IASC Bulletin 2014

IASC 2014
BULLETIN

IASC Bulletin 2014
ISSN: 1654-7594, ISBN: 978-3-9813637-6-0

INTERNATIONAL ARCTIC SCIENCE COMMITTEE
Telegrafenberg A43, DE - 14473 Potsdam, Germany
www.iasc.info

INTERNATIONAL ARCTIC SCIENCE COMMITTEE

[IASC] · INTERNATIONