) can be analyzed via K-means cluster analysis allowing to identify different aerosol categories from a single monitoring site. PSDs can also analyzed using a receptor model - Positive Matrix Fractionation (PMF). PMF can separate contributions to the PSD, whereas K-means clustering can describe the possible different combinations of PSD. Our work shows that major multiplatform field campaigns and a long term monitoring network are essential to address important research questions. Our aim is

to continue to collect aerosol size distributions from both long term and intensive field studies (including ship based measurements), because they are a critical variable for studying the evolution of ultrafine particles in the atmosphere. We aim to continue to use such techniques and continue expanding an Arctic aerosol size distribution database.

Title

Last Name of PRESENTING Author

Biebow

Middle Name or initials of PRESENTING Author

First Name of PRESENTING Author

Nicole

Email of PRESENTING Author

nicole.biebow@awi.de

Country of PRESENTING Author

Germany

Institution, organization or general address

Alfred Wegener Institute, Helmholtz Center for Polar and Marine Research

Theme

Sub-Theme 2: Implementing and Optimizing a pan-Arctic Observing System

Author list (in order)

Biebow, Nicole* and Veronica Willmott

Poster title (brief)

ARICE - Making the Arctic Ocean accessible for excellent science

Abstract - text box

Retreating sea ice and warming waters create opportunities and challenges that have given rise to an unprecedented political and economic interest in the Arctic Ocean over the past decade. Increased European funding of polar research demonstrate how critical science-informed decision-making has become in the face of a changing Arctic. These investments have enabled scientists to contribute substantially to understanding the ongoing processes. However, compared to the knowledge base needed for effectively predicting the effects of climate change, the available datasets are still insufficient.

The new EU infrastructure project ARICE joins the efforts of 14 partners from 12 different countries to provide the Arctic research community with better capacities for marine-based observations in the Arctic Ocean. ARICE will develop strategies to ensure the optimal use of the existing polar research vessels and will work towards an International Arctic Research Icebreaker Consortium which shares and jointly funds operational ship time on the available Research Icebreakers.

ARICE will also provide fully-funded transnational access to six key European and International Research Icebreakers for European and International researchers, solely based on the scientific excellence of the

submitted proposals. ARICE will amongst other expeditions, give scientists access to the German research icebreaker Polarstern during the MOSAiC expedition. MOSAiC stands for Multidisciplinary drifting Observatory for the Study of Arctic Climate and is the first year-round expedition into the central Arctic exploring the Arctic climate system. ARICE is also partnering with the maritime industry on a “ships and platforms of opportunity” programme and will improve the research icebreakers’ services by exploring into new key technologies which could lead to an improvement of ship-based and autonomous observations in the Arctic Ocean.

Title
Korean contribution in the Pacific Central Arctic Ocean (CAO) for implementing and optimizing a pan-Arctic observing system
Last Name of PRESENTING Author
Kang
Middle Name or initials of PRESENTING Author
First Name of PRESENTING Author
Sung-Ho
Email of PRESENTING Author
shkang@kopri.re.kr
Country of PRESENTING Author
Korea
Institution, organization or general address
Korea Polar Research Institute
Theme
Sub-Theme 2: Implementing and Optimizing a pan-Arctic Observing System
Author list (in order)
Sung-Ho Kang
Poster title (brief)
Korean contribution in the Pacific Central Arctic Ocean (CAO) for implementing and optimizing a pan-Arctic observing system
Abstract - text box
Sea ice-covered waters in the Pacific Central Arctic Ocean (CAO) is a major study site of the Korean Arctic program, regularly visited by its flagship icebreaker, IBRV Araon. Annually conducted ocean-going expeditions occupy a number of oceanographic stations and place a few moorings, focusing on baseline oceanography, sea ice dynamics and lower trophic level. Mid trophic level and fish, however, are yet to be the principal targets of the project. But fisheries potential in the Central Arctic Ocean and the basis for its sound management are of interest to Korea, as a party to the recent negotiation of the proposed fisheries agreement in the CAO. Korea-Arctic Ocean Observing System (K-AOOS) program (2016-2020) has provided a platform of international cooperation, welcoming numerous foreign scientists on board and providing instrument deployment opportunities. K-AOOS advocates a data policy that promotes a wide sharing of validated and calibrated data. K-AOOS takes a view that a dedicated scientific leadership in the CAO is warranted that can coordinate multi-national and multi- partner field expeditions and

maximize the scientific output. Repeated transect observations and time-series records from icebreaker Araon and moorings are to investigate the relationship between the amount of heat that this region of Pacific Central Arctic Ocean (CAO) releases into the atmosphere, the enhanced mixing of both surface and intermediate waters in response to increased storms, increased ocean absorption of solar radiation, and the consequent impacts on the changing weather and climate of the Northern Hemisphere. Araon's Arctic cruises, usually conducted from August to September, focused on investigating water column structure and processes around the Chukchi Borderland and East Siberian Sea that is a region undergoing rapid transition in both sea ice conditions and sea water temperatures. In addition, sea ice dynamics and sea ice ecosystem analysis are included in the research program to identify key environmental parameters (physical and biogeochemical) in rapid transition due to the sea-ice decrease in the western Arctic Ocean (Chukchi and East Siberian Seas). Currently Korea participates in the Pacific Arctic Group (PAG)-endorsed Distributed Biological Observatory (DBO) and Pacific Arctic Climate and Ecosystem Observatory (PACEO) networks by occupying the DBO3 line in the southern Chukchi Sea as Araon transits northward to the core study area in the Chukchi Borderland region.

Title
Coordinated Arctic Acoustic Thermometry Experiment
Last Name of PRESENTING Author
Sagen
Middle Name or initials of PRESENTING Author
First Name of PRESENTING Author
Hanne
Email of PRESENTING Author
hanne.sagen@nersc.no
Country of PRESENTING Author
Norway
Institution, organization or general address
Nansen Environmental and Remote Sensing Center
Theme
Sub-Theme 2: Implementing and Optimizing a pan-Arctic Observing System
Author list (in order)
Sagen, Hanne; Matthew Dzieciuch; Langhaug, Helene; Worcester, Peter; Granskog, Mats; Sandven, Stein; Proshutinsky, Andrey; Heimbach, Patrick; Dushaw, Brian; Storheim, Espen; Geyer, Florian, Hamre, Torill, Yamakawa, Asuka
Poster title (brief)
Coordinated Arctic Acoustic Thermometry Experiment (CAATEX)
Abstract - text box
Moored multipurpose acoustic networks have been implemented in a sequence of year-long research experiments in the Fram Strait and in the Beaufort Sea. The technological readiness level is high, while the data management of passive acoustics and acoustic thermometry is not very well developed. The acoustic data has not yet been included in the common data repositories because standards and formats have been missing. This is currently addressed and under development within the INTAROS project (Integrated Arctic Observation System). The previous experiments have all been implemented in the Marginal Ice Zone, but new initiatives for establishing acoustic networks in the interior of the Arctic have begun. Recently the Research Council of Norway and Office of Naval Research funded the Coordinated Arctic Acoustic Thermometry Experiment (CAATEX). The primary objective of CAATEX is to use acoustic thermometry to estimate the heat content of the Arctic Ocean to benchmark how warm the Arctic Ocean is and to improve our

understanding of uncertainties in ocean heat content estimates from climate models. The CAATEX experiment will start in September 2019 and recovered in 2020 as part of the MOSAIC program.

Title

Last Name of PRESENTING Author

Eaton

Middle Name or initials of PRESENTING Author

First Name of PRESENTING Author

Claire

Email of PRESENTING Author

cke1002@wildcats.unh.edu

Country of PRESENTING Author

United States

Institution, organization or general address

University of New Hampshire

Theme

Sub-Theme 2: Implementing and Optimizing a pan-Arctic Observing System

Author list (in order)

Eaton, Claire*; Ashcraft, Catherine

Poster title (brief)

Science Diplomacy in the Atlantic Arctic: Assessing Potential Expansion of the Distributed Biological Observatory (DBO) to the Baffin Bay-Davis Strait Area

Abstract - text box

Never has the need for international scientific cooperation in polar regions been more urgent. Climate change is impacting marine ecosystems across the globe at an astounding rate, but nowhere is affected more severely than the Arctic. Research teams from countries across the globe are now working to gather insight into current trends and future scenarios related to physical and biological change. Despite growing interest among both the scientific community and national governments, those conducting marine research in the Arctic face a number of technical, logistical, political, and resource-related challenges. These challenges present a serious barrier to research efforts that could stymie scientific progress and related applications (e.g., climate change mitigation, biodiversity conservation, etc.). In response, scientists and governments are developing and expanding science diplomacy efforts, or facilitation of scientific research through international cooperation. A current example of such efforts is the Distributed Biological Observatory (DBO). The DBO represents a case in which high-level, agency-to-agency cooperation surrounding Arctic research has successfully led to accumulation of

critically important biological and oceanographic data that can be used to inform environmental governance, regional political and economic strategy, and ongoing scientific research efforts. The main objective of this research is to conduct a stakeholder analysis of relevant actors engaged in Arctic marine research and the DBO in order to characterize the parties involved, the key issues they find important, and their interests related to these issues in order to facilitate future expansions to new parts of the circumpolar system, such as the Baffin Bay-Davis Strait area.

Effects of Arctic sea-ice and biogeochemical drivers and storms on under-ice water fCO_2

Agneta Fransson[1], Melissa Chierici[2], Ingunn Skjelvan[3], Are Olsen[4], Philipp Assmy[1], Algot K. Peterson[4], Gunnar Spreen[5], Brian Ward[6]

[1]Norwegian Polar Institute, Fram Centre, Tromsø, Norway
[2]Institute of Marine Research, Tromsø, Norway
[3]Bjerknes Centre for Climate Research, Uni Research Climate, Bergen, Norway
[4]Bjerknes Centre for Climate Research, Geophysical Institute, University of Bergen, Bergen, Norway
[5]Institute of Environmental Physics, University of Bremen, Bremen, Germany
[6]AirSea Laboratory, School of Physics and Ryan Institute, National University of Ireland, Galway, Ireland

The ice cover in the Arctic Ocean has decreased during the last decades, manifested in particular as an extensive transition from thicker multiyear ice to thinner first-year ice. As the summer sea-ice cover is decreasing, larger areas with open water will be exposed to the atmosphere. This will have implications for the carbonate chemistry and sea-air carbon dioxide (CO_2) exchange. We present measurements of CO_2 fugacity (fCO_2) and estimates of the effects biogeochemical processes in under-ice water, driving the sea-air CO_2 fluxes. The data was obtained from January to June 2015 during the Norwegian young sea ICE (N-ICE2015) expedition, where the ship drifted with four different ice floes and covered the deep Nansen Basin, the slopes north of Svalbard, and the Yermak Plateau. This unique winter-to-spring data set includes the first winter-time under-ice water fCO_2 observations in this region. The observed under-ice fCO_2 was undersaturated relative to the atmospheric fCO_2. Although the sea ice partly prevented direct CO_2 exchange between ocean and atmosphere, frequently occurring leads and breakup of the ice sheet promoted sea-air CO_2 fluxes. The maximum sea-air CO_2 fluxes occurred during storm events in February and June. In winter, the main drivers of the change in under-ice water fCO_2 were dissolution of $CaCO_3$ (ikaite) and vertical mixing. In June, in addition to these processes, primary production and sea-air CO_2 fluxes were important.

Title
Ms.
Last Name of PRESENTING Author
Gress Hansen
Middle Name or initials of PRESENTING Author
First Name of PRESENTING Author
Simone
Email of PRESENTING Author
simonegress@hotmail.com
Country of PRESENTING Author
Denmark
Institution, organization or general address
University of Copenhagen
Theme
Sub- Theme 3: Operating Observing Systems and Networks
Author list (in order)
NORDECO (Nordic Agency of Development and Ecology) (Denmark), Snowchange Cooperative (Finland)

Poster title (brief)
An assessment of community based monitoring in the Arctic

Abstract - text box
The poster presents the results of my thesis work within community based monitoring (CBM) in the Arctic. I have performed fieldwork alongside the first ever Saami led restoration project in Finland, conducted an assessment of the characteristics of Arctic CBM programmes and analysed fish stock abundance data from a “best-example” CBM case study from Greenland, in order to conclude:

1. What are the general characteristics of Arctic CBM programmes?
2. What are the most distinguishing features of CBM compared to scientific monitoring?
3. Is there a difference in the format and the results between CBM data and scientific data?

This poster is relevant to the sub-theme 3 as it amongst other addresses CBM used to guide bottom-up management of fish stocks and other wildlife.

Additionally, this thesis work feeds into the big EU project INTAROS (Integrated Arctic Observation System) and will result in a joint meta-database of Arctic scientific and CBM programmes. Thus creating an easy accessible overview of both conventional and CBM monitoring programmes in the Arctic, hopefully bringing together these two approaches.

Background: Science-driven environmental monitoring is often challenged when trying to unravel the complexities of ecosystem dynamics, especially in the Arctic where field work is extraordinarily expensive and logistically difficult. Instead novel approaches are being developed to improve the monitoring of the Arctic environment. One of these approaches is community based monitoring (CBM) which integrates local and Indigenous knowledge with scientific knowledge. CBM has been found to cost-efficiently strengthen conventional science-driven monitoring while at the same time resulting in advantageous co-benefits for the local participants and communities.

Title
Dr.
Last Name of PRESENTING Author
Wood
Middle Name or initials of PRESENTING Author
R
First Name of PRESENTING Author
Wood
Email of PRESENTING Author
kevin.r.wood@noaa.gov
Country of PRESENTING Author
United States
Institution, organization or general address
Univ. of Washington, JISAO
Theme
Sub- Theme 3: Operating Observing Systems and Networks
Author list (in order)
Wood, Kevin R.; Calvin W. Mordy; Steven R. Jayne
Poster title (brief)
Air-Launched Autonomous Profilers in the Arctic
Abstract - text box
Seasonally ice-covered marginal seas are among the most difficult regions in the Arctic to observe. Physical constraints imposed by the variable presence of sea ice in all forms of growth and decay make sensing the ocean and air-sea-ice interface in this domain especially challenging. The inadequacy of observing systems hampers sea ice and weather forecast services in the region and is thought to be a major contributor to large uncertainties in modeling and related climate projections. The Arctic Heat Open Science Experiment helps fill this observation gap with innovative air-deployed autonomous floats and other near real-time weather and ocean-sensing systems. These capabilities allow continuous monitoring of the seasonally evolving state of the ocean, from initial melt in the spring, to autumn freeze-up and into the winter. ALAMO (Air-Launched Autonomous Micro-Observer) floats deployed in 2016 and 2017 have revealed in real time oceanographic features not otherwise observable. These include, for example, detection in the spring of thin layers of Atlantic Water on the central Chukchi continental shelf below the typical sampling depth of standard oceanographic moorings and CTD casts, and the presence of anomalous heat below the mixed layer in the autumn that likely impact sea

ice formation later in the season. Data collected by this project are distributed in near real-time on project websites and on the Global Telecommunications System (GTS), with the objective to provide timely delivery of observations for use in weather and sea-ice forecasts, for model and reanalysis applications, and to support ongoing research activities across disciplines. This research supports improved forecast services that protect and enhance the safety and economic viability of maritime and coastal community activities in Alaska. Data are free and open to all.

Title
Miss
Last Name of PRESENTING Author
Thomson
Middle Name or initials of PRESENTING Author
First Name of PRESENTING Author
Laura
Email of PRESENTING Author
lthomson@sfu.ca
Country of PRESENTING Author
Canada
Institution, organization or general address
8888 University Dr., Burnaby, BC V5A 1S6 CANADA
Theme
Sub- Theme 3: Operating Observing Systems and Networks
Author list (in order)
Thomson, Laura; Adams, Peter; Cogley, Graham; Ecclestone, Miles
Poster title (brief)
Multi-decadal glacier monitoring on Axel Heiberg Island, Nunavut
Abstract - text box
The Canadian Arctic Archipelago (CAA) hosts an area of glaciers and ice caps exceeding 140,000 km2. This large area of ice in combination with enhanced Arctic warming, which has exceeded 3°C since 1972 at the Eureka weather station, has resulted in the CAA becoming the largest contributor to global sea level rise outside the continental ice sheets. While remote sensing serves as a critical tool in determining the extent of glacier change across this large region, field-based observations of glacier dynamics and glacier-climate processes are essential for the prediction of future glacier stability.

White Glacier on Axel Heiberg Island, Nunavut, hosts one of Canada's longest glacier mass balance records (58 years) as well as numerous early studies during the 1960-1970s into polythermal glacier dynamics, englacial temperatures, and energy balance processes in the glacier accumulation and ablation areas. Recent work is endeavoring to determine how these key aspects of the glacier system are evolving under enhanced warming in recent decades using continuous dGPS observations, automatic weather stations, time-lapse camera techniques, and thermos-mechanically coupled modelling tools. We present both the historic and ongoing work

here, and welcome recommendations from the community for future research directions and potential collaborations.

Title
Dr.
Last Name of PRESENTING Author
Kaplin
Middle Name or initials of PRESENTING Author
First Name of PRESENTING Author
Nikita
Email of PRESENTING Author
kaplinik@bk.ru
Country of PRESENTING Author
Russian Federation
Institution, organization or general address
Indigenous Community Association in Evenkia
Theme
Sub- Theme 3: Operating Observing Systems and Networks
Author list (in order)
Nikita Kaplin
Poster title (brief)
Monitoring of Indigenous Law Enforcement in Evenkia, Russia
Abstract - text box
Nineteen native communities in the heart of Siberia have been united into the Arun (Revival) Association in 1989 to guide own destiny and sustain their traditional land use and lifestyle in the modern world. The same year, the International Labour Organization has adopted a vital international legal document – the ILO Convention No. 169. It really reflected hopes of all indigenous peoples in the world for their survival and the future self-determination. Two years later, Arun Association along with the other indigenous groups and activists in the Soviet Union has supported the establishment of the Russian Association of Indigenous Peoples of the North (RAIPON) – the leading organization of the indigenous movement and driver of the aboriginal cooperation in the Arctic Council. One of the important tasks in this networking process was targeting comprehensive knowledge about legal and political changes in their homeland. This knowledge is an important resource for native population to share and constantly apply in their struggle for the spiritual, cultural and economic development. The Arun Association is strongly interested in both assessment of the legal instruments and their operational use on land. This monitoring at the ground level provides information available for a range of other users, including researchers and policymakers.

