IASC Bulletin 2020

IASC 2020
BULLETIN

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INTERNATIONAL ARCTIC SCIENCE COMMITTEE
Borgir, Norðurslóð, 600 Akureyri, ICELAND
www.iasc.info

INTERNATIONAL ARCTIC SCIENCE COMMITTEE

[IASC] · INTERNATIONAL ARCTIC SCIENCE COMMITTEE

The International Arctic Science Committee (IASC) is a non-governmental, international scientific organization. IASC's mission is to encourage and facilitate cooperation in all aspects of Arctic research, in all countries engaged in Arctic research and in all areas of the Arctic. Overall, IASC promotes and supports leading-edge interdisciplinary research in order to foster a greater scientific understanding of the Arctic region and its role in the Earth system.

TO ACHIEVE THIS MISSION IASC:

- Initiates, coordinates, and promotes scientific activities at a circumarctic or international level;
- Provides mechanisms and instruments to support science development;
- Provides objective and independent scientific advice on issues of science in the Arctic and communicates scientific information to the public;
- Seeks to ensure that scientific data and information from the Arctic are safeguarded, freely exchangeable and accessible;
- Promotes international access to all geographic areas and the sharing of knowledge, logistics and other resources;
- Provides for the freedom and ethical conduct of science;
- Promotes and involves the next generation of scientists working in the Arctic; and
- Promotes polar cooperation through interaction with relevant science organizations.

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[IASC] · STRUCTURE

Representatives of national scientific organizations from all 23 member countries form the IASC Council. The President of IASC is elected by Council, which also elects 4 Vice-Presidents to serve on the Executive Committee. Council usually meets once per year during the Arctic Science Summit Week (ASSW). The IASC Executive Committee operates as a board of directors and manages the activities of IASC between Council meetings. The Chair is the President of IASC.

The IASC Secretariat implements decisions of the Executive Committee and Council, manages IASC finances, conducts outreach activities, and maintains international communication.

IASC MEMBER COUNTRIES

Austria	Austrian Polar Research Institute (APRI)	www.polarresearch.at
Canada	Polar Knowledge Canada	www.canada.ca/en/polar-knowledge.html
China	Chinese Arctic and Antarctic Administration	www.ipolar.org/en/
Czech Republic	Centre for Polar Ecology	www.prf.jcu.cz/en/cpe.html
Denmark	Danish Agency for Science and Higher Education	www.ufm.dk/en
Finland	Council of Finnish Academies	www.academies.fi/en
France	National Center for Scientific Research (CNRS)	www.cnrs.fr/en
Germany	German Research Foundation	www.dfg.de/en
Iceland	The Icelandic Centre for Research (RANNÍS)	www.en.rannis.is
India	National Centre for Polar and Ocean Research (NCPOR)	www.ncaor.gov.in
Italy	National Research Council of Italy (CNR)	www.cnr.it/en
Japan	Science Council of Japan, National Institute of Polar Research (NiPR)	www.nipr.ac.jp/english
The Netherlands	Dutch Research Council (NWO)	www.nwo.nl/en
Norway	Research Council of Norway	www.forskningsradet.no/en
Poland	Polish Academy of Sciences, Committee on Polar Research	www.kbp.pan.pl/index.php?lang=en
Portugal	Portuguese Foundation for Science and Technology	www.fct.pt/index.phtml.en
Republic of Korea	Korea National Committee on Polar Research (KOPRI)	www.kopri.re.kr/eng
Russia	Russian Academy of Sciences	www.ras.ru
Spain	Spanish Polar Committee (CPE)	www.ciencia.gob.es
Sweden	Swedish Research Council	www.vr.se/english.html
Switzerland	Swiss Committee on Polar and High Altitude Research	www.polar-research.ch
United Kingdom	Natural Environment Research Council (NERC)	www.nerc.ukri.org
USA	Polar Research Board	www.dels.nas.edu/prb

PHOTO: ALFRED-WEGENER-INSTITUT (AWI) / ESTHER HORVATH
Logistics operation next to the research icebreaker Polarstern.

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[IMPRINT]

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COVER PHOTO: ALFRED-WEGENER-INSTITUT (AWI) / STEFAN HENDRICKS
Setting up "Ocean City" on the MOSAiC Expedition.

[CONTENTS]

PHOTO: ALFRED-WEGENER-INSTITUT (AWI) / MARIO HOPPMANN

Mi-8 helicopter landing next to researchers and bear guards during deployment of the Distributed Network, MOSAiC Expedition.

[PREFACE]

This bulletin presents a glimpse at the immense amount of incredibly important work being conducted by dedicated Arctic researchers throughout the world. It was well established during the International Polar Year in 1882-83 that collaborations in polar research and partnering across nations would lead to far greater achievements than could be accomplished by any single country.

Over the following hundred years, the thirst for polar knowledge and understanding of polar processes grew. In the first half of the 20th century, Arctic research was generally exploratory and disciplinary. Substantial and important achievements documented geography, climate, and resources. These essential observations led to tremendous accomplishments in understanding continental drift, atmospheric dynamics, and creating instruments and equipment essential for scientific progress. The latter half of the 20th century opened an era of investigating interactions and interdependence among system components and a desire to understand system drivers, responses and feedbacks.

In August 1990, the value of international collaborations and a mechanism for coordination and facilitation of Arctic research was formalized in the creation of the International Arctic Science Committee. Over the past thirty years, IASC has greatly advanced Arctic science by identifying and promoting research needs. IASC has been a breeding ground for new programs and for building international teams that would share ideas, resources, data, field camps and ships, and understanding.

In this very dynamic period where the Arctic is experiencing marked changes in physical and biological systems, demographics, and social structures, IASC continues to serve. The flagship Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) expedition exemplifies critically important research that is made possible through very generous contributions of platforms, equipment, funding and other resources from many nations. T-MOSAiC (or Terrestrial Multidisciplinary distributed Observatories for the Study of Arctic Connections), which is entering its implementation phase, will also generate global interest and investments and broaden our understanding of connections in the Arctic system. Other important programs initiated within IASC include the ALaskan Pollution and Chemical Analysis (ALPACA) project, which seeks to close knowledge gaps in understanding of atmospheric chemical mechanisms occurring under cold and dark conditions and a study on Arctic Glaciers and their recent mass loss and contributions to sea-level rise. Our research teams have also focused upon Arctic Urbanization and Sustainable Development as well as Gender in Polar Research.

While there are many pressing needs and limited resources to address these challenges, our understanding of polar process and societies continues to grow. IASC plays an important role in advancing Arctic knowledge and we are very proud of the members of our research community building on the contributions of those early Arctic researchers who recognized the value of international collaborations. We also humbly recognize and thank the visionary Arctic scientists who, thirty years ago, saw the need for an organization to facilitate these partnerships and created the International Arctic Science Committee. Their vision established IASC's path toward international collaborations on interdisciplinary questions and understanding of the role of the Arctic in the global system.

Dr. Larry Hinzman | IASC President

PHOTO: UAF PHOTO BY JR ANCHETA
Dr. Larry Hinzman, IASC President

PHOTO: MARIASILVIA GIAMBERINI

On a cloudy day, sometimes it is still possible to discern the shape of mountain peaks and glaciers from the clouds while flying in Svalbard from the scientific community of Ny-Ålesund back to Longyearbyen.

1. IASC Internal Development

» 1 IASC Internal Development

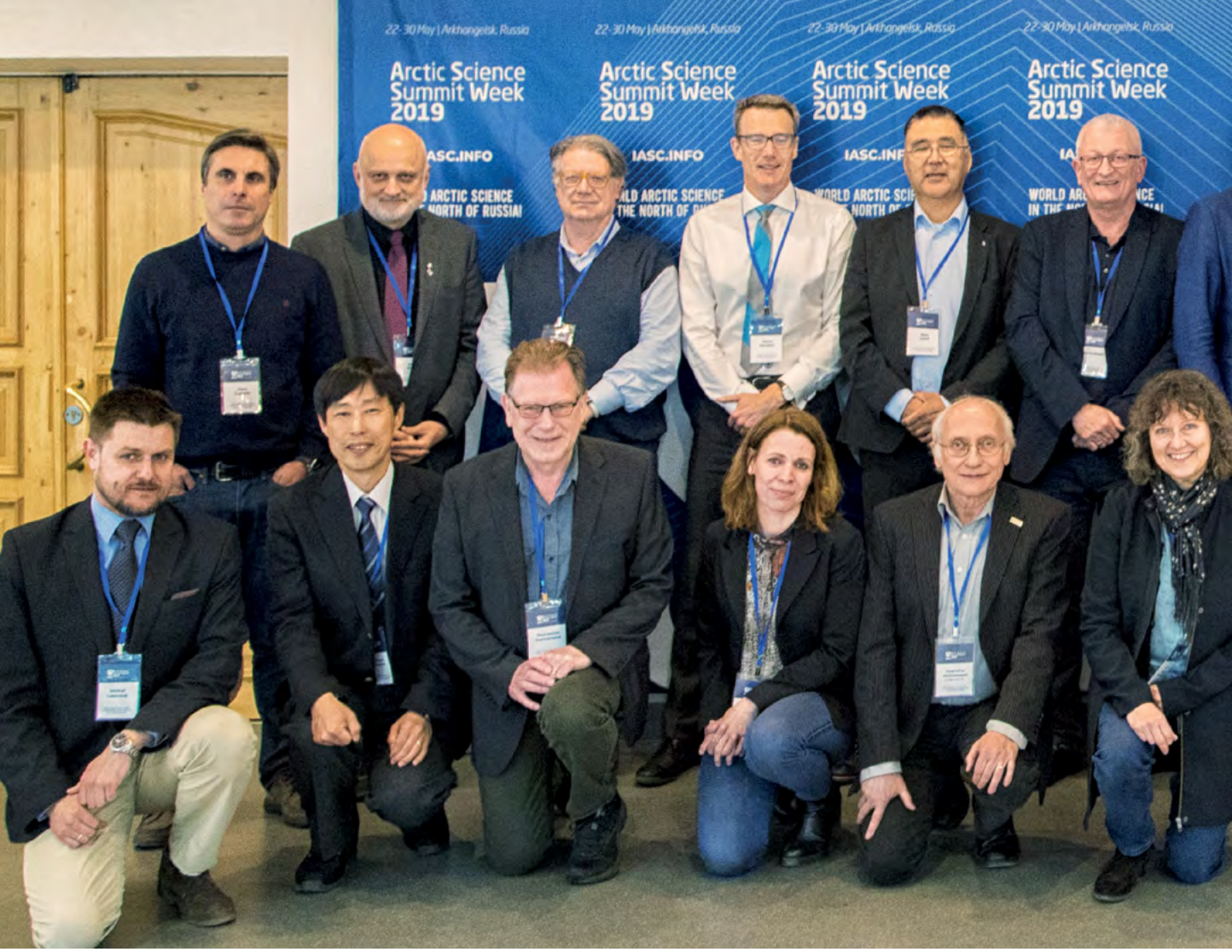
PHOTO: IASC ARCHIVE
IASC was established 30 years ago, with IASC's Founding Articles signed in Resolute Bay, Nunavut on 28 August, 1990.

IASC Organization

The International Arctic Science Committee (IASC) is a non-governmental organization that encourages and facilitates cooperation in all aspects of Arctic research, in all countries engaged in Arctic research, and in all areas of the Arctic region. To fulfill its mission, IASC promotes and supports leading-edge interdisciplinary research in order to foster a greater scientific understanding of the Arctic region and its role in the Earth system. IASC was established in 1990 and began operations in 1991. It currently comprises 23 member countries. IASC member organizations are national science organizations that cover all fields of Arctic research.

COUNTRY	MEMBER ORGANIZATION	IASC COUNCIL MEMBER
Austria	Austrian Polar Research Institute (APRI)	Wolfgang Schöner
Canada	Polar Knowledge Canada	Wayne Pollard
China	Chinese Arctic and Antarctic Administration	Huigen Yang, Vice-President
Czech Republic	Centre for Polar Ecology	Josef Elster
Denmark	Danish Agency for Science and Higher Education	Lise Lotte Sørensen
Finland	Council of Finnish Academies	Paula Kankaanpää, Vice-President
France	National Center for Scientific Research (CNRS)	Jérôme Chappellaz
Germany	German Research Foundation	Günther Heinemann
Iceland	The Icelandic Centre for Research (RANNÍS)	Þorsteinn Gunnarsson
India	National Centre for Polar and Ocean Research (NCPOR)	M. Ravichandran
Italy	National Research Council of Italy (CNR)	Carlo Barbante
Japan	Science Council of Japan, National Institute of Polar Research (NiPR)	Hiroyuki Enomoto
The Netherlands	Dutch Research Council (NWO)	Dick van der Kroef
Norway	Research Council of Norway	Ingvild Marthinsen
Poland	Polish Academy of Sciences, Committee on Polar Research	Michał Łuszczuk
Portugal	Portuguese Foundation for Science and Technology	João Canario
Russia	Russian Academy of Sciences	Vladimir Pavlenko, Vice-President
Republic of Korea	Korea National Committee on Polar Research (KOPRI)	Yeadong Kim
Spain	Spanish Polar Committee (CPE)	Antonio Quesada
Sweden	Swedish Research Council	Magnus Friberg
Switzerland	Swiss Committee on Polar and High Altitude Research	Martin Schneebeli
United Kingdom	Natural Environment Research Council (NERC)	Henry Burgess, Vice-President
USA	Polar Research Board	Larry Hinzman, President

TABLE: An overview of the IASC countries, organizations, and Council members.
For contact information, please visit https://iasc.info/iasc/organization/council/council-members.



IASC Council

The IASC Council is comprised of representatives from national scientific organizations from all IASC member countries. The IASC Council typically meets once a year during Arctic Science Summit Week (ASSW). Council members provide input regarding a wide range of scientific and technical topics and provide access to a large number of scientists and administrators through their national committees.

The IASC Council is responsible for:

- Developing policies and guidelines for cooperative Arctic research;
- Establishing Working Groups and Action Groups that address and act on timely topics in Arctic science;
- Recommending, in cooperation with the Working Groups, implementation plans for IASC programs and activities;
- Making decisions regarding the participation of national scientific organizations from non-Arctic countries; and,
- Organizing Arctic science conferences.

PHOTO: NICOLAJ GERNET
IASC Council, ASSW2019, Arkhangelsk, Russia.

IASC Executive Committee

The IASC Executive Committee operates as a board of directors and manages IASC's activities between Council meetings. The Executive Committee consists of five elected officials: the President, four Vice-Presidents, and the Executive Secretary (ex officio).

The current IASC Executive Committee members are:

Dr. Larry Hinzman, President

Mr. Henry Burgess, Vice-President

Dr. Huigen Yang, Vice-President

Dr. Paula Kankaanpää, Vice-President

Dr. Vladimir Pavlenko, Vice-President

Dr. Allen Pope, IASC Executive Secretary

Secretariat

The IASC Secretariat is responsible for the daily operations of IASC including:

- Communicating with Council members;
- Implementing the decisions of the IASC Council and Executive Committee;
- Communicating with other organizations including the Arctic Council and its subsidiary bodies and the International Science Council (ISC);
- Providing support for the IASC Working Groups and Action Groups;
- Publishing the IASC Bulletin and IASC communication materials as required;
- Maintaining the IASC website, preparing the IASC newsletter, and facilitating outreach; and,
- Administering IASC finances.

The central IASC Secretariat is supplemented by the dispersed Secretariat, drawing support from individuals and institutions in a range of IASC members countries, especially addressing the support for the growing number of activities undertaken by the IASC Working Groups and early career researcher development.

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PHOTO: MARY EDWARDS
Walker Lake, Brooks Range, Alaska. Photo taken in July 2013 during a heat wave when air temperatures reached 30 °C. The team was based at the lake for a project aiming to retrieve long-term records of carbon processing in relation to vegetation and climate change from the sediments of nearby small lakes.

ISIRA / ИСИРА

For ISIRA, 2020 featured extensive discussions on the future goals and efforts that the group should undertake in the light of the upcoming Chairmanship of the Russian Federation at the Arctic Council (2021-2023). During ASSW2020, ISIRA will hold a panel discussion which will focus on implementation of the Arctic Council's Agreement on Enhancing International Arctic Scientific Cooperation, on the Arctic Science Ministerial and its strategic agenda and outcomes, potential collaborative activities/projects, and a roadmap for the future towards open research access in the Russian Arctic.

Within the last 5 years, 7 ISIRA meetings were organized in order to understand and structure ISIRA's role within the IASC community, to make it more sustainable and active in its informative and supportive role and vision. In 2019, ISIRA began discussing implementation of the recommendations from an earlier ISIRA workshop, brought more structure to its allocation of funds, and began discussions around terms of reference. Recent years have shown a decrease of international science cooperation in the Russian Arctic. However, ISIRA members foresee increasing interest in bilateral and multilateral cooperation with the Russian scientific community, and in this regard more open and inclusive communicative strategies with all groups of the Arctic stakeholders are necessary. Considering these factors, ISIRA will continue to support young scientists and will promote the role of building and developing the Arctic partnerships to facilitate cooperation and the active role of science in the policymaking process.

2020 год для группы ИСИРА будет обозначен продолжительными, масштабными дискуссиями о будущих целях и необходимых действиях, которые должна предпринять группа в свете предстоящего Председательства Российской Федерации в Арктическом Совете (2021-2023). В рамках ASSW2020 ИСИРА организует панельную дискуссию, посвященную реализации Соглашения Арктического Совета по укреплению международного арктического научного сотрудничества, а также ознакомлению со стратегическими задачами и целями прошедших Министерских встреч по арктической науке. В ходе мероприятия также планируется обсудить потенциальные совмест-

PHOTO: VITALIY ZEMLYANSKIY
Geobotanical assessment of pasture conditions in the northern part of West Siberia; Severtsov Institute (RAS) expedition, 2017, Central Yamal, Russia.

ные идеи, проекты и дорожную карту на будущее, в особенности по вопросам открытого доступа к российской части Арктики.

За последние 5 лет было организовано порядка 7 встреч, направленных на понимание структуры и роли группы ИСИРА в сообществе комитета МАНК, на поддержку ее более устойчивой и активной позиции в своей основной роли – группы информационной поддержки. В последние годы международное научное сотрудничество на территории российской Арктики снизилось. Однако, члены группы ожидают повышение и развитие интереса к билатеральному и многостороннему сотрудничеству с российским научным сообществом в предстоящие годы, а в этой связи, необходимо применять более открытые и всеобъемлющие стратегии коммуникации со всеми группами арктических стейкхолдеров. Учитывая все эти факторы, ИСИРА продолжит поддержку молодых ученых и будет способствовать построению и развитию арктического партнерства для развития сотрудничества, а также активной роли науки в процессе принятия решений.

ISIRA | Members — Члены | ИСИРА

Chair Arkady Tishkov, Russia

TBA, Canada

Juha Pekka Lunkka, Finland

Hanna Lappalainen, Finland

Heidi Kassens, Germany

Atsuko Sugimoto, Japan

Vladimir Kotlyakov, Russia

Sergey Priamikov, Russia

Boris Morgunov, Russia

Magnus Augner, Sweden

Gabriela Schaepman-Strub, Switzerland

Gareth Rees, UK

Lee Cooper, USA

Yulia Zaika, ISIRA Secretary

Allen Pope, IASC Executive Secretary

PHOTO: Courtesy of Dr. Sue Moore

IASC Medal 2020

IASC awards the 2020 IASC Medal to Sue E. Moore for Outstanding Achievement in Understanding Marine Mammals as Ecosystem Sentinels and how Climate Change is Influencing the Phenology of Arctic Species

Dr. Sue Moore has worked in the Arctic and contributed to Arctic science for over 40 years. During her early career, she concentrated on the ecology of Arctic marine mammals and established the first understanding of cetacean habitat selection in the North American Arctic. Her research on marine mammals as ecosystem sentinels is seminal work that has influenced conclusions on how climate change is influencing the phenology of both Arctic and sub-Arctic species. Dr. Moore's research transcended and evolved to include an interdisciplinary understanding of Arctic ecosystems that integrates physical oceanography and atmospheric measurements with lower trophic levels. She was involved in creating mitigation scenarios to guard Arctic whales, walruses, and seals from negative impacts associated with commercial shipping and offshore oil and gas development and developing ecosystem scenarios to predict the future Arctic under the "Arctic Marine Pulses" model.

Dr. Moore has served in key roles in the international Arctic community including advisory positions at the International Whaling Commission (IWC), participated in multiple of science panels (including the IASC/SCAR Bipolar Action Group), and played other roles with the US National Science Foundation and the US Marine Mammal Commission. Her work in IWC has supported the rights of indigenous whalers to continue traditional subsistence harvests as part of a larger effort to sustain cultural practices.

Dr. Moore has advised and mentored early (and advanced) career scientists, including numerous women, who are currently working on Arctic issues as scientists and policymakers. She continues her work as a Research Scientist at the University of Washington's Center for Ecosystem Sentinels. Based on her continuous and extremely productive career examining and understanding how climate change is transforming the Arctic and how these transformations influence trophic levels from phytoplankton to the subsistence culture of Arctic Indigenous Peoples, IASC is honored to award Dr. Sue Moore the 2020 IASC Medal.

The other shortlisted candidates for the 2020 IASC Medal were:

- **Atsumu Ohmura** for outstanding achievement in understanding complex climate and glacier relationships, thermal energy flow in the Arctic, and in building programs and data-archives in the Arctic
- **Peter Wadhams** for outstanding achievement in understanding polar climate and sea-ice interactions, and the effect of the warming Arctic on sea ice loss and reduction of albedo

PHOTO: MARTIN LULAK
Viktorie Brožová and Marie Šabacká, both from the Centre for Polar Ecology,
on the top of Tarantellen, central Svalbard.

2. IASC Working Groups

» 2 IASC Working Groups

Encouraging and supporting international science-led programs

IASC is engaged in all fields of Arctic research. Its main scientific working bodies consist of five Working Groups (WGs): Atmosphere, Cryosphere, Marine, Social & Human, and Terrestrial. The primary function of the WGs is to encourage and support science-led international programs by offering opportunities for planning and coordination, and by facilitating communication and access to facilities. Each WG is composed of up to two scientists from each IASC member country, appointed by the national adhering bodies.

All five IASC WGs are guided by scientific Work Plans which concisely articulate, with scientifically-driven high-level specifics not programmatic detail, how they will achieve IASC's vision over the coming years. These plans are meant to help Arctic scientists get involved in IASC activities, and it is expected that they will evolve in the coming years as the WGs continue with their work. These scientific foci are included in the WG sections which follow, and the full plans are on the IASC website.

The WG members are experts in their field that have an international reputation and are from different scientific disciplines so that the full range of Arctic research is represented within the WGs. Though the WGs are somewhat disciplinary, they also address cross-cutting science questions by initiating activities that involve at least two WGs. To this end, WGs are required to work together to use at least 40% of their funds in collaboration with paired funds from at least one other WG. In particular, IASC encourages projects which bridge the social and natural/physical sciences. IASC hopes that this will lead to closer cooperation, coordination, and teamwork across Arctic science disciplines.

Cross-Cutting Activities

MOSAiC Summer School

When: 16 September - 28 October 2019
Where: Tromsø (Norway) & the Arctic Ocean
Working Groups: AWG, CWG, MWG

Highlights

- Teaching about Arctic System Science while being actually in the Arctic environment proved to support sustainable learning and was incredible inspiring for young scientific minds.
- Learning from practitioners, engineers and scientists and getting involved in real field science is a rewarding and a life-time experience.
- A sophisticated review system of applications, well-organized lecture plan with teambuilding activities and awareness for complex and challenging situations onboard, helped to keep the group healthy and may have supported this incredible positive group dynamic we had.
- It seems like the Ambassadors' approach is a great chance to increase the output and keep the legacy of a project or program alive for a long time.

APECS and AWI organized a 6-week training on the Russian icebreaking research vessel Akademik Fedorov in the Central Arctic with main support from ARICE and IASC, as well as from CliC and YOPP. The MOSAiC School was a unique opportunity for 20 early career researchers during the first leg of the MOSAiC Expedition. They were selected from about 250 applicants from 35 countries with the help of 30 reviewers through a rigorous evaluation process. Coming from a wide background of environmental research backgrounds in physics, physical geography, glaciology, oceanography, geochemistry, geology, climate sciences, applied mathematics, biology, hydrology, remote sensing and modelling, and being early in their career, for most of them it was the first experience in the Arctic or on an icebreaking research vessel. The aim of the MOSAiC School was to 1) Train and educate the next generation of Arctic system science experts, 2) Provide support to the MOSAiC teams and 3) Communicate the newly gained knowledge experience through MOSAiC Ambassadors' projects.

CONTACT

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Arctic Futures 2050

When: 4-6 September 2019
Where: Washington, D.C. (USA)
Working Groups: CWG, SHWG

Highlights

- Sea ice, ice sheets, glaciers, and permafrost are diminishing in the warming Arctic with adverse impacts on the safety, food security, and traditional lifestyles of Indigenous Peoples of the Arctic.
- Global consequences of Arctic environmental changes include amplifying atmospheric and oceanic warming, raising sea levels, and increasing extreme weather events.
- Collaboration among scientists, Indigenous Peoples, and policy makers positively influences Arctic policies, but differences in the tempos and styles of communication are substantial and require additional efforts to overcome. Participants voiced strong, nearly unanimous support for continuing these discussions beyond the conference.

Does scientific and Indigenous knowledge adequately inform Arctic policies? The Study of Environmental Arctic Change (SEARCH) convened Arctic Futures 2050, an international conference designed to explore the opportunities and challenges for deeper dialogue between scientists, Indigenous knowledge holders, and those making and influencing policy.

The conference asked: What challenges confront policy makers in the rapidly changing Arctic? What basic research is needed to inform responses to Arctic change? What applied research is needed to inform responses to change? What tools can facilitate informing policy making with science and Indigenous knowledge? What opportunities exist for partnerships between policy makers and scientists?

Four hundred Arctic scientists; Indigenous knowledge holders; policy makers; natural resource managers; and military, industrial, and other operators in the Arctic convened at the National Academies of Sciences in Washington, DC on 4 – 6 September 2019. Travel awards were provided to 29 early-career researchers—including 2 supported with IASC funding—from Russia, the United States, Canada, Finland, Argentina, Sweden, and the United Kingdom. An additional 21 travel awards supported participation by Indigenous participants from Russia, the United States, and Canada.

On-line streaming of the conference resulted in over 1,500 views, and Twitter shared conference content with more than 61,000 users. The conference agenda and video links to all presentations and panels are available at the SEARCH website.

CONTACT

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The Future of Arctic Fjord Systems

When: 22-23 July 2019
Where: Oslo (Norway)
Working Groups: AWG, CWG, MWG, SHWG, TWG

Highlights

- High-profile discussions on the concept of Arctic fjords as coupled socio-ecological systems.
- Identification of pressing research needs to minimize the level of uncertainty in predictions on the future Arctic.
- Final elaboration of a comprehensive research proposal under the H2020 program.

This workshop facilitated a transdisciplinary forum for Arctic natural and social scientists for knowledge exchange on the burning issues associated to the transition of the Artic towards a more boreal regime. The workshop focused on the notion of Arctic fjord systems as coupled social ecological systems (SES) and explored linkages between fjord ecosystem services and changes in their provision and use, as well as adaptation options for industry and governance. It thus aligned with the strategic foci in the Social & Human, Marine, and Cryosphere Working Groups. The discussions during the workshop were synthesized into the concept of the transdisciplinary research project proposal FACE-IT (The Future of Arctic Coastal Ecosystems – Identifying Transitions in Fjord Systems and adjacent coastal areas"). In this way the workshop funded by IASC represents a significant milestone in the process of proposal writing. The full proposal has been submitted to the European Commission.

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PHOTO: ANNA MUNIAK
Fjord landscape in Svalbard.

BEPSII: Biogeochemical Exchange Processes at Sea-Ice Interfaces

When: 16-18 August 2019
Where: Winnipeg (Canada)
Working Groups: AWG, CWG, MWG, SHWG

Highlights

- BEPSII prepared a community paper/position analysis summarizing "The future of Arctic sea-ice biogeochemistry and ice-associated ecosystems" which is being submitted to Nature Climate Change.
- BEPSII/ECV-ice successfully performed intercomparison projects (PP and light) at the Saroma-ka Lagoon in Japan and the is preparing upcoming intercomparison projects on sea-ice CO2 flux measurements and primary production at the sea-ice chamber (University of East Anglia) and in Cambridge Bay (Canada, 2021).
- BEPSII chaired a session at the IGS sea-ice symposium in addition to two other biology related session, which greatly enhanced the focus on biogeochemical processes in the sea-ice region, compared to earlier IGS sea-ice symposia.

The international expert community on sea ice biogecochemical processes at sea-ice interfaces (BEPSII) had another productive meeting in conjunction with the international IGS sea-ice symposium in Winnipeg. Five Task Groups were established to address and report on several successful intercomparison projects, technology and data collection, modelling and observational process, synthesis, and outreach. Small group and plenary discussions were held to draft an extended outline for a BEPSII community paper on sea-ice ecosystem services. The Paper will cover both Arctic and Antarctic and will highlight ecologically and biologically significant components of the sea-ice ecosystem and what services the system provides to the human society. Several other integrative projects are in the planning stage, including to build a better/closer link with the atmospheric chemistry community CATCH and to revisit the sea-ice carbon pump due to many new discoveries and insights in recent years.

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Synoptic Arctic Survey

When: May 2019
Where: Woods Hole, MA (US)
Working Groups: AWG, CWG, MWG

Highlights

- Modeling can provide greater spatial and temporal context; the SAS measurements can improve biogeochemical modeling.
- SAS is an excellent opportunity to engage early career scientists in Arctic research.
- Ideas were advanced for engagement of local and Indigenous communities including participation on cruises and pan-Arctic science fairs.

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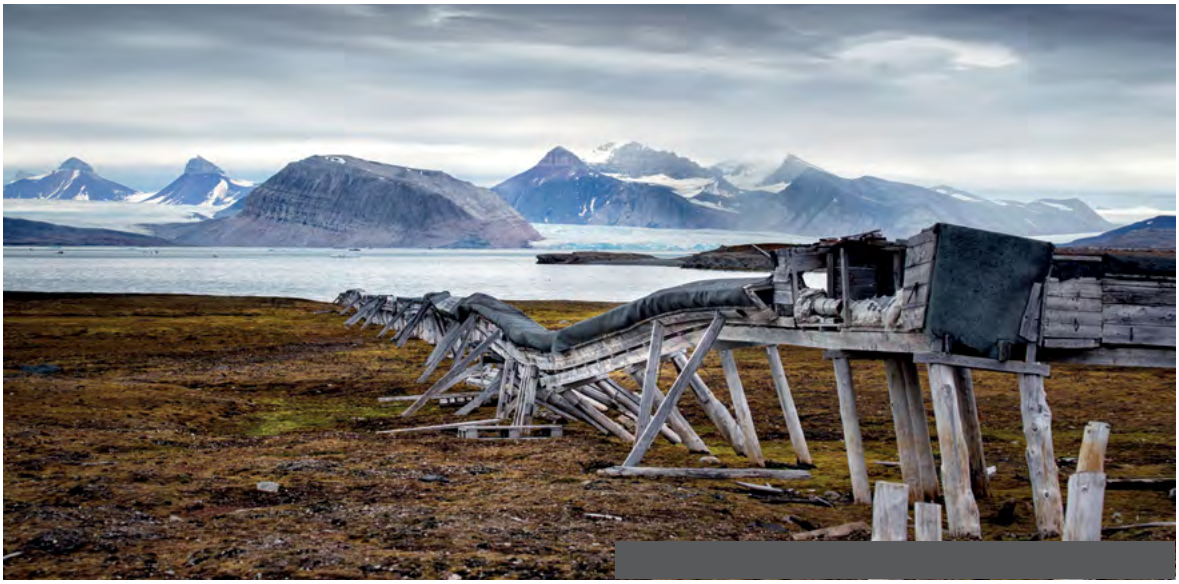
A workshop to advance the international Synoptic Arctic Survey (SAS) effort was held at the Woods Hole Oceanographic Institution. Fifty-nine scientists and science managers participated in the workshop, including 17 early career and 19 international scientists. The workshop reviewed the scientific goals, planned and proposed cruises in 2020-21 and associated measurements of the SAS as well as expanding studies with the SAS Science Plan. Three focal working groups (Physical Oceanography, Marine Ecosystem, Carbon Cycle and Ocean Acidification) refined the core measurements with synergies emerging between the groups. Additional measurements, both ship-based and from non-ship assets, were endorsed if able to be accommodated without compromising the core SAS measurements. Locations of the SAS transects/tracks were discussed relative to the scientific justification for each, including placement relative to key hydrographic features such as boundary currents and relative to previously sampled transects.

PHOTO: OLGA GOMMERSHTADT
One of the biggest ice shields observed on Franz Joseph Land during the Arctic Floating University, AFU-2017.



T-MOSAiC

When: May 2019
Where: Arkhangelsk (Russia)
Working Groups: AWG, CWG, MWG, SHWG, TWG

Highlights

- A workshop on the IASC project Terrestrial Multidisciplinary distributed Observatories for the Study of Arctic Connections (T-MOSAiC) took place during ASSW2019 in Arkhangelsk, Russia.
- The T-MOSAiC implementation plan was presented based on Action Groups covering a broad range of topics relevant to the Science Plan, and the scientific community was invited to participate.
- Scientific discussions about Arctic infrastructure and other related issues were discussed through a joint meeting led by the Rapid Arctic Transitions through Infrastructure and Climate (RATIC) group.

During ASSW2019, a T-MOSAiC workshop took place in Arkhangelsk, Russia. The highlights of the workshop were the discussions of the T-MOSAiC implementation plan, particularly the creation and definition of Action Groups that will address the scientific objectives of the Science Plan during the implementation phase of 2019-2020. Presentations were made by Arctic researchers (including early career researchers) that included topics such as Arctic dust, forest fires, and several subjects related to the Indigenous populations of the North. A joint meeting with RATIC culminated in the creation of the Arctic Infrastructure Action Group whereby RATIC activities will now contribute to T-MOSAiC. The presentations were followed by discussions among all participants that enriched the science objectives of T-MOSAiC and the aim to achieve to a better understanding the fast-changing Arctic.

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PHOTO: MARIASILVIA GIAMBERINI
This wreck of a pipeline "utilidor" is part of the cultural heritage of the old mining activities in the Ny-Ålesund base, Svalbard, dismissed in 1963 after the tragic explosion that killed 21 miners in 1962.

PACES Workshop on Northern Urbanization: Sustainable Cities

When: 23 May 2019
Where: Arkhangelsk (Russia)
Working Groups: AWG, SHWG

Highlights

- Air Pollution: Urban emissions in the Arctic can be high due to cold temperatures (heating) and they are trapped in shallow air layers. Applying air quality regulations developed in the mid-latitudes might not solve the problem, because a) human activities and meteorology are different, and b) toxicology of air pollutants in cold temperatures might be different as well as the physiology or local residents which can potentially lead to different health response.
- Climate change and Infrastructure: A warming Arctic means for some cities that infrastructure built to endure several months of very cold temperatures might not be suitable for temperatures varying around zero degree Celsius that create cycles of melting and freezing. A number of adaptation measures might be needed, especially in urban areas which create heat islands "pushing" the local temperatures towards the freezing/melting point.
- Twin City Approach: The World Meteorological Organization is already conducting a program based on twin cities (locations with similar characteristics such as size, infrastructure, climate) to develop strategies for the monitoring and assessment of risks (and opportunities) associated with weather and air pollution in urban environments. Arctic cities are not yet included. We propose to identify 1-3 pairs of cities to join the program.

Urbanization is accelerating globally, also in Northern high latitudes. This trend causes transformation in the geosphere, biosphere, atmosphere and hydrosphere, affecting the human-environment system over both short and long timescales. Cities represent a complex and highly dynamic interface between Earth components (atmosphere, land, water etc.) and societal factors (health, social equity, life quality etc.). At the same time, cities are very sensitive to climate change. This vulnerability is strongly pronounced in the Arctic, a region that is warming at twice the rate of the global average, and it has direct and indirect impacts on the local livelihoods, infrastructure, water resources, ecology and air quality.

More than 20 people met at the workshop in Arkhangelsk organized by the "air Pollution in the Arctic: Climate, Environment and Society" (PACES) project to discuss a way forward how to tackle this complex and highly interdisciplinary challenge. Among the topics discussed were a pilot study, the Alaskan Layered air Pollution and Chemical Analysis (ALPACA) project which will be conducted in Fairbanks starting from winter 2019 spearheaded by PACES. Furthermore, further pilot studies for the Kola area and Apatity in Russia as well as Rovaniemi or Luleå in northern Europe, with participation from local authorities and citizens, have been suggested.

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Rapid Arctic Transitions through Infrastructure and Climate (RATIC)

When: May 2019
Where: Arkhangelsk (Russia)
Working Groups: SHWG, TWG

Highlights

- Prioritized key scientific questions related to sustainable Arctic infrastructure in natural, social, and built environments and identified a range of data products that would help answer these questions, including a pan-Arctic geospatial database of existing and planned infrastructure, a time-series analysis based on available imagery, and an update to the International Permafrost Association (IPA) Circum-Arctic map of permafrost and ground-ice conditions.
- Developed a conceptual approach for pan-Arctic infrastructure research that would use a classification of infrastructure types to inform selection of monitoring and observation sites in collaboration with local communities and in places where access and resources exist.
- Agreed to form an Arctic Infrastructure Action Group under T-MOSAiC as the nexus for RATIC activities in 2019-2021. More on the goals and members of the action group can be found at www.T-MOSAiC.com/infrastructure.html.

The impacts of climate change, infrastructure, and the interactions between them in vulnerable Arctic landscapes are both complex and urgent. The Rapid Arctic Transitions due to Infrastructure and Climate (RATIC) initiative was created in 2014-15 as a forum to promote sustainable infrastructure as a key theme in Arctic research planning—one that requires multidisciplinary collaboration by scientists, local communities, governments and industry to be successful. This full-day workshop brought together 51 participants from 11 countries to share their work and identify research priorities. The group also discussed opportunities to advance RATIC goals through participation in the three-year, circumpolar T-MOSAiC (Terrestrial Multidisciplinary distributed Observatories for the Study of Arctic Connections) project.

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PHOTO: OLGA GOMMERSHTADT
The photo was taken during the 2017 Arctic Floating University in the sole settlement 'Tikhaya Bay' on Hooker Island, Franz Joseph Land.

5th Snow Science Winter School 2019

When: 17 - 23 February 2019
Where: Hailuoto (Finland)
Working Groups: CWG, MWG

Highlights

- 21 students from diverse fields participated in a week-long winter school, learning field techniques for scientific quantification snow properties in a natural environment.
- The site in Hailuoto, Finland, made it possible to conduct measurements of snow on sea ice.
- This is of primary importance concerning the upcoming Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) campaign (www.mosaic-expedition.com). Many of the school's students and lecturers will participate in the campaign.

The theme of this 5th Snow Science Winter School was snow on sea ice. Theory-oriented lectures took place in the morning, followed by demonstrations and practical experiments by the graduate and post-graduate students in the field. The island of Hailuoto in the Bay of Bothnia provided a unique opportunity to work on sea ice. The site has been used previously by FMI as well as Universities in Finland for oceanographic and sea ice studies. In conjunction with the Snow School on preceding weeks, a field training session for the MOSAiC campaign was organized with some lecturers and students participating in both events.

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PHOTO: KIRSTIN WERNER
Scientist Achim Randelhoff retrieves one of the many sea-ice cores sampled north of Svalbard during Polarstern's TRANSSIZ cruise.

High Latitude Dust

When: 13-14 February 2019
Where: Reykjavík (Iceland)
Working Groups: AWG, CWG, SHWG, TWG

Highlights

- Estimates from field studies, remote sensing, and modeling all suggest around 5% of global dust emissions originate from the high latitudes.
- WMO SDS-WAS and EU COST InDust initiatives are working in support of better understanding high latitude dust pathways and effects.
- Climatically significant cryospheric effects of light-absorbing high latitude dust can be similar to the albedo and melt effects of Black Carbon.
- Dust storms in the capital area of Iceland contribute to almost 25% of the exceeding of the PM10 health limit.

The IASC Workshop on Effects and Extremes of High Latitude Dust was jointly organized by the Finnish Meteorological Institute and the Agricultural University of Iceland, in co-operation with the IceDust Aerosol Association, InDust COST Action and IBA-FIN-BCDUST project of the Ministry for Foreign Affairs of Finland. The overarching aim of this interdisciplinary workshop was to review our understanding of effects and extremes of high latitude dust in the past, present and future, and to identify research needs.

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Atmosphere Working Group (AWG)

Scientific Foci:

- Cloud, Water Vapor, Aerosols, Fluxes
- Arctic Air Pollution
- Coupled Arctic Climate System
- Arctic Weather Extremes
- Linkages: Role of the Arctic in the Global Climate System

The scientific scope of the Atmosphere Working Group (AWG) includes research towards understanding and predicting the Arctic climate system and its change. Arctic air pollution is among the key priorities, which has influences on Arctic climate through trace gas and aerosol forcing, is harmful to Arctic communities and ecosystems, and may mediate important high latitude climate feedbacks. Other key priorities are snow, Arctic paleoclimates, and aerosol-cloud interactions in the Arctic including their controls on the aerosol population. Several of these priorities are cutting across several IASC Working Groups.

These topics have been put under the three pillars of:

1) MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate)
2) PACES (air Pollution in the Arctic: Climate, Environment and Societies)
3) YOPP/PPP (Year of Polar Prediction / Polar Prediction Project)

Two of the main pillars of the AWG, MOSAiC and PACES, are firmly rooted in the AWG. 2019 saw the deployment of the MOSAiC Arctic drift experiment, which is the largest and probably most ambitious Arctic cruise campaign ever undertaken. This unique project was conceived bottom-up from the AWG. The AWG has engaged with PPP's YOPP activities, and supported exchange among the science projects that are endorsed by YOPP. The AWG is now actively exploring connections between the 3 main AWG pillars to facilitate new understanding of the Arctic atmosphere within the coupled Arctic system.

PHOTO: NICOLAJ GERNET
IASC Atmosphere Working Group at ASSW2019, Arkhangelsk, Russia.

NAME	COUNTRY	EXPERTISE
Chair Stephen Arnold	UK	Arctic trace gases and aerosols; Atmospheric chemistry; Tropospheric ozone
Vice-Chair Annette Rinke	Germany	Arctic climate modeling; Arctic atmospheric processes; Surface-atmosphere interactions
Vice-Chair G.W.K. (Kent) Moore	Canada	High-latitude air-sea-ice interactions; Polar meteorology; Paleoclimatology
James Drummond	Canada	Remote sounding; Ozone and air quality; Climate change
Ding Minghu	China	Mass balance; Air-sea/ice interaction; Measurement technique
Kamil Laska	Czech Republic	Solar radiation modelling; Boundary layer processes; Glacier-climate interactions
Jacob Klenø Nøjgaard	Denmark	Arctic aerosol; Mass spectrometry; Source apportionment
Jens Hesselbjerg	Denmark	Coupled Arctic climate system; Climate change; Climate prediction
Kalevi Mursula	Finland	Space climate; Heliospheric and magnetospheric physics; Solar climate effects at high latitudes
Tiina Nygård	Finland	Atmospheric thermodynamics; Moisture/clouds; Numerical modelling
Olivier Jourdan	France	Clouds; Microphysics; Airborne measurements
Astrid Lampert	Germany	Atmospheric boundary layer; Airborne meteorology; In situ measurements
Guðrún Nína Petersen	Iceland	Arctic weather; Extreme weather; Numerical weather prediction
Rohit Srivastava	India	Atmospheric aerosols; Black carbon; Climate modeling
Sourav Chatterjee	India	Large-scale atmospheric circulation; Pole-tropics teleconnections; Air-sea-ice interactions
Stefano Decesari	Italy	Atmospheric chemistry; Aerosol-climate interactions; Biogenic & anthropogenic organic aerosols
Jun Inoue	Japan	Arctic climate change; Air-sea-ice interactions; Arctic weather
Yutaka Tobo	Japan	Atmospheric aerosols; Aerosol-cloud interactions; Ice nucleation
Laurens Ganzeveld	The Netherlands	Atmospheric chemistry-climate interactions; Surface exchange processes; Modelling
Thomas Spengler	Norway	Atmosphere dynamics; Mesoscale meteorology; Air-sea-ice interactions
Maria Sand	Norway	Climate modeling; Black carbon aerosols; Aerosol-radiation interactions
Ewa Łupikasza	Poland	Climate change; Atmospheric circulation; Synoptic climatology
Andrzej Araźny	Poland	Polar climate; Bioclimatology; Biometeorology; Climate change
Daniele Bortoli	Portugal	Atmospheric physics; Active and passive remote sensing; Spectroscopy
Seong-Joong Kim	Republic of Korea	Polar climate dynamics; Climate modelling; Climate variability
Sang-Jong Park	Republic of Korea	Polar meteorology; Atmospheric boundary layer; Surface-atmosphere interactions
Alexander P. Makshtas	Russia	Sea ice and permafrost - atmosphere interaction processes; Arctic climate
Boris Vladimirovich Kozelov	Russia	Geliogeophysical impact to Arctic atmosphere; Climate and micro-climate in Arctic region
Ana Cabrerizo	Spain	Persistent organic pollutants; Environmental chemistry; Temporal trends
Carlos Toledano	Spain	Atmospheric aerosols; Remote sensing; Radiometry
Thomas Kuhn	Sweden	In-situ measurements of Arctic clouds; Snowfall; Ice fog
Julia Schmale	Switzerland	Aerosol chemistry and microphysics; Cloud condensation nuclei; In-situ observations
Jo Browse	UK	Aerosols; Clouds; Modelling
Muyin Wang	USA	Arctic climate dynamics; Model-data synthesis; Sea-ice prediction
Gijs de Boer	USA	Arctic clouds; Autonomous Observing; Aerosol-cloud interactions
FELLOWS		
Gillian Young	UK	Cloud microphysics; Mixed-phase clouds; Aerosol-cloud interactions
Sophie Haslett	Sweden	Arctic aerosols and trace gases; Mass spectrometry; Atmospheric chemistry
Avneet Singh	Norway	Data assimilation; Climate prediction; Complex planetary systems

SECRETARY

Sara Morris, National Oceanographic and Atmospheric Administration, USA

[1] Membership as of 20 February 2020. Please visit https://iasc.info/working-groups/atmosphere/members for updated information and contact information for each Working Group Member.

PACES Workshop (Air Pollution in the Arctic: Climate, Environment and Societies)

When: 18-20 September 2019
Where: Oslo (Norway)

Highlights

- Strong engagement from the aerosol-cloud interactions community, with a highly active session on exploring links between our understanding of Arctic polluted and natural aerosol sources and implications for Arctic clouds and climate.
- Development of a plan for a new set of model experiments under PACES Working Group 1, focused on comparing model performance and addressing model uncertainties during specific long-range pollution transport events from Asia to the Arctic.
- Continued discussion and planning for a range of field activities centered on improving understanding of chemical processing and impacts of air pollution in high latitude towns and cities under PACES Working Group 2. These include the planned Alaskan Layered air Pollution and Chemical Analysis (ALPACA) project, and the "Twin Cities" concept for assessment of risks associated with weather and air pollution in Arctic urban environments, and comparison across different settlements (in collaboration with the WMO GURME initiative).

Around fifty scientists with interests in Arctic air pollution gathered in Oslo, Norway, for the 3rd PACES Open Science Meeting in September 2019, where recent research highlights and ongoing and planned activities within "Air Pollution in the Arctic: Climate, Environment and Societies" (PACES) initiative and more broadly were discussed in-depth. Scientific session themes included long-range pollution transport to the Arctic and global-scale linkages, Arctic aerosol-cloud interactions, local Arctic air pollution sources and high latitude polluted boundary layers, and sustainable Arctic development. More than 25 scientific presentations were given, and 11 posters were presented across these topics, with additional group discussion around plans for new Arctic field activities and modeling exercises focused on addressing knowledge gaps in Arctic air pollution, sources and impacts. Funding from both IASC and IGAC allowed supported attendance of around 10 early career scientists.

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Winter Polar Vortex Workshop

When: 11-13 September 2019
Where: Seattle (US)

Highlights

- Arctic/mid-latitude weather linkages have emerged from analyses of observations.
- One source of the linkage uncertainty is the inherent chaotic nature of the atmosphere.
- Multiple factors contribute to these relationships.

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Large and rapid changes in the Arctic represent a new driver of weather patterns in mid-latitudes, potentially affecting millions of people. Recent studies of this north/south linkage, however, are inconsistent. Studies based on observed data report robust conclusions in some areas, seasons, and background conditions, while model-simulated connections and averaging over large areas, long time periods, and many ensemble members are generally less clear. We suggest that one source of uncertainty arises from the inherent chaotic nature of the atmosphere. Thermodynamic forcing, by a rapidly warming Arctic and loss of sea ice, contributes to latitudinal weather linkages in the past decade. But internal atmospheric dynamics, i.e., large-scale wind patterns (jet stream location, strength, and orientation), may obscure the connections, making understanding of direct cause-and-effect challenging.

PHOTO: Courtesy of PACES Workshop, held in Oslo in September 2019.

Quantifying the Indirect Effect: from Sources to Climate Effects of Natural and Transported aerosol in the Arctic (QuIESCENT Arctic) Workshop

When: 4-5 April 2019
Where: Cambridge (UK)

Highlights

- Arctic aerosol-cloud interactions are poorly understood, yet it is difficult to disentangle these processes and identify key drivers from others which influence clouds (e.g. boundary layer structure, moisture transport).
- We need more measurements of the vertical structure of the boundary layer, clouds, and aerosols, particularly during the winter, to improve our understanding of the Arctic indirect effect and quantify associated processes better in numerical models.
- Efforts are needed to improve communication and collaboration between the observing and modelling communities to facilitate better knowledge transfer to high-resolution atmospheric models and up-scaling to global circulation models.

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The QuIESCENT Arctic workshop was initiated by the PACES (air Pollution in the Arctic: Climate, Environment, and Societies) project, with support of the IASC Atmosphere Working Group, and was also endorsed by the International Association for Meteorology and Atmospheric Sciences (IAMAS, via both the International Commission on Polar Meteorology and the International Commission on Clouds and Precipitation) and International Global Atmospheric Chemistry (IGAC). Through discussions, the workshop identified the need to improve communication between the observing and modelling communities and to carry momentum forward to future workshops, activities, and projects targeting this topic.

WEBSITE

https://sites.google.com/view/quiescent-arctic/workshops/1st-quiescent-workshop?authuser=0

MOSAiC Final Implementation Workshop

When: 11 - 15 March 2019
Where: Postdam (Germany)

Highlights

- Expedition extended and ends on October 14th 2020 in Bremerhaven.
- Introduction of the cruise leader and co-cruise leader for almost all legs.
- Both modelers and observers met for one day to discuss and implement the linkage of observations and modelling activity before, during, and after the expedition.

230 scientists of the MOSAiC (Multidisciplinary Drifting Observatory of the Study of Arctic Climate) community participated in the final big workshop before the MOSAiC expedition started on 20 September 2019. The workshop focused on the implementation of the expedition and to inform the participants of the cruise about logistical details. The schedule for the 6 legs and the exchanges of scientists and crew are finalized, including the announcement that Leg 6 will be extended and finishes on 14 October 2020 in Bremerhaven (Germany). With only 6 months until Polarstern left Tromsø, most of the cruise leaders and co-cruise leaders introduced themselves, and the participants of each leg were defined. The deadlines for freight issues, training courses, and medical exams were announced. Several new developments were announced, like the MOSAiC data policy, the media concept introducing the Progressive Web App (launched just before the start of the MOSAiC expedition), and education concept including the MOSAiC School onboard of Fedorov.

WEBSITE

www.mosaic-expedition.org

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PHOTO: PAULINE SNOEIJS LEIJONMALM
The platform for the MOSAiC Expedition is the German research vessel Polarstern.

Cryosphere Working Group (CWG)

Scientific Foci:

- Atmosphere-glacier-ocean interactions
- Cutting barriers in snow knowledge
- Causes, impacts and prediction of extreme cryospheric events

The Cryosphere Working Group (CWG) is composed of 38 members from 23 countries, plus three early career IASC Fellows and a Secretary. Our research interests span all elements of the cryosphere - the frozen regions of our planet - including sea ice, mountain glaciers, ice caps, icebergs, the Greenland ice sheet, snow cover, permafrost and seasonally frozen ground, and lake and river-ice. The CWG helps promote activities that enhance our understanding of these cryospheric components of the Arctic/sub-Arctic and their interaction with the Earth's climate system. While the CWG is interested in all elements of the cryosphere, our activities have been structured across three main themes:

- *Atmosphere-glacier-ocean interactions: implications on the pan-Arctic glacier mass budget,* which explores the link between the response of glaciers to climate change and both atmospheric changes and ocean circulation, with focus on the dynamics and mass budget of Arctic glaciers and their impact on global sea-level and regional freshwater runoff.
- *Cutting barriers in snow knowledge,* in which the impact of snow on glacier and ice-sheet mass balance and sea-ice variability is explored. Through this theme we seek to promote an improved common knowledge of snow-related processes by bringing together snow-interested scientists working within the various IASC working groups.
- *Causes, impacts and prediction of extreme cryospheric events,* which aims to gain understanding on a wide variety of phenomena, including intense storms/cyclonic activity, severe warm periods, droughts, rapid iceberg calving events, anomalous ice-sheet surface melt, avalanches, and heavy rain-on-snow events, many of which are becoming more frequently observed in the Arctic.

PHOTO: NICOLAJ GERNET
IASC Cryosphere Working Group, ASSW2019, Arkhangelsk, Russia.

NAME	COUNTRY	EXPERTISE
Chair Guðfinna Tollý Aðalgeirsdóttir	Iceland	Climate - glaciers/ice sheets interaction; Evolution of Icelandic glaciers and the Greenland ice sheet
Vice Chair Jari Haapala	Finland	Sea-ice physics; Numerical modeling; Climate variablity and change
Vice Chair Martin Schneebeli	Switzerland	Snow and snow tomography; Stratigraphy; Snow instruments
Annett Bartsch	Austria	Permafrost; Snow; Remote sensing
Wolfgang Schöner	Austria	Glacier mass balance; Surface energy balance; Snow climatology
Shawn Marshall	Canada	Glacier and ice sheet modelling; Cryosphere-climate processes; Glacier mass balance
Sun Bo	China	Radioglaciology; Ice sheet mass balance and sea level; Sea-ice processes and climate
Marie Sabacka	Czech Republic	Glacier ecology
Signe Bech Andersen	Denmark	Glaciology; Greenland Ice sheet; Climate
Arttu Polojärvi	Finland	Ice mechanics; Numerical modeling; Deformed sea ice
Hans-Werner Jacobi	France	Snow physics and chemistry; Snow-atmosphere interactions; Climate
Hugues Lantuit	Germany	Permafrost; Geomorphology and remote sensing; Coastal science
Gunnar Spreen	Germany	Sea ice; Remote sensing; Ocean-sea ice-atmosphere interactions
Þorsteinn Þorsteinsson	Iceland	Glaciology; Ice drilling; Climate history
Thamban Meloth	India	Ice core research; Glaciology; Snow biogeochemistry
Ramanathan Ramanathan	India	Glaciology; Biogeochemistry; Hydrology
Andrea Spolaor	Italy	Paleoclimate; Snow chemistry; Air-snow exchange
Nozomu Takeuchi	Japan	Glacier-ecology; Microbiology; Glaciology
Teruo Aoki	Japan	Optical properties of snow; Atmospheric radiation; Greenland Ice Sheet
Richard Bintanja	The Netherlands	Arctic climate change; Climate variability; Arctic hydrological cycle; Climate modelling
Elisabeth Isaksson	Norway	Glaciology; Ice cores; Snow chemistry
Thomas Vikhamar Schuler	Norway	Arctic glacier mass balance & hydrology; Subglacial processes; Modeling cryosphere: snow, glaciers and permafrost
Mariusz Grabiec	Poland	Mass balance; Geometry changes; Thickness and internal structure of Arctic glaciers
Ireneusz Sobota	Poland	Cryospheric changes; Mass balance; Snow; Permafrost
Gonçalo Vieira	Portugal	Permafrost; Remote sensing; Geomorphology
Hyun-cheol Kim	Republic of Korea	Remote sensing; Sea ice
Jung-Ho Kang	Republic of Korea	Environmental monitoring; Glaciology; Snow and ice chemistry
Dmitry Drozdov	Russia	Permafrost: Mapping, Thermal state, Active layer, Remote sensing; Arctic Coastal Dynamics; Arctic landscapes
Sergei Verkulich	Russia	Glaciers and permafrost; Antarctic and Arctic Quaternary sediments; Terrestrial records
Carolina Gabarro	Spain	Remote sensing; Sea-ice extension; Sea-ice thickness
Jaime Otero	Spain	Glaciers; Numerical Models; Calving
Veijo Pohjola	Sweden	Glaciology; Climatology; Natural hazards
Poul Christoffersen	UK	Glacial hydrology; Ice-ocean interactions; Basal processes
Richard Essery	UK	Snow modelling; Seasonal snow cover; Snow hydrology
Robert Hawley	USA	Glaciers, ice sheets, snow and firn; Mass balance; Remote sensing
Cathy Wilson	USA	Hydrology; Geomorphology; Permafrost
FELLOWS		
Alice Bradley	USA	Sea ice; Marginal ice zone and coastal processes; Environmental heat transport
Barbara Barzycka	Poland	Remote sensing; Glacier facies; Drone mapping
Sammie Buzzard	USA	Glaciology; Ice shelves; Sea ice

SECRETARY

Michael Wood, NASA Jet Propulsion Laboratory, USA

[2] Membership as of 20 February 2020. Please visit https://iasc.info/working-groups/atmosphere/members for updated information and contact information for each Working Group Member.

The State of Glaciers and Ice Caps in the Arctic Region

When: 11 October 2019
Where: Reykjavík (Iceland)

Scientific Highlights

- Arctic and sub-Arctic ice masses (including the Greenland ice sheet) presently account for two thirds of the total contribution of glaciers and ice caps on Earth to ongoing sea-level rise. GRACE-FO data allow continuation of earlier gravimetry results on mass loss from Greenland and Arctic Canada.
- The ice bridge across the Hornsund channel, which separates the two southernmost islands of Svalbard, is projected to have diappeared by 2065. By then, peak runoff from ice caps in Iceland will have been reached, according to recent estimates.
- The new Arctic DEM and products that will result from followup projects create an opportunity to monitor glacier changes in the Arctic with unprecedented precision.

Arctic Glaciers: Recent mass loss and contributions to sea-level rise
Session at the Arctic Circle Assembly

Geodetic glacier mass balance and the ArcticDEM
Workshop in connection with the Arctic Circle Assembly

Recent mass loss from Arctic glaciers and ice caps and new methods to analyze these changes received attention at an IASC-supported session and workshop, held during this year's Arctic Circle Assembly in Iceland. This symposium, which draws more than 2000 delegates annually, has now become one of the largest platforms for international dialogue on the future of the Arctic.

In the breakout session on Arctic glaciology, results from Greenland, Arctic Canada, Svalbard and Iceland were presented and discussed. Different methods for determining the mass balance of glaciers and ice caps were outlined by the speakers: ground-based measurements of surface mass balance, estimates of calving rates, aerial photography, airborne lidar measurements, satellite gravimetry and mass balance modelling. The results are unequivocal: glaciers in the Arctic are losing mass at a dramatic pace in response to rapid warming in the region. The Greenland Ice Sheet is currently the largest single contributor to ongoing sea-level rise, delivering 247±15 GT/yr of meltwater to the oceans. All other glaciers and ice caps in the Arctic (including the Greenland periphery) are estimated to contribute 213±29 GT/yr. Five presentations were given during the 90-minute session in the Harpa Conference Centre in Reykjavík, which was attended by 70 delegates.

The IASC grant also provided partial support for a half-day workshop on the Arctic DEM, a new digital elevation model of the entire Arctic and sub-Arctic region north of 60°N, including glaciated regions. This data set was created from satellite measurements conducted during the US Chairmanship in the Arctic

Council in 2015-2017. The workshop was attended by 20 glaciologists and other experts working in this field, representing most Arctic countries. Presentations were given on the ArcticDEM, on initial attempts to use this digital model to study glacier changes since 2015 and on related studies of geodetic mass balance. Participants explored the possibilities and methodologies for deriving geodetic glacier mass balance from repeated DEMs of glaciers from the ArcticDEM and other data sets. Future collaboration of scientists working with Arctic glaciers in this area of research was also discussed by the group.

The Arctic Circle session and the dArcticDEM Workshop form part of activities organized during Iceland´s chairmanship in the Arctic Council 2019-2021.

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PHOTO: MARIASILVIA GIAMBERINI
Ny-Ålesund, areal view of a glacier.

Marine Working Group (MWG)

Scientific Foci:

- Predicting and understanding rapid changes to the ocean system
- Understanding biological and ecosystem processes in the Arctic and sub-Arctic seas
- Understanding sea-ice structure dynamics and the Arctic system
- Understanding geochemical processes in the Arctic and sub-Arctic seas
- Climate and geological history of the Arctic basin

The IASC Marine Working Group (MWG) facilitates international coordination of research in the Arctic marine environment and supports cross-cutting objectives through face-to-face annual meetings. Frequent electronic communication is used throughout the remainder of the year, including exchange and collaboration with terrestrial, cryospheric, atmospheric and social scientists where appropriate. The MWG also seeks to encourage and facilitate two-way communication between working group members from each member state of IASC and their national science constituencies. Another important goal is to provide support for early career scientists and include their involvement in international research coordinated by IASC member countries, including expanding roles for IASC Fellows in MWG tasks.

Specific work goals that are integrated into the MWG Work Plan include project coordination and support for prominent initiatives that include: renewal of the Arctic in Rapid Transition network that has provided a mechanism for the early career science community to become engaged in international Arctic research; implementation of the Multidisciplinary drifting Observatory for the study of Arctic Climate (MOSAiC); contribution to the Workshop on Arctic Glaciology and Proglacial Marine Ecosystem; and expansion of the Distributed Biological Observatory on a pan-Arctic basis. Strengthening international cooperation with Russian scientists remains a key goal, including support for IASC's Russian Arctic (ISIRA) activities that are seeking to improve conditions for marine research within Russia's Exclusive Economic Zone. Finally, identifying new mechanisms to involve the MWG in Arctic Council observer activities and meetings are critical to connecting research with governmental affairs at the international level.

PHOTO: NICOLAJ GERNET
IASC Marine Working Group, ASSW2019, Arkhangelsk, Russia.

NAME	COUNTRY	EXPERTISE
Chair Lee Cooper	USA	Marine biogeochemistry, including stable and radioactive isotopes
Vice-Chair Hajime Yamaguchi	Japan	Naval architecture and ocean engineering; Arctic sea routes; Sea ice
Vice-Chair Heidi Kassens	Germany	Marine Geology; Interdisciplinary polar research projects; Cooperation with Russia
Gerhard Herndl	Austria	Limnology; Microbial oceanography of Polar seas
Renate Degen	Austria	Marine ecology; Benthic ecosystems; Functional traits
John Fyfe	Canada	Global and regional climate variability; Role of the poles in the global system
Christine Michel	Canada	Role of sea ice in Arctic marine ecosystems; Pelagic and benthic Arctic food webs
Jinping Zhao	China	Physical oceanography; Sea-ice physics; Ice and marine optics
Oleg Ditrich	Czech Republic	Parasitology; Zoology; Polar ecology
Colin Stedmon	Denmark	Chemical oceanography; Environmental spectroscopy; Dissolved organic matter biogeochemistry
Marit-Solveig Seidenkrantz	Denmark	Climate system science; Palaeoclimate; Palaeoceanography; Palaeontology; Marine geology
Jaakko Heinonen	Finland	Arctic marine technology; Offshore structures; Offshore wind energy
Hermanni Kaartokallio	Finland	Sea ice ecology; Microbial ecology in cold marine environments
Laurent Chauvaud	France	Coastal ecology; Marine biology; Sclerochemistry
Marie-Noëlle Houssais	France	Physical oceanography; Ocean-sea ice processes; Large-scale and mesoscale ocean variability
Heidi Kassens	Germany	Marine Geology; Interdisciplinary polar research projects; Cooperation with Russia
Torsten Kanzow	Germany	Observational physical oceanography; Long-term time series observations
Anna Heiða Ólafsdóttir	Iceland	Geographical distribution, migration, life history traits, and stock assessment of small pelagic fish in the northeast Atlantic
M. Ravichandran	India	Ocean observations; Modelling
Rahul Mohan	India	Marine geology; Palaeoclimate
Tommaso Tesi	Italy	Paleoclimatology; Geochemistry; Oceanography
Hajime Yamaguchi	Japan	Naval architecture and ocean engineering; Arctic sea routes; Sea ice
Takashi Kikuchi	Japan	Physical oceanography; Polar oceanography; Polar climate
Martine van den Heuvel	The Netherlands	Polar marine biology; Ecotoxicology; Rapid assessment of non-indigenous species using eDNA
Randi Ingvaldsen	Norway	Physical/Polar oceanography; Climate variability; Climate impacts on species and ecosystem
Arild Sundfjord	Norway	Ocean – sea ice interaction; Regional & sub-mesoscale ocean modelling; Vertical mixing
Monika Kędra	Poland	Biological oceanography; Food webs; Carbon cycling
Waldemar Walczowski	Poland	Physical oceanography; Hydrology; Ocean and glacier interaction
Teresa Cabrita	Portugal	Marine pollution; Trace element biogeochemistry; Phytoplankton ecotoxicology
Eun Jin Yang	Republic of Korea	Polar marine ecology; Microzooplankton biology
Jinyoung Jung	Republic of Korea	Chemical oceanography; Biogeochemistry
Sergey Pisarev	Russia	Meso-scale oceanographic processes; Shot-period variations of ocean climate in the Arctic Ocean
Alexander Makshtas	Russia	Air - sea-ice interaction in the Arctic; Structure of atmospheric boundary layer in the polar regions
Antonio Tovar	Spain	Biogeochemical cycles of trace metals in the ocean; Marine environmental pollution; Global change
Manuel D'Allosto	Spain	Atmospheric science; Marine aerosols and air quality in coastal areas
Pauline Snoeijs Leijonmalm	Sweden	Sea-ice ecology; Microbiology; Fish ecology; Food-web ecology
Andrew Brierley	UK	Marine ecology; Scientific echosounding; Zooplankton ecology, predator-prey interactions
Finlo Cottier	UK	Ice – Ocean processes; Coupled biological-physical interactions; Fjordic systems; Autonomous technologies
Lee Cooper	USA	Marine biogeochemistry, including stable and radioactive isotopes
Karen Frey	USA	Land-ocean linkages; Sea ice; Biogeochemistry

[3] Membership as of 20 February 2020. Please visit https://iasc.info/working-groups/marine/members for updated information and contact information for each Working Group Member.

NAME	COUNTRY	EXPERTISE
FELLOWS		
Françoise Amélineau	France / Norway	Seabird and shorebird ecology; Spatial ecology; Microplastic pollution
Maria Paulsen	Denmark	Microbial foodwebs; Terrestrial runoff; Bacterial activity
Amanda Burson	UK	Phytoplankton ecology; Nutrients & stoichiometry; Fjords & coasts

SECRETARY

Laura Ghigliotti, National Research Council of Italy, Italy

PHOTO: DR. SARAT CHANDRA TRIPATHY
Collection of sediment samples by Van-Veen grab in Krossfjorden, Ny-Ålesund, Svalbard.

Recent Activities

The 2019 GRC on Polar Marine Science

When: 16 - 17 March 2019
Where: Castelvecchio Pascoli (Italy)

Highlights

- A total of 136 participants from 17 countries attended the conference, including 57 early-career scientists.
- Exploration of linkages between the physical, biogeochemical and human dimensions of connectivity in changing polar seas, including for the first time the fields of atmospheric dynamics and human well-being.
- The conference provided a rare opportunity for graduate students and postdoctoral scientists to discuss their work in a semi-formal setting, allowing them to develop an international network of peers and connect with the foremost experts in the field.

The unique formats of the Gordon Research Conference on Polar Marine Science (GRC) and preceding Gordon Research Seminar (GRS), with invited speakers, discussion leaders, and ample discussion time resulted in open brainstorming and the emergence of new ideas on the functioning of polar oceans and the Arctic in particular. Poster sessions created a highly dynamic environment to explore and discuss the conference themes in greater detail. Poster presenters (mostly early-career scientists) were able to introduce themselves to the whole group by providing short oral summaries of their work during the plenary sessions. The conference provided a rare opportunity for graduate students and postdoctoral scientists to discuss their work in a semi-formal setting, allowing them to develop an international network of peers and connect with the foremost experts in the field. The group developed on the ways that connections between disciplines can be enhanced and put to the service of polar science and contributed to better prepare and position early-career scientists for the research challenges that lay ahead for the international Arctic research community. The "Power Hour", during which the challenges that women who pursue a research career in polar marine sciences face, was strongly attended and successful. A report of this activity was sent to GRC for circulation to conference participants. The funds provided by IASC-MWG supported the registration of six early-career scientists to the GRC and GRS. A total of 136 participants from 17 countries attended the conference, including 57 early-career scientists. The scientific focus of the conference was the exploration of linkages between the physical, biogeochemical and human dimensions of connectivity in changing polar seas, including for the first time the fields of atmospheric dynamics and human well-being (details available on conference web page). Because GRC emphasizes the importance of presenting and discussing a majority of unpublished research at the frontier of knowledge, the material presented is officially "off-the-record", with no abstracts, photographs, or proceedings published before, during, or after the conference.

WEBSITE

https://www.grc.org/polar-marine-science-grs-conference/2019//

CONTACT

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Social and Human Working Group (SHWG)

Scientific Foci:

- Arctic residents and change**
- Histories, perceptions and representations of the Arctic**
- Securities, governance, and law**
- Natural resource(s)/ use/ exploitation and development: past, present, future
- Human health and well-being

Cross-Cutting Foci:

- Human health, well-being and ecosystem change
- Long-term impacts, vulnerability and resilience in Arctic social-ecological systems
- Competing forms of resource use in a changing environment
- Perception and representation of Arctic science

The scientific scope of the Social and Human Working Group (SHWG) includes all aspects of social sciences and humanities research in the Arctic, as well as their connections with other IASC Working Groups. It is important to integrate the social and human perspective into international efforts to address issues of climate and environmental change. Not only does human behavior have an enormous influence on the environment, but changing natural environments also directly and indirectly affect people.

A wide range of topics is therefore of interest to the SHWG, including human health and well-being; livelihoods and land use; geopolitics and peace in the Arctic; and vulnerability and resilience in a changing Arctic. As demonstrated by the supported activities in 2019/20, SWHG members addressed these topics in all manners of ways: i.e., by supporting multi-stakeholder dialogue on human well-being and sustainability, and by exploring the principles of justice as linked to the multilayered concerns of sustainable development, global warming or human security.

The SHWG also supported and participated in nine IASC cross-cutting activities, on topics as varied as Indigenous knowledge, science and polity; changing social ecological systems in the Arctic; gender in polar research; and Arctic Urbanization.

Finally, the SHWG places high value on supporting early career development. All workshops awarded travel grants for early-career researchers and three of the activities (SHWG supported cross-cutting activities included) were directly involved with capacity building.

PHOTO: NICOLAJ GERNET
IASC Social & Human Working Group, ASSW2019, Arkhangelsk, Russia.

**denotes a priority within the scientific foci

NAME	COUNTRY	EXPERTISE
Chair Andrey Petrov	USA	Arctic regional/economic development; Sustainability; Urbanization
Vice-Chair Halvor Dannevig	Norway	Climate change adaptation; Environmental governance; Co-production of knowledge
Vice-Chair Susan Chatwood	Canada	Health systems; Population health; Community engagement
Gertrude Saxinger	Austria	Anthropology; Indigenous communities; Extractive industries; Labour mobility (FIFO); Infrastructure
Peter Schweitzer	Austria	Infrastructure studies; Anthropology of climate change; Indigenous political movements
David Natcher	Canada	Environmental livelihoods; Culture and economy; Maintenance of local food systems
Xu Shijie	China	Geomagnetism; Remote Sensing
Ping Su	China	Global Governance; International Political Sociology; International Organization
Barbora Padrtova	Czech Republic	Arctic geopolitics and security; International relations; Foreign policy
Robert Chr. Thomsen	Denmark	Autonomy/self-governance movements; Greenland; Indigenous movements
Pelle Tejsner	Denmark	Human rights; Sustainable development and climate change mitigation; Land use policy and resource extraction
Lassi Heininen	Finland	International relations, geopolitics and security; Environmental politics; Northern Europe and Russia
Mervi Heikkinen	Finland	Women's and gender studies; Intersectionality; Ethics; Higher education
Béatrice Collignon	France	Inuit geographic knowledge; Geographies of the Inuit; Inuit culture and contemporary societies
Virginie Vaté	France	Anthropology of religion; Shamanism and Christianity; Conversion; Chukotka and Alaska
J. Otto Habeck	Germany	Gender and social distinction; Segregation, marginality and mobility; Indigenous land use and permafrost
Alexander Proelss	Germany	International law; International law of the Sea; International environmental law
Catherine Chambers	Iceland	Coastal communities; Fisheries and aquaculture governance; Fishermen's knowledge
Swati Nagar	India	Polar science outreach
Akiho Shibata	Japan	International law; Polar law and policy
Shinichiro Tabata	Japan	Economic development and sustainability of the Russian Arctic regions
Annette Scheepstra	The Netherlands	
Britt Kramvig	Norway	Indigenous peoples ontologies, politics, and art; Creativity, tourism, and innovation in Arctic and indigenous communities
Michał Łuszczuk	Poland	Interational relations; Diplomacy; Security
Agnieszka Skorupa	Poland	Psychology; Human behaviour in extreme situations; Group and individual adaptation to Polar region
Seung Woo Han	Republic of Korea	Polar policy; Polar sociology; International law
Hyunkyo Seo	Republic of Korea	Polar policy
Andrei Golovnev	Russia	Anthropology, ethnography and ethnohistory; Arctic nomads, migration and movement
Andrey Podoplekin	Russia	Social psychology in the Arctic; Circumpolar states; Policy of scientific researches
Elena Conde	Spain	Arctic; Law of the Sea; Legal regime of marine scientific research
Peter Sköld	Sweden	Arctic regional development; Indigenous health, cultures, identities; Research planning
Ragnhild Nilsson	Sweden	Indigenous politics; Indigenous representation and self-determination
Ingrid A Medby	UK	Arctic Identity; Political Geography; Critical Geopolitics
Klaus Dodds	UK	Geopolitics; Security; Diplomacy
Lawrence Hamilton	USA	Sociology; Demography; Survey research
FELLOWS		
Stanislav Ksenofontov	Russia / Switzerland	Global change; Vulnerability of social-ecological systems; Arctic Yakutia
Megan Sheremata	Canada	Inuit knowledge; Environmental change; Eastern Hudson Bay
Pauline Pic	Canada	Geopolitics; Security; Arctic governance

SECRETARY

Gunnar Gunnarsson, Stefansson Arctic Institute, Iceland

[4] Membership as of 20 February 2020. Please visit https://iasc.info/working-groups/social-human/members for updated information and contact information for each Working Group Member.

Calotte Academy

When: 12 - 19 November 2019
Where: Finland, Norway, and Russia

Highlights

- The Calotte Academy is a post-modern academic stage and workshop that fosters interdisciplinary, knowledge(s), and dialogue-building, and implements the interplay between science and politics.
- This kind of academic forum, as a "School of dialogue," is a much needed democratic and equal space for an open discussion and dialogue.
- Based on, and following from, the outcomes of the previous symposia the theme of the 2020 Academy is "New and Emerging Trends of Arctic Governance, Geopolitics, Geoeconomics, and Science".

The Calotte Academy, which has been arranged annually since 1991, has a participatory approach with visits, sessions and 'hearings' in several destinations in the European Arctic, across (national) borders (Finland, Norway, Russia, Sweden, and Sapmi), with local audiences and expertise. It aims to bring together academics and other experts, policy-shapers and -makers to discuss, debate and brainstorm on relevant global, regional and local issues with an intention of sharing information and ideas, research results and insights, as well as fostering dialogue and creating networks between different stakeholders. In this, the most important method, as well as the main principle of the CA, is to allocate time enough for open discussion and debate (about twice more time than for a presentation).

The theme of the 2019 Academy was "Future Arctic Societies: Scenarios, Innovations, Best Practices & Actors". In this year, the travelling symposium discussed issues, discourses, innovations and practices relevant for Future Arctic / Northern societies in the context of the global Arctic in Enontekiö, Inari and Rovaiemi (Finland), and Kautokeino, Kirkines and Neiden (Norway). These issues were discussed theoretically and holistically from inter-disciplinary approaches, and from academic, policy-oriented and business ones, including community development, governance, Indigeneity, reindeer herding & tourism, technologies & industries & testing, as well as telecommunications and digitalization. Discussions were done from the perspectives of past(s), present(s) and in particular future(s), and from those of different stakeholders from Indigenous peoples to global business, as well as in global, international, Arctic, and local contexts.

WEBSITE

https://calotte-academy.com/

CONTACT

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Northern Sustainable Development Forum (NSDF)

When: 24 - 28 September 2019
Where: Yakutsk, Sakha Republic (Russia)

Highlights

- NSDF successfully implemented a multistakeholder dialogue within the Forum's program and discussed the possible ways to improve and facilitate human well-being and sustainability including balanced existence within the socio-ecological systems of the Arctic and the Northern regions.
- A number of agreements on enhanced cooperation in the context of Arctic science, business, and culture among the different groups of stakeholders were signed within the Forum which in the foreseeable future will help to increase the level of communication among the important Arctic stakeholders.
- NSDF is preparing the recommendations and road-map for future strengthening of Northern sustainability based on the results from discussions and community feedback.

On 24-28 September 2019, Yakutsk city hosted the Northern Sustainable Development Forum which gathered more than 100 representatives from different regions of Russia and countries including China, Japan, Republic of Korea, USA, Canada, Finland, Norway, Denmark, and Sweden.

One of the missions of the Forum is to connect and open dialogue between different groups of Arctic and Northern stakeholders in order to facilitate the human well-being and balanced existence in complex socio-ecological systems of the Arctic. To achieve this mission, the program of Forum has been structured in the way it could include a number of venues and proper conditions for communication between people and stakeholders at the interregional and international levels – plenary and themed sessions, round tables, institutional and B2B meetings, lectures, master classes and active individual dialogues. Greater attention within the NSDF program has been paid to young scientists and Indigenous groups.

A number of important agreements have been signed along the Forum's days with regional administrations, international and national organizations, and big companies on implementation of joint interdisciplinary projects by creating international experts' teams.

Scientific discussions and workshops attracted more than 50 scientists from different institutions with an interest and research devoted to the Northern regions and their sustainability. The overarching goal of discussion was to understand how the quality of life of population can be improved, and which mechanisms to support sustainable development in the cold-climate regions work more effectively and can be used as model for other northern territories within the circumarctic community. We expect NSDF to become an annual platform for international cooperation and discussions on Northern sustainability.

CONTACT

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Arctic Justice

When: 22 - 23 August 2019
Where: Uppsala (Sweden)

Highlights

- The notion of justice provides a useful tool for developing a research agenda that seeks progressive solutions for achieving sustainable development in the Arctic.
- Multi-disciplinary perspectives provide richer understandings and interpretations of the landscape for Arctic sustainability research.
- A major challenge to just economic futures lies in overcoming the restrictions imposed by social, economic, and territorial boundary-making by the state.

The Arctic region is considered as a barometer for discussions of sustainable development, global warming, or human security, but these conversations rarely include futures underpinned by principles of justice. As a frontier for economic development, the Arctic should also be considered as a frontier for considering new types of social, political, economic and environmental ideas. The motivating principle of this workshop was to consider foundations for a new framework of thought that offers a fair deal to the Arctic as it is increasingly incorporated into global processes.

The workshop consisted of four research sessions: normative justice, climate change and sustainability, resources issues, and society. The research presentations included perspectives from scholars from a variety of disciplines including: geography, law, ethics, political science, anthropology and sociology. Professor Don Mitchell (Uppsala University) delivered a keynote lecture on "The Landscape of Justice and Critical Research Agendas", which explained that geographies of injustice often include unrecognised parts of society, who are often 'hidden' in plain sight and challenged us to broaden our understanding of stakeholders in the Arctic.

CONTACT
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Long-term Perspectives of Social-Ecological Systems

When: 24 May 2019
Where: Arkhangelsk (Russia)

Highlights

- Arctic social-ecological systems face drastic challenges and an extensive interdisciplinary assessment is required.
- To assess social-ecological systems not only research data is necessary, but also consideration of Indigenous knowledge is essential.
- A joint special issue in a peer-reviewed journal might be published in the future.

A session on "Long-term Perspectives of Social-Ecological Systems" took place within Arctic Science Summit Week 2019 held in Arkhangelsk. The session aimed at exploring of how communities and stakeholders deal with combined challenges from climate change, political, economic and resource pressures, changes to the global order and new social-cultural realities and what the future might hold for the Arctic.

The session brought together six scholars from various disciplines focusing on social-ecological systems, the interaction of society and place, and the future social-ecological change scenarios. The presentations contributed to the understanding of human introduction of invasive species, vulnerability of social-ecological systems to global change, food insecurity, climate change as well as economic and social changes, and Indigenous knowledge across different Arctic regions, including Alaska, Canada, Russian Lapland and Siberia.

CONTACT

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Permafrost and Pastoral Land Use in Mongolia

When: 20 - 24 March 2019
Where: Ulaanbaatar (Mongolia)

Highlights

- Participants discussed the need for better access to more accurate meteorological data, in particular regarding changing precipitation patterns at local scale; and for a more nuanced understanding of how landscape aspect, snow and ice conditions, changes in plant species, grazing and logging all interact locally with permafrost dynamics.
- Traditional (unwritten) and new (officially established) land-use management strategies may help promote sustainable pasture and forest use in permafrost areas, but they must reflect changes in herd composition (e.g., the recent increase in cashmere goats), long-term inter-regional migration of herders and herds within Mongolia, as well as legal and technological changes.
- Drawing on successful examples from Central Yakutia (Sakha Republic, Russian Federation), participants recommend more frequent knowledge exchanges between local herders, social and environmental scientists in different communities across northern Mongolia.

The "Permafrost and Culture" Group (supported by IPA and IASC) intends to make permafrost dynamics understandable and relevant for social-sciences research in Inner Asia and the circumpolar North. Our ambition is a comparison of how local inhabitants deal with environmental change in different parts of Asia's vast area of permafrost.

The workshop in Ulaanbaatar was attended by 20 researchers from Mongolia and beyond, and it included a half-day seminar with students of geography and a field excursion to the permafrost research site at Terelj. The workshop revealed new aspects of permafrost distribution and the interplay of cryosphere, hydrology, vegetation, pastoralism, and socio-economic setting. Though not located in the Arctic, large parts of Mongolia are characterized by permafrost. Similar to neighboring Siberia, pastoralism is an important source of income and subsistence for many inhabitants. This form of land use is strongly dependent on environmental conditions. In permafrost regions, changes in the landscape and thus in the resource base may proceed rather rapidly and in unprecedented ways. Reversely, animal husbandry may also have an impact on local and regional environmental conditions – and on permafrost dynamics – as was demonstrated in earlier workshops (in Yakutsk and Vorkuta) of this research initiative.

CONTACT

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PHOTO: MARTHA RAYNOLDS

Cranberry on lichen-covered rock (***Vaccinium vitis-idaea***), photographed during the PACEMAP Project (Predicting Arctic Change through Ecosystem Molecular Proxies), Three-Lakes, Nunavik (Québec), August 2019.

Terrestrial Working Group (TWG)

Scientific Foci:

- Improving knowledge at multiple spatial scales of the current state of Arctic terrestrial geosystems and ecosystems
- Determining the net effect of the terrestrial and freshwater environmental and biosphere's processes that amplify or moderate climate warming
- Developing unifying concepts, fundamental theories, and computer models of the interactions among species, interactions between species, and their environment, and the biology of life in extreme environments
- Estimating past changes in Arctic geo- and biodiversity, measuring current change and predicting future changes
- Developing high spatial resolution models of terrestrial geosystem and ecosystem change and other tools that can be used by Arctic stakeholders for adaptation strategies and sustainable management of natural resources and ecosystem services
- Determining the role of connectivity in the functioning of Arctic terrestrial systems, including connections within the Arctic and the global system

The Terrestrial Working Group (TWG) fosters and supports a broad spectrum of activities, including cross-cutting activities and T-MOSAiC, the Terrestrial Multidisciplinary distributed Observatories for the Study of Arctic Climate. This support aims to reflect the enormous geo-, bio- and social diversity associated with the Arctic terrestrial and freshwater realms.

PHOTO: NICOLAJ GERNET
IASC Terrestrial Working Group, ASSW2019, Arkhangelsk, Russia.

NAME	COUNTRY	EXPERTISE
Chair Josef Elster	Czech Republic	Microbial ecology; Stress ecophysiology of cyanobacteria and microalgae
Vice-Chair Vladimir Romanovsky	USA	Permafrost; Geographic areas: Beringia (Alaska and NE Siberia), Norway and Svalbard
Vice-Chair Ulrike Herzschuh	Germany	Ecosystem change on decadal to glacial time-scales; Ancient DNA and pollen analysis
Andreas Richter	Austria	Microbial ecology; Terrestrial ecosystem ecology; Belowground plant-microbe interactions
Birgit Sattler	Austria	Microbial ecology; High altitude and polar limnology; Aerobiology
Philip Marsh	Canada	Hydrology; Snow; Permafrost; Hydrologic-Terrestrial System Interactions
Emily Jenkins	Canada	Wildlife; Parasites; Vectors
Luo Wei	China	Phytoplankton; Microbiology; Molecular ecology
Torben R. Christensen	Denmark	Biogeochemistry; Carbon cycling; Terrestrial ecosystem functioning
Thomas Friborg	Denmark	Climatic feedbacks; Carbon budgets; Terrestrial ecosystems
Otso Suominen	Finland	Animal ecology; Ecological interactions; Herbivory; Biodiversity
Miska Luoto	Finland	Data mining; Remote sensing; Biogeography
Thierry Boulinier	France	Seabird ecology; Disease ecology; Animal ecology
Christelle Marlin	France	
Nikola Koglin	Germany	Petrology; Geochemistry; Geochronology
Jón S. Ólafsson	Iceland	Freshwater Ecology; Ecosystem Processes; Subarctic freshwater ecosystems
Archana Singh	India	Aquatic chemistry
Santonu Goswami	India	Permafrost
Antonello Provenzale	Italy	Geosphere-biosphere interactions; Climate change impacts; Terrestrial ecosystems
Tetsuya Hiyama	Japan	Hydrology; Climate Change; Hydrologic-Terrestrial System Interactions
Masaki Uchida	Japan	Microbial ecology; Ecosystem ecology
Rolf Anker Ims	Norway	Biodiversity; Tundra ecosystems; Climate change impacts
Pernille Bronken Eidesen	Norway	Arctic botany; Phylogeography; Spatial & temporal variation of biodiversity
Piotr Owczarek	Poland	Dendrogeomorphology; Modern slope and glaciofluvial processes; Climate - landscape interaction
Zbigniew Zwoliński	Poland	Geomorphology; Geodiversity; Geoinformation
João Canário	Portugal	Biogeochemistry; Permafrost; Trace-elements
Tae-Yoon Park	Republic of Korea	Palaeontology; Evolutionary Biology; Polar Geology
Ji Young Jung	Republic of Korea	Biogeochemistry; Soil carbon dynamics; Tundra ecosystems
Alexander Makarov	Russia	Carbon cycle
Olga L'vovna Makarova	Russia	Tundra invertebrates; Mites; Insects; Earthworms; Taxonomy; Community structure
Sergi Pla-Rabes	Spain	Paleoecology; Remote ecosystems; Biodiversity; Biogeochemistry
Hans Linderholm	Sweden	Arctic climate change; Paleoclimate; Glacier variability
Gabriela Schaepman-Strub	Switzerland	Biodiversity; Ecosystem functioning; Energy budget; Remote sensing
Christian Rixen	Switzerland	Arctic and alpine plant ecology; Biodiversity and ecosystem functioning
Rien Aerts	The Netherlands	Global Change effects on polar ecosystem functioning; Biodiversity; Biogeochemistry
Philip Wookey	UK	Biodiversity; Biogeochemistry; Carbon fluxes and cycling
Mary Edwards	UK	Vegetation ecology and palaeoecology; Quaternary biogeography; Long-term climate history
Michelle Mack	USA	Plant and ecosystem ecology; Disturbance ecology; Nitrogen cycling
FELLOWS		
Anna-Maria Virkkala	Finland	Ecosystem ecology; Greenhouse gases; Soil organic carbon
Clay Prater	UK	Elemental ecology; Cross-system nutrient flux; Limnology
Matthias Fuchs	Germany	Arctic deltas; Permafrost; Carbon

SECRETARY

Rebecca Hewitt, Northern Arizona University, USA

[5] Membership as of 20 February 2020. Please visit https://iasc.info/working-groups/terrestrial/members for updated information and contact information for each Working Group Member.

AVA - Arctic Biodiversity and Ecosystem Functioning

When: May 2019
Where: Arkhangelsk (Russia)

Highlights

- Abstracts on the status of national AVA data bases, Russian vegetation plot data, and applications of vegetation plot data are available through the workshop proceedings.
- Training of Turboveg has resulted in technical recommendations on how to align national data entries in preparation for the pan-arctic data integration.
- A central website on AVA, with supporting information and links to national data bases is under construction with CAFF, and will be accessible through CAFF.

The AVA initiative is encouraging each Arctic nation to assemble its own archive with common protocols that will later allow the databases to be united into a single circumpolar AVA. Over 30 scientists attended the AVA IASC workshop in Arkhangelsk. Oral and poster presentations discussed progress of the national data bases, with a focus on Russian data, and potential applications of AVA data. Several hours were reserved to discuss special topics in smaller groups, including 1) practical questions of data integration into AVA (with a focus on Russian territories), 2) methods and standardization for vegetation classification, 3) strategies of how to move forward with the with Arctic vegetation work in international programs, and 4) to collect materials for a central website linking to national data bases.

During a half-day training, interested participants learned how to use Turboveg, the standard software to enter data into AVA. This training led to discussions on how to make Turboveg more user-friendly, how to technically align the different national data sets to make them ready for circumpolar integration, and on common species lists for vascular plants, mosses, and lichens. A half-day wrap-up and synthesis meeting concluded the extended Arctic vegetation meeting on 23 May 2019.

CONTACT

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Herbivory Network

When: 19 - 21 September 2019
Where: Yamal-Nemets Autonomous District (Russia)

Highlights

- Standardized common protocols can help consolidate collaborative research efforts across the Arctic.
- Integrating across scales, from plot-level vegetation analyses to remote-sensing products, will help monitor the influences of herbivores in tundra ecosystems.
- Systematic tools to synthesize existing knowledge on plant-herbivore interactions can help assess how robust our knowledge base is and can guide the design of targeted studies.

Interactions between herbivores and plants are a fundamental component of Arctic ecosystems. These interactions can modulate the responses of tundra ecosystems to ongoing environmental changes; for example, through their impacts on the structure of vegetation, herbivores can influence patterns of snow cover and albedo, with large-scale consequences to the climate system. As well, many herbivores are important to the livelihoods of peoples in the Arctic. The Herbivory Network (HN) was initiated in 2014 with the support of IASC. HN has continued to develop as a growing international network of researchers investigating the role of herbivores in the tundra. The last five years of collaboration have been very fruitful and have resulted already in 6 scientific publications and 17 presentations at conferences and scientific meetings. But there is still a long way ahead!

The last HN meeting was held 19-24 September 2019 in Labytnangi, Yamal-Nenets Autonomous District, Russia. Meeting participants were warmly welcomed to the town of Labytnangi, in beautiful autumn colors. The meeting was hosted at the newly built research facilities at the Arctic Research Station of the Institute of Plant and Animal Ecology, Russian Academy of Sciences. A total of 20 researchers (including 8 Early Career Scientists) from 8 countries participated in the meeting, which was organized as a series of parallel smaller hands-on workshop sessions. During the meeting we made substantial progress on some of the ongoing HN projects and new ideas for future collaboration projects were developed.

WEBSITE

http://herbivory.lbhi.is

CONTACT

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PHOTO: NICOLAJ GERNET
Cultural performance, ASSW2019, Arkhangelsk, Russia.

3. Arctic Science Summit Week 2019

» 3 Arctic Science Summit Week 2019

Arctic Science Summit Week 2019 was held in Arkhangelsk, Russia and hosted at the Northern Arctic Federal University and the Northern Medical State University under the auspices of the Russian Academy of Sciences. Over 450 delegates from 23 countries included scientists, Indigenous leaders, business and nonprofit organizations and representatives from government from the Russian Federation and throughout the world. The theme of ASSW2019 was "Climate Change and Development of the Arctic Population," encompassing a broad range of scientific community meetings as well as a fascinating open science conference with 19 oral sessions, a poster session, 15 keynote speakers (including a remote lecture by IASC Medallist Dr. Marika Holland), and even Pomor cultural performances and excursions. ASSW2019 was a unique opportunity for the IASC community to network with colleagues from around the circumpolar north, in particular learning and sharing with the research and researchers of the Russian Arctic.

PHOTO: MEGHAN SHEREMATA
Indigenous Peoples & Partners self-organized meeting during ASSW2019.

Upcoming ASSWs

ASSW 2020: Akureyri, Iceland - including the 5th Arctic Observing Summit

The ASSW and AOS meetings will be arranged during March 27 to April 2 in Akureyri, in the facilities of the University of Akureyri.

Website: **www.assw2020.is**

ASSW 2021: Lisboa, Portugal; 19-26 March, 2021

ASSW 2021 will be held in Lisboa, Portugal on 19-26 March 2021. This will inlcude science community and business meetings, a cultural day, and a science symposium with the theme "The Arctic: Regional Changes, Global Impacts."

Website: **www.assw2021.pt**

ASSW 2022: Tromsø, Norway- including the 6th Arctic Observing Summit

ASSW 2022 will be held in Tromsø, Norway on 26 March - 1 April 2022. This will include science community and business meetings, the Arctic Observing Summit, and very likely an Arctic Science Day.

PHOTO: MARTIN LULAK
Marie Šabacká (Centre for Polar Ecology) uses a portable field microscope on the Nordenskioldbreen, central Svalbard.

4. Data and Observations

» 4 Data and Observations

Sustaining Arctic Observing Networks (SAON)

Vision, Mission and Goals

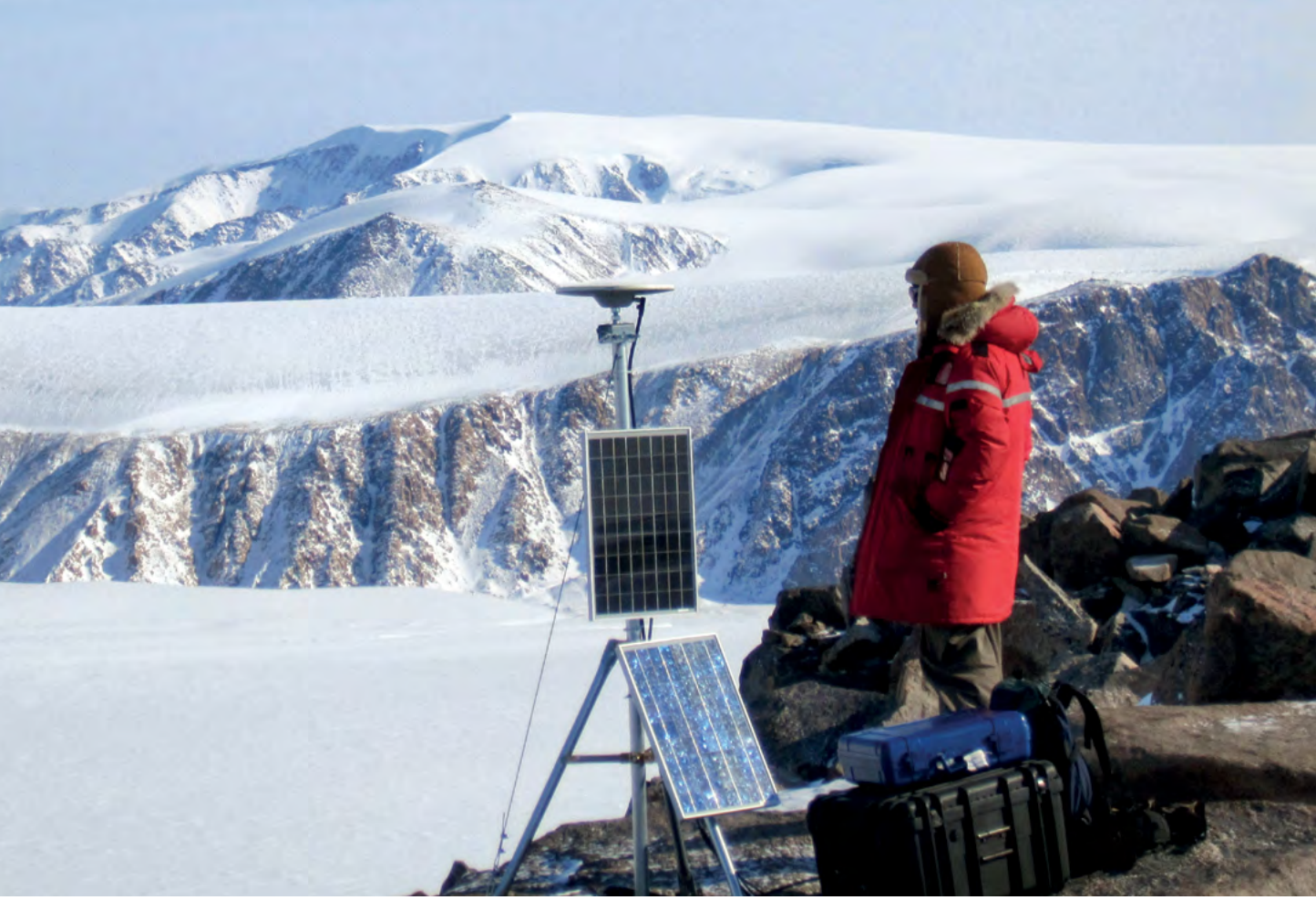
SAON is a joint initiative of the Arctic Council and IASC. SAON's vision is a connected, collaborative, and comprehensive long-term pan-Arctic Observing System that serves societal needs. The mission of SAON is to facilitate, coordinate, and advocate for coordinated international pan-Arctic observations and mobilize the support needed to sustain them.

The SAON Board has approved a 10-year strategy and implementation plan for SAON in 2018 and adopted the following three goals:

1. Create a roadmap to a well-integrated Arctic Observing System;
2. Promote free and ethically open access to all Arctic observational data; and
3. Ensure sustainability of Arctic observing.

Creating a roadmap to a well-integrated Arctic Observing System.

In its strategy, SAON has identified the need for a Roadmap for Arctic Observing and Data Systems (ROADS) as a way of defining the needed Observing and Data System and to specify how the various partners and players are going to collectively work towards achieving that system. ROADS seeks to generate a systems-level view of observing requirements and implementation strategies. All interested countries, Arctic as well as non-Arctic, are invited to contribute to this process. The 5th Arctic Observing Summit will further refine the proposed process.



Free and ethically open access to all Arctic observational data

Ongoing projects of the Arctic Data Committee (ADC) include:

- The Polar Data Forum (PDF) focuses on improving how people and systems can share data in a meaningful way. The goal is to move towards open and connected systems based on a culture of trust and acknowledgement of data production and use. The ADC arranged the PDF in cooperation with partners in 2013 and 2015 and 2019.
- Establishing a map of the Arctic data management "ecosystem." This will be both a concept map indicating projects, services and relationships as well as a geographic map indicating location.
- The Vocabularies and Semantics Working Group coordinates vocabularies and semantics development activities across the polar information community.

Arctic Observing Summit

The Arctic Observing Summit (AOS) is SAON's outreach event. AOS is a high-level, biennial summit that aims to provide community-driven, science-based guidance for the design, implementation, coordination and sustained long-term (decades) operation of an international network of Arctic observing systems. The 5th AOS has the theme Observing for Action and takes place 31 March to 2 April 2020 in the context of ASSW2020 in Akureyri, Iceland.

SAON WEBSITE, SOCIAL, MEDIA, AND NEWSLETTER:
https://www.arcticobserving.org

ARCTIC OBSERVING SUMMIT WEBSITE:
https://arcticobservingsummit.org/

PHOTO: MARTIN SHARP
GPS observations near Belcher Glacier, Devon Ice Cap, Nunavut (Canada).

Arctic Data Committee (ADC)

The ADC was formed by IASC and SAON in late 2014. The overarching purpose of the ADC is to promote and facilitate international collaboration towards the goal of free, ethically open, sustained, and timely access to Arctic data through useful, usable, and interoperable systems. Since its formation, the ADC has convened, co-convened, or contributed to a number of activities and events including meetings and implementation workshops in partnership with many other Arctic and polar bodies (e.g., SCAR Standing Committee on Antarctic Data Management, Southern Ocean Observing System, and the GEO Cold Regions Initiative).

In 2019, following conversations at the Polar Data Planning Summit in Boulder, and the Polar Data and Systems and Architecture Workshop in Geneva in 2018, the ADC organized the Third Polar Data Forum (PDF III), hosted by the Finnish Meteorological Institute in Helsinki, 18-22 November. PDF III was co-organized with regional partners including the INTAROS project in conjunction with the EU Arctic Cluster, the Royal Netherlands Institute for Sea Research, and other European organizations. The Forum was co-convened by the ADC, the Southern Ocean Observing System, the SCAR Standing Committee on Antarctic Data Management, the World Data System and other organizations engaged in polar data management.

PDF III included a two-day conference-style meeting in support of information exchange, with the remainder of the week using a "hackathon" approach that built on the development work done in Boulder, Geneva, and other related meetings. Working and hackathon activity themes included:

- Enhancing Polar Federated Search
- Understanding and Applying Controlled Vocabularies and Formal Semantics
- Arctic Data Interoperability
- Data Interoperability Between Disparate Data Sources
- Marine Data
- Arctic Data from the Copernicus Marine Services
- Policy, Broader Context and Scenarios

Results and outcomes will be shared via the ADC website and the 5th Arctic Observing Summit being held in Iceland from 31 March to 2 April 2020.

WEBSITE

https://arcticdc.org/

CONTACTS

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Marten Tacoma, Vice-Chair | Marten.Tacoma@nioz.nl

PHOTO: PAULINE SNOEIJS-LEIJONMALM

Three scientists using the "Floe Navi" system for navigation on the MOSAiC ice floe at 86°N in November 2019. The German research icebreaker Polarstern is drifting with the transpolar drift for one year during the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) expedition.

5. Capacity Building

» 5 Capacity Building

IASC Fellowship Program

IASC recognizes that the next generation of Arctic researchers is faced with emerging scientific and societal challenges due to the growing impacts of Arctic and global climate change. IASC therefore believes that it is of great importance to foster, promote, and involve young researchers working in the Arctic by:

- Striving to represent early career researchers within IASC;
- Providing support, endorsement, and dissemination of information on activities, projects and requests for participation; and,
- Supporting travel grants to early career scientists for participation in select Arctic conferences.

With these instruments, IASC aims to promote early career researchers within the organization by providing career-building activities such as developing and organizing scientific workshops, planning international and interdisciplinary research activities and programs, and developing professional networks.

Since 2014, IASC has supported its Fellowship Program that matches early career scientists including graduate students, postdocs and junior faculty to each of IASC's WGs. As of 2020, a total of 40 early career researchers have participated in the IASC Fellowship Program. Fellows have the opportunity to participate as WG members for three years and are provided with funding to attend two consecutive ASSW meetings during their initial fellowship years. This unique opportunity lets these early career researchers to become active members of their WGs, allowing them to develop research collaborations and professional networks with senior researchers across a range of disciplines.

In 2020, IASC is partnering a second time with the Conservation of Arctic Flora and Fauna (CAFF) Working Group of the Arctic Council to offer the CAFF-IASC Fellowships. These Fellows are paired with a CAFF activity (the Arctic Migratory Birds Initiative and the Coastal Ecosystem Monitoring Group), funded to participate in ASSW and these activities' events, and contribute towards producing a deliver-

able. The CAFF-IASC CEFG Fellow is Nicholas Huffeldt. As of 20 February, the CAFF-IASC AMBI Fellow was not yet confirmed. With active mentorship, the aim of this Fellowship is to give early career researchers experience is bridging the gap between research and decision-making.

Earlier in 2019, the 2019 Fellow Class was introduced during the joint WG meeting at ASSW2019 in Arkhangelsk, Russia. The previous years' 2018 Fellows were deeply involved in both the WG and Council meetings, as well as in the ASSW science symposium. IASC Fellows co-convened scientific sessions, presented scientific research and participated in panel discussions at ASSW2019.

Fellows also attend other important meetings including but not limited to the Arctic Circle Assembly held in Reykjavik, Iceland, the CAFF Circumpolar Biodiversity Monitoring Program Marine Scoping Workshop held in Nuuk, Greenland, the Protection of the Arctic Marine Environment's Regional Action Plan for Marine Litter and Plastics Pollution Workshop held in Oslo, Norway, and more.

IASC is excited to witness the contributions all of our current and past Fellows bring to IASC's scientific activities and Arctic research as a whole. IASC would like to acknowledge all that have supported the idea of the IASC Fellowship Program and outstanding early career researchers who have served as Fellows. Now in its seventh year, the benefits of the IASC Fellowship Program are clearly evident for the Fellows, for IASC, and for Arctic research.

PHOTO: MARTHA RAYNOLDS
Helga Bültmann identifying a lichen during the project - PACEMAP (Predicting Arctic Change through Ecosystem Molecular Proxies). North of Clyde River, Baffin Island, Nunavut.

Fellows' Voices

I started my IASC Fellowship at the very beginning of my Arctic-related research and it has been an incredible way to get to meet the international community, develop a deeper understanding of the Arctic, and learn more about the challenges of working in the Arctic environment. In particular, the opportunity to meet the other Fellows has helped me to learn a huge amount and form relationships that I'm sure will last into the future of our research!

Sophie Haslett | 2019 Atmosphere Working Group Fellow
Arctic aerosols and trace gases; Mass spectrometry; Atmospheric chemistry

I would recommend the IASC Fellowship program to any Early Career Scientist who is seeking new experiences and opportunities. As an IASC Fellow, I have learned about the "backstage of science" i.e. how science in the Arctic is supported by international and interdisciplinary efforts, as by people involved with IASC. The IASC Fellowship is also an ideal platform to expand your scientific network, by meeting and interacting with scientists from different backgrounds and experiences – which for me resulted in being invited to the 2019 Arctic Circle Assembly as a speaker!

Barbara Barzycka | 2019 Cryosphere Working Group Fellow
Remote sensing; Glacier facies; Drone mapping

PHOTO: NICOLAJ GERNET
IASC President Larry Hinzman awards the 2019 IASC Fellows at ASSW 2019, Arkhangelsk, Russia.

As an IASC Fellow with the Marine Working Group, I much appreciate both the international and the cross-system approach; the possibility to connect across borders is absolutely necessary to assess the changes in the marine Arctic. Also, I feel that it gives me a taste of the often hidden, opaque, or bureaucratic parts of science, which is far from my everyday work as a postdoc. Over the course of my Fellowship, I have been able to expand my network and improve my understanding of connections within Arctic systems.

Maria Paulsen | 2019 Marine Working Group Fellow
Microbial foodwebs; Terrestrial runoff; Bacterial activity

Being an IASC Fellow has given me tremendous opportunities to grow as an early career researcher. The Fellowship has provided me with a unique chance to work with leading scientists from across the globe. And it has connected me with Indigenous scholars and allied researchers who are committed to co-producing scientific knowledge with Indigenous Peoples. I plan to continue collaborating with many of these new colleagues and mentors in the years to come, and I am very grateful to IASC for the experience.

Megan Sheremata | 2019 Social and Human Working Group Fellow
Inuit knowledge; Environmental change; Eastern Hudson Bay

The IASC Fellowship is a great opportunity to become an active participant in the pan-Arctic research community. By interacting with other early career scientists and established researchers, the Fellowship provides a unique opportunity to see how large-scale science is conceived and managed from the bottom-up and to contribute towards shaping and facilitating these efforts.

Clay Prater | 2019 Terrestrial Working Group Fellow
Elemental ecology; Cross-system nutrient flux; Limnology

Overview of Supported Early Career Scientists

170
EARLY CAREER SCIENTISTS RECEIVED TRAVEL SUPPORT FROM IASC

29
ACTIVITIES AT WHICH IASC SUPPORTED ECS

70%
OF IASC SCIENTIFIC FUNDS USED TO SUPPORT ECS

129.100 €
USED TO SUPPORT ECS PARTICIPATION

TRIPS TAKEN BY QUOTED ECS
JOURNEYS SUPPORTED BY IASC
IASC MEMBER COUNTRIES
OTHER COUNTRIES

Early Career Scientists' Testimonials

ALEX MAVROVIC

Affiliation: Université du Québec à Trois-Rivières
Country of Residence: Canada
Activity: MOSAiC School 2019

The MOSAiC school offered me the opportunity to learn from senior scientists right in the action! I learned more during the 6 weeks of this project than during entire school semesters. Particularly important, I acquired new knowledge of coupled system in geophysical sciences. While exchanging ideas, I made contacts with senior scientists that will hopefully lead to new partnership for my ongoing PhD. I am extremely grateful to IASC to have contributed to this very unique and valuable opportunity. Thank you.

PAT WONGPAN

Affiliation: Institute of Low Temperature Science, Hokkaido University
Country of Residence: Japan
Activity: Joint BEPSII/ECVice General Meeting

Without the support from IASC, I could not have attended the meeting. I met new colleagues, rejoined with my PhD advisors from NZ again, and updated my sea ice literature.

MEGHA VERMA

Affiliation: Imperial College London
Country of Residence: UK
Activity: Herbivory Network Workshop

IASC support gave me the opportunity to meet researchers who work with ground data to monitor ecological changes and discuss the potential means to integrate both satellite imagery, drone imagery and on-ground data to monitor these changes. It also allowed me to meet with senior scientists and understand the research in the Arctic further. I would like to thank IASC and the event organizers for the opportunity to attend the meeting.

SCOTT ZOLKOS

Affiliation: University of Alberta
Country of Residence: Canada
Activity: IASC Bylaws Action Group Meeting

My participation gave me a new perspective on what it takes to run an international, multidisciplinary Arctic research organization. As an ECR, this is incredibly insightful for my future scientific endeavors with IASC and in international Arctic research! … Thanks for the opportunity to contribute. I'm glad to be part of the team!

MARIA PISAREVA

Affiliation: Shirshov Institute of Oceanology RAS
Country of Residence: Russia
Activity: Synoptic Arctic Survey Planning Workshop

[I] learned about the SAS program, and discussed the possibility of participating in it, and learned what the scientists of SAS are working on and presented my research to them. New collaborations and participation in SAS would be useful for my studies of Russian Arctic Seas hydrology. Thank you for having me at SAS!

HAR AMRIT SINGH SANDHU

Affiliation: Punjab Engineering College
Country of Residence: India
Activity: ASSW 2019

This is a life-time opportunity to attend ASSW2019! I was able to meet various researchers and collaborators, as well as learn about the latest inventions and techniques etc. … Thanks for motivating researchers/scientists like me.