Process of indigenous legislation development in Russia was most active during the democratization period when the state had demonstrated that the protection of the rights of indigenous peoples of the Russian Federation was one of the important constitutional tasks of a democratic and social state that had revised its Constitution and adopted Article 69 that guarantees the rights of the indigenous small-numbered peoples according to the universally recognized principles and norms of international law and international treaties. Ratification of the Framework Convention for the Protection of National Minorities (FCNM) by the Russian Federation should be also attributed to the achievements of this period under review. By 2001 there has been developed and adopted 3 principal Federal Laws:

- On the guarantees of the rights of small-numbered indigenous peoples (1999);
- On the general principles of the organization of the communities of small-numbered indigenous peoples of the North, Siberia and the Far East of the Russian Federation (2000);
- On the territories of traditional nature management of the small-numbered indigenous peoples of the North, Siberia and the Far East of the Russian Federation (2001).

These federal laws, in accordance with the Constitution, reflect the universally recognized principles and norms of international law and the international treaties of the Russian Federation, and establish the legal basis for guarantees of the original socio-economic and cultural development of the indigenous peoples, protection of their ancestral habitat, traditional way of life, husbandry and craftsmanship. Federal legislation is of primary and priority order (in view of the fact that the subject of this regulation is the rights and freedoms of a person and a citizen of the Russian Federation), while the regional legislation is complementary, concretizing human rights (specific issues of protection of rights and freedoms of the person and the citizen, rights of national minorities, natural environment and habitat and traditional way of life of the ethnic communities).

At the same time, after 2001 the stagnation in the Russian legal development has become highly noticeable, especially in the area of the indigenous laws' enforcement. In the last 15 years, the main positive achievements are to be considered only in the area of legislative settlement of the issue of registration of persons from the indigenous

peoples of the North, Siberia and Far East, leading a nomadic and (or) nomadic way of life, as well as the approval of the following documents:
a) List of indigenous peoples of the North, Siberia and the Far East of the Russian Federation;
b) List of places of traditional residence and traditional economic activity;
c) List of the types of traditional economic activity of the indigenous peoples;
d) Methods of calculating the losses affecting associations of the indigenous peoples of the North, Siberia and the Far East as a result of economic and other activities of organizations of all forms of ownership and individual entrepreneurs;
e) Rules of provision and distribution of subsidies from the federal budget to the regional budgets to support the economic and social development of the indigenous minorities of the North, Siberia and the Far East, as well as support for reindeer herding;

Still, in the law enforcement there is practice of silencing or ignorance of the provisions of the UN Declaration on the rights of indigenous peoples (2007); in the national legal relations there is lack of implementation of almost all important rights proclaimed by the ILO Convention 169 (not ratified by the Russian Federation): the right to choose its own priorities in the process of development; the right to participate in the preparation, implementation and evaluation of plans and programs that affect their interests; the right to preserve their own customs and institutions; ownership of the lands they traditionally occupy; the right to establish their own educational institutions etc.
Enforcement of the federal law “On territories of traditional nature use of the indigenous peoples of the North, Siberia and the Far East of the Russian Federation” was practically blocked – all attempts to register or approve the regional or local initiatives just failed at the federal level. Legislation researchers write about ‘imitation of legal intentions’ connected with regulation of aboriginal relations. Unfortunately, this becomes the rule in the state bodies, for example, the failure of specific federal ministries to launch a number of specific legal actions in the plan of activities of socio-economic development of the regions of the North, (e.g. development of the mechanism for harmonization and decision-making on the relationship between the indigenous minorities of the North and Economic; elaboration of a pilot project for the establishing by 2010

traditional land use areas of indigenous small-numbered peoples, preparation of proposals for the position of an authorized representative of the indigenous minorities of the North and a plan of action for the implementation of the concept of sustainable development of indigenous peoples). Acute conflicts on resource distribution in the regions and land use at the territories where indigenous small-numbered peoples of the North, Siberia and the Far East live require urgent measures for preparation of legal acts providing their priority access to the hunting grounds and quotas on hunting animals and aboriginal fishing. At the regional level it is necessary to regulate rights in the sphere of renewable natural resources and an organization of land use and administration in the places of residence and economic activity of indigenous peoples, to establish model territories of traditional nature use both at local and regional levels.

However, attempts, contrary to the requirements of the Russian Constitution and international standards, continue to block the domestic policy of granting special rights to national minorities, although at the international level Russia consistently condemns any manifestations of discrimination against ethnic minorities. Additionally, ignorance of judges and other lawyers in the courts (partly because of lack of legal institutions and the system of advanced professional training on indigenous rights) distorts the basis of aboriginal legislation, and causes its interpretation and application ignoring the local situation in the indigenous communities, with no regard of their culture, customs and traditions. Taking into consideration all these circumstances, it is necessary, through regional regulation and law enforcement, to ensure the binding of the federal legal standard of rights to specific legal relations, taking into account the specific situation of the respective ethnic communities.

The objectives of the on-going monitoring are as follows:

• Supervision of compliance with legislation on indigenous rights shall become one of the special tasks of the prosecutor's office;

• The courts, by cases involving small-numbered indigenous peoples of the North, shall took into account their status, customs and traditions, relying on the opinion of experts and authorized representatives to ensure the correct interpretation of the proceedings, affected facts, relations and phenomena of cultural and anthropological specificity;

• Citizens from among the indigenous peoples and their associations shall be able to defend their special rights as derivatives of the fundamental

rights and freedoms of citizens in the Constitutional Court of the Russian Federation, as well as in constitutional courts of the subjects (regions) of the Russian Federation (in the Republic of Sakha (Yakutia), where such a court has been operating for over 20 years, its role in defending the rights of the northern peoples is very noticeable);
• The Human Rights Ombudsman in the Russian Federation has to follow the practice of respecting the rights of the indigenous minorities of the north and reflect it in the annual reports (unfortunately this only happened in 2001, 2002 and 2011); there might be a need to establish an institution of the Ombudsman for the Rights of indigenous peoples in Russia;
• The constituent entities (regions) of the Russian Federation, which are home to the small-numbered indigenous peoples of the North, are to establish the position of Commissioner for the rights of these peoples, taking into account that such a post is regarded as a model, based on the experience of the Commissioner for the Rights of the indigenous peoples in Krasnoyarsk Kray, Russia;
• Representatives of small indigenous peoples and officials shall have more opportunities to better understand and apply indigenous legislation. This could be facilitated by the publication of relevant collections of legal acts, court decisions, commentaries to laws, teaching courses (Aboriginal Law) in law universities, in the system of professional advancement of judicial specialists, state and municipal employees (at least in the regions of the North), legal education of indigenous leaders and activists. The Internet networks and possibilities shall be fully utilized for the dissemination of legal information and the relevant case studies.
The on-going monitoring in Evenkia is geared primarily for practitioners to use, recognizing the overwhelming number of legal problems on land that currently exist and lack of legal support in the indigenous communities. Based on this monitoring, Evenk communities are able
● to document problems at specific locations arising from law enforcement practice, and also to share solutions. Shared resources can be in the form of published documents or videos and photos.
● to connect through an interactive forum for discussion, solution finding, and problem identification. These public forums can be used for effective research and policy that is sourced from on-the-ground witnesses.
● to explore problems and solutions of other Arctic communities. The monitoring outcomes provide Arctic communities with solution-finding tools to community problems that stem from positive legal actions.

- to initiate legal actions and improve situation on site.

Title
Dr.
Last Name of PRESENTING Author
Drummond
Middle Name or initials of PRESENTING Author
R
First Name of PRESENTING Author
James
Email of PRESENTING Author
james.drummond@dal.ca
Country of PRESENTING Author
Canada
Institution, organization or general address
Dalhousie University, Department of Physics and Atmospheric Science
Theme
Sub- Theme 3: Operating Observing Systems and Networks
Author list (in order)
PEARL Science Team
Poster title (brief)
tmospheric Research at the Polar Environment Atmospheric Research Laboratory (PEARL)
Abstract - text box
The Polar Environment Atmospheric Research Laboratory (PEARL) at Eureka, Nunavut is located about halfway up Ellesmere Island, right on the 80N North latitude line and 1,100km from the pole. It is located about as far North as it is possible to go and still have (with difficulty) a continuous internet connection which facilitates both experimentation and remote instrument operation. PEARL operates as an all-year atmospheric observatory and hosts upwards of 25 research instruments with considerable capacity for remote operations as well as on-site activities.

The large number of contemporaneous measurements at PEARL offers some unique opportunities to spot linkages between atmospheric phenomena which might be missed by a smaller, more focussed effort. The cross-support provided by the various teams and the on-site resources and technical support enhances the success of the overall enterprise, and also provides a very effective learning environment for students and other young researchers for what might otherwise be a very challenging location for measurements.

Current PEARL activities are centred around the areas of air quality, ozone studies and climate change with three themes of “composition measurements”, “satellite validation” and the “polar night”. Although primarily directed at atmospheric research, other studies at the site have reached down into the ice and the permafrost or out into space with the testing of a polar astronomical telescope.

PEARL is currently supported by Natural Sciences and Engineering Research Council, Environment and Climate Change Canada, and the Canadian Space Agency. It is operated by a team of researchers from Canadian universities and government departments.

Title
Dr
Last Name of PRESENTING Author
Holmén
Middle Name or initials of PRESENTING Author
First Name of PRESENTING Author
Kim
Email of PRESENTING Author
kim.holmen@npolar.no
Country of PRESENTING Author
Norway
Institution, organization or general address
Svalbard Integrated Arctic Earth Observing System
Theme
Sub- Theme 3: Operating Observing Systems and Networks
Author list (in order)
*Holmén, Kim; Jennings, Inger; Hübner, Christiane; and Lihavainen, Heikki.
Poster title (brief)
SIOS – an international collaboration to create a regional observing system for Arctic Earth System Science
Abstract - text box
The Svalbard Integrated Arctic Earth Observing System (SIOS) is a collaborative effort to develop and maintain a regional observational system for long term measurements in and around the High Arctic archipelago Svalbard. The purpose of the observing system is to address Earth System Science questions related to Global Change. The observing system and research facilities offered by SIOS build on the extensive observation capacity and diverse world-class research infrastructure provided by many institutions already established in Svalbard. This includes a substantial capability for utilising remote sensing resources to complement ground-based observations. From this solid foundation, SIOS envisions a significant contribution to the systematic development of new methods and observational design in Svalbard. This knowledge can advance other observational networks in the Arctic and elsewhere.

The tools used by SIOS to achieve more efficient use and better integration of the observing system include a distributed data management system, an open access program that includes logistical support, and training and education activities. These and other services

are coordinated by the SIOS Knowledge Centre, the central hub of SIOS, in collaboration with representatives from SIOS's international membership. Working groups and task forces deliver the services in direct and structured dialogue with scientists, user groups, policy makers and other porters of societal and scientific needs.

SIOS brings observations together into a coherent and integrated observational programme that will be sustained. Thus, SIOS offers unique opportunities for research and the acquisition of fundamental knowledge about global environmental change.

SIOS aims to set an example for how to systematically construct observational networks in the Arctic and how joint efforts provide added value to the user community.

Title
Dr.
Last Name of PRESENTING Author
Bell
Middle Name or initials of PRESENTING Author
First Name of PRESENTING Author
Trevor
Email of PRESENTING Author
tbell@mun.ca
Country of PRESENTING Author
Canada
Institution, organization or general address
Memorial University of Newfoundland
Theme
- Sub-Theme 1: The need for the Observing System
- Sub- Theme 3: Operating Observing Systems and Networks

Author list (in order)
Bell, Trevor; and the SmartICE Team
Poster title (brief)
SmartICE: application of a social enterprise model to the delivery of sea-ice monitoring and information services
Abstract - text box
SmartICE (smartice.org) is a northern social enterprise that puts into the hands of communities the technology that helps them adapt to unpredictable sea-ice changes, resulting from climate change. Inuit knowledge of sea ice has been acquired from centuries of observation and use. But in the last decades this traditional knowledge has become less dependable in the face of unprecedented environmental changes.

SmartICE is the World's first climate change adaptation tool that integrates on-ice technology, remote sensing and Inuit knowledge to generate near real-time information on sea-ice conditions. It maintains a network of stationary and mobile sensors that measures and transmits sea-ice thickness data from community trails. It also maps sea-ice surface conditions from satellite imagery to inform safe travel choices. It uses information technology to generate accessible products that match the needs of community users.

In response to increasing community demand for its services and with the

support of the 2016 Arctic Inspiration Prize (arcticinspirationprize.ca), SmartICE is expanding across the Arctic through a social enterprise business model. This business plan is consistent with Inuit societal values such as caring for the environment and community and being innovative and resourceful. It also commits to maximizing social impact and creating positive change in Arctic communities, while applying an entrepreneurial approach to the delivery of novel sea-ice information services for the public and private sectors.

The SmartICE information system not only benefits public safety, food security, and health and wellbeing, but also enables and supports economic activities for communities and industries alike. For example, winter shipping, ice-based fisheries and tourism, environmental monitoring, and emergency response are typically carried out in the landfast ice zone where SmartICE operates. SmartICE services therefore reduce risk and improve performance and safety.

Title
Dr.
Last Name of PRESENTING Author
Cross
Middle Name or initials of PRESENTING Author
N
First Name of PRESENTING Author
Jessica
Email of PRESENTING Author
jessica.cross@noaa.gov
Country of PRESENTING Author
United States
Institution, organization or general address
NOAA Pacific Marine Environmental Laboratory
Theme
Sub- Theme 3: Operating Observing Systems and Networks
Author list (in order)
Cross, Jessica*; Hurst, Thomas; Foy, Robert; Long, Chris; Dalton, Michael; Stone, Robert
Poster title (brief)
Successes and challenges of interdisciplinary Ocean Acidification research in Alaska
Abstract - text box
Arctic regions are a bellwether for ocean acidification impacts, experiencing some of the most rapid and extensive consequences of ocean acidification of coastal regions. Acidification is occurring in important habitat for commercial and subsistence fisheries, and could eventually cause cascading economic echoes around the Nation. In response to this vulnerability, the Alaska Fisheries Science Center and the Pacific Marine Environmental laboratory formed a novel partnership that combined monitoring and observations with species response studies, OA forecasting models, and human impact assessments. The results from each of these research areas actively and directly inform the others, resulting in an adaptive, efficient research portfolio that addresses emerging key stakeholder needs as understanding of Alaskan acidification evolves. This interdisciplinary scaled approach has been extremely successful in connecting acidification vulnerabilities with decision makers, enabling an extensive economic vulnerability assessment of Alaskan communities and a more focused analysis of potential population declines

and attendant economic consequences for important commercial species. We highlight these successes to show the potential of this interdisciplinary model for other observing needs, and key challenges that remain. One such challenge is represented by the size and variability of the region itself: current resources cannot cover all observational scales and species of interest. In the future, we recommend increasing the complexity of our observing and experimentation beyond basic thresholds and indicators to assess broad spatiotemporal variability, long-term population acclimation, and co-stressors. We also recommend initiating salmonid research, which stakeholders have identified as a glaring experimental gap. To meet these needs, we emphasize the power of biogeochemical models, new technologies, and creative indicators that may provide new insights and capacity.

Title

Last Name of PRESENTING Author

Bradley

Middle Name or initials of PRESENTING Author

First Name of PRESENTING Author

Alice

Email of PRESENTING Author

alice.chapman.bradley@dartmouth.edu

Country of PRESENTING Author

USA

Institution, organization or general address

Dartmouth College

Theme

OTHER - Topics relevant to Arctic Observing

Author list (in order)

Bradley, Alice; Durham, Elizabeth; Obbard, Rachel

Poster title (brief)

Validating remote sensing products with local and indigenous observations

Abstract - text box

Remote sensing approaches provide large spatial coverage and often high repeat frequency, but require validation to effectively link the measurements to physical properties on the surface. Often the information needed for validation is hard to come by, where the remote sensing product would fill a real gap in the observational record. Indigenous and local records can fill this need for remote sensing products that are defined near coastlines, where people using the environment can provide first-hand information about the conditions.

In an effort to validate a passive microwave approach for observing sea ice extent in coastal pixels, there was a need for validation data in the fall season when darkness and persistent cloud cover made visible imagery impossible. Local records collated through the ELOKA project filled this gap, and while daily reports were not available, major events in sea ice conditions were noted which provided sufficient information to use for the validation study, especially in the early winter. Webcam and sea ice radar information supplemented these observations when available.

Title
Dr.
Last Name of PRESENTING Author
Khalsa
Middle Name or initials of PRESENTING Author
Siri Jodha
First Name of PRESENTING Author
Siri Jodha
Email of PRESENTING Author
sjsk@nsidc.org
Country of PRESENTING Author
United States
Institution, organization or general address
Univ. of Colorado
Theme
OTHER - Topics relevant to Arctic Observing
Author list (in order)
Camps, Adriano; Khalsa, SiriJodha*; Heron, Mal; Kinsner, Witold; Milne, Tony; Marouchos, Andreas; and Ruggieri, Marina
Poster title (brief)
Convergence at the Poles: IEEE Brings Diverse Communities and Technical Solutions to Polar Challenges
Abstract - text box
The Poles represent the ideal point of convergence for people, technology, and vision to address the challenges facing humanity. IEEE, as the world's largest technical profession organization with more than 423,000 members in over 160 countries, brings together diverse technical communities, advanced concepts and disciplines across the globe for the benefit of humanity. IEEE is actively working to identify ways in which it can most productively contribute to Polar observations since the location so closely mirrors its own mission.
The IEEE in the North and South Poles (INSP) ad hoc committee started its activities in 2017, and during its first year of existence it has already triggered and supported a number of activities that will continue in 2018:
• InuCube: a Cubesat project led by the University of Manitoba to educate, raise awareness of the challenges of the Artic, and to perform basic Earth Observations.
• The Young Professionals in Space (YPinSpace) bootcamp to train students and recent graduates in space techniques and technologies, with

a focus on Earth Observation and in particular in cryospheric applications.
• The IEEE Geoscience and Remote Sensing Socitey's Student Grand Challenge: a competition of 5 international teams of students to create an end-to-end drone-based Earth Observing system and mobile phone app with focus in cryospheric applications.
• The IEEE Dataport: an on-line, perpetually free-of charge repository of data sets up to 2TB to be used for research and other scientific studies.
• A dedicated special section entitled "Addressing Economic, Environmental and Humanitarian Challenges in the Polar Regions" in IEEE Access, a new open access journal.
• The organization of the Antarctic and Southern Ocean Forum (ASOF) and the Arctic and Northern Ocean Forum (ANOF) workshops, that gather scientists, engineers and decision makers with interests in autonomous observing and other technologies including miniaturization and ruggedization, acoustics, oceanographic mooring technologies and related Data Science topics.
IEEE looks to participate in appropriate international fora in order to productively contribute to Polar observations.

Title

Last Name of PRESENTING Author

Akhmetkaliyeva

Middle Name or initials of PRESENTING Author

First Name of PRESENTING Author

Saule

Email of PRESENTING Author

saule.akhmetkaliyeva@stu.mmu.ac.uk

Country of PRESENTING Author

United Kingdom

Institution, organization or general address

Manchester Metropolitan University

Theme

OTHER - Topics relevant to Arctic Observing

Author list (in order)

Akhmetkaliyeva, Saule*; Sparkes, Robert; Clarke, Leon; Dean, Andrew; and Cook, Simon

Poster title (brief)

Carbon release during 21st century glacier recession

Abstract - text box

Glacier ice covers ~11% of Earth's land surface, and contains within it a globally significant reservoir of easily degradable glacial organic carbon (GOC). GOC is held within glacier ice, subglacial sediments, and proglacial sediments and soils. Much of this ice and GOC is situated within the Arctic - a region that is experiencing the most rapid and greatest magnitude of warming on Earth. Predicted warming through this century will result in global glacier recession with exposure and release of GOC to lakes and oceans. Degradation of this organic material through physical, chemical and/or biological processes can produce the potent greenhouse gases CO2 and/or CH4. Release of these gases to the atmosphere represents a positive feedback on global warming, although GOC can also seed biological production downstream resulting in enhanced photosynthetic carbon drawdown. Therefore, the PhD project is to quantify carbon export from receding glaciers in the Arctic.

Title
Dr
Last Name of PRESENTING Author
Sankar
Middle Name or initials of PRESENTING Author Darwin
First Name of PRESENTING Author
Ravi
Email of PRESENTING Author
ravi.sankar@ucalgary.ca
Country of PRESENTING Author
Canada
Institution, organization or general address
University of Calgary, Arctic Institute of North America
Theme
OTHER - Topics relevant to Arctic Observing
Author list (in order)
Sankar, Ravi D., Murray, Maribeth., Wells, P., Ayre, M.
Poster title (brief)
Using Landsat multi temporal imagery to monitor and evaluate shoreline movement along Canada's Northwest Territories.
Abstract - text box
This investigation quantified rates of shoreline movement along a 44 km segment of Southwestern Banks Island, Northwest Territories, Canada. Fifty-nine years of shoreline position data (from 1958-2017) were obtained from aerial photos, orthoimagery and Landsat multi-spectral satellite imagery. The data was incorporated into ArcGIS 9.3 and the Digital Shoreline Analysis System (DSAS) was used to determine and evaluate rates of change. Results show that the 44 km stretch of Arctic coastline along Southwestern Banks Island retreated at an average rate of -0.89 meters per year over the duration of the study period. The analysis revealed a dominant erosional signal across a significant portion of the study-area with approximately 72% of the shoreline retreating landward. A localized segment of shoreline in close vicinity to Sachs harbor was also analyzed over the short-term period 1999-2015. Data shows acceleration of erosion in this area over the short-term, with average retreat rates of -1.24 meters/year. Increased storm intensity coupled with elevated air and sea-surface temperatures and decreased sea-ice extent all act as catalysts to accelerate coastal erosion along the Sachs Harbor locale.

The *Nansen Legacy*

- A joint Norwegian Arctic research project providing holistic, cross-disciplinary scientific knowledge of the climate and ecosystem of the northern Barents Sea in the past, present and future

The Barents Sea is an Atlantic Water gateway to the Arctic Basin, at the same time as it is at the receiving end of sea ice export from the Arctic Ocean. Large-scale patterns of Arctic climate change are largely present, or even enhanced, in the Barents Sea. In 2018, the new Norwegian project "Nansen Legacy" started, involving ten Norwegian research institutes/universities/private entities, which all have major activity and competence about the Arctic marine environment. The *Nansen Legacy* is the collective answer of the Norwegian research community to the outstanding changes witnessed in the Barents Sea and the Arctic as a whole. The *Nansen Legacy* constitutes a joint Norwegian research platform to address the following over-arching objectives over the coming six years:

1. Improve the scientific basis for sustainable management of natural resources beyond the present ice edge

2. Characterize the main human impacts, physical drivers, and intrinsic operation of the changing Barents Sea ecosystems – past, present, and future

3. Explore and exploit the prognostic mechanisms governing weather, climate and ecosystem, including predictive capabilities and constraining uncertainties

4. Optimize the use of emerging technologies, logistic capabilities, research recruitment and stakeholder interaction to explore and manage the emerging Arctic Ocean.

The *Nansen Legacy* will investigate crucial climate processes and changes going on and determining the environmental conditions in the northern Barents Sea, and the project will provide a 2020–2100 outlook for the expected state of climate, sea ice, and ecosystem, including near-term predictions. It will evaluate the sensitivity and functionality of early-warning indicators used to detect change in marine resources and their vulnerability to exploitation. Further, the project will largely improve polar weather forecasts for the safety of people and commercial operations. Another core legacy will be the recruitment and training of the next generation of trained cross-disciplinary researchers, with a unique national and international network. Overall, the *Nansen Legacy* will contribute to international research and a comprehensive pan-Arctic understanding.

Title
Impact of Sea Ice Thickness and Freeboard Products on Forecast Performance
Last Name of PRESENTING Author
Kauker
Middle Name or initials of PRESENTING Author
First Name of PRESENTING Author
Frank
Email of PRESENTING Author
frank.kauker@awi.de
Country of PRESENTING Author
Germany
Institution, organization or general address
Alfred Wegener Institute
Theme
Sub-Theme 2: Implementing and Optimizing a pan-Arctic Observing System
Author list (in order)
Kaminski, Thomas; Kauker, Frank*; Pedersen, Leif Toudal; Vossbeck, Michael; Haak, Helmuth; Niederdrenk, Laura; Hendricks, Stefan; Ricker, Robert; Karcher, Michael; Eicken, Hajo and Grabak, Ola
Poster title (brief)
Impact of EO products on sea ice forecasts
Abstract - text box
The A+5 project of ESA's Arctic+ initiative has constructed a flexible system for Arctic Mission Benefit Analysis (ArcMBA) that evaluates in a mathematically rigorous fashion the observational constraints imposed by individual and groups of EO data products in using the quantitative network design (QND) approach. The assessment of the observation impact (added value) is performed in terms of the uncertainty reduction in a four-week forecast of sea ice and snow volumes for three regions along the Northern Sea Route. The assessments covered seven EO products, three real products and four hypothetical products.
The real products are monthly sea ice thickness (SIT), sea ice freeboard (SIFB), and radar freeboard (RFB), all derived from CryoSat-2 by AWI. These are complemented by two hypothetical laser freeboard products and two hypothetical snow depth products.
On the basis of the per-pixel uncertainty ranges that are provided with the CryoSat-2 products, the SIT achieves the best performance for SIV

forecasts. For SNV, the performance of RFB is better. A hypothetical laser freeboard (LFB) product with low accuracy has a similar impact as RFB on both SIV and SNV. A reduction in the uncertainty of the LFB product yields a significant increase in performance. Combining with a hypothetical snow depth product achieves a significant performance.

From sea ice to seals: A moored marine ecosystem observatory in the Arctic

Claudine Hauri, Seth Danielson, Andrew M.P. McDonnell, Russell R. Hopcroft, Peter Winsor, Peter Shipton, Catherine Lalande, Kathleen M. Stafford, Lee W. Cooper, Jacqueline M. Grebmeier, Andrew Mahoney, Klara Maisch, Molly McCammon, Hank Statscewich, Andy Sybrandy, Thomas Weingartner

Emerging sensor technologies have opened up new opportunities to monitor and understand complex interactions across all levels of the ecosystem. The Chukchi Ecosystem Observatory uses these technologies to meet needs for continuous, high resolution, and year-round observations in the biologically productive and seasonally ice-covered Chukchi Sea off the northwest coast of Alaska. This mooring array records a broad suite of parameters that facilitate observations yielding better understanding of physical, chemical and biological couplings, phenologies, and the overall state of this Arctic shelf marine ecosystem. While cold temperatures and eight months of sea ice cover present challenging conditions for the operation of the observatory, this extreme environment also provides as a rigorous test bed for innovative ecosystem monitoring strategies. Our data provides new perspectives on the seasonal evolution of sea ice, water column structure and physical properties, annual cycles in nitrate, dissolved oxygen, inorganic carbon, phytoplankton blooms and export, zooplankton abundance and vertical migration, the occurrence of Arctic cod, and vocalizations of marine mammals such as bearded seals. We are combining these integrated ecosystem observations with ship-based observations and modeling to produce a time-series that documents biological community responses to changing seasonal sea ice and water temperatures while establishing a scientific basis for ecosystem management. In working towards an ecosystem observatory network around Alaska, we are currently developing a second ecosystem observatory for the Gulf of Alaska. If this approach can be successful in the unforgiving Arctic environment, then it is ready to be deployed globally in ecosystems where the operational challenges are typically much reduced.

Last Name of PRESENTING Author
Whitty
Middle Name or initials of PRESENTING Author
First Name of PRESENTING Author
Naomi
Email of PRESENTING Author
naomi@polarfield.com
Country of PRESENTING Author
USA
Institution, organization or general address
CH2M HILL Polar Services
Theme
Sub-Theme 2: Implementing and Optimizing a pan-Arctic Observing System
Author list (in order)
Kassin, A.; Cody, R.; Manley, W.F.; Gaylord, A.G.; Villarreal, S.; Barba, M.; Escarzaga, S.; Haberman, T.; *Whitty, N.; and Tweedie, C.E.
Poster title (brief)
The Arctic Observing Viewer (AOV): Visualization, Data Discovery, Strategic Assessment, and Decision Support for Arctic Observing
Abstract - text box
To better assess progress in Arctic Observing made by SAON, US AON, NSF AON, and related initiatives, an updated version of the Arctic Observing Viewer (AOV; http://ArcticObservingViewer.org) has been released. This web mapping application and information system conveys the who, what, where, and when of "data collection sites" – the precise locations of monitoring assets, observing platforms, and wherever repeat marine or terrestrial measurements have been taken. Over 13,000 sites across the circumarctic are documented including a range of boreholes, towers, ship tracks, buoys, sampling stations, sensor networks, vegetation plots, stream gauges, ice cores, observatories, and more. Contributing partners are the US NSF, NOAA, the NSF Arctic Data Center, ADIwg, AOOS, CAFF, GTN-P, IASOA, INTERACT, Isaaffik, NASA ABoVE, NSIDC, and USGS, among others, covering 22 initiatives and networks. Users can visualize, navigate, select, search, draw, print, view details, and follow links to obtain a comprehensive perspective of monitoring activities. We continue to develop, populate, and enhance AOV. Recent updates include: a vastly improved Search tool with free text queries, autocomplete, and filters; faster performance; new Observatories and Stations map layers; a

new public-facing web service; additional documentation for interoperability of ISO site-level metadata; and more. AOV is founded on principles of interoperability, such that agencies and organizations can use the AOV Viewer and web services for their own purposes. In this way, AOV complements other distributed yet interoperable cyber resources and helps science planners, funding agencies, investigators, data specialists, and others to: assess status, identify overlap, fill gaps, optimize sampling design, refine network performance, clarify directions, access data, coordinate logistics, and collaborate to meet Arctic Observing goals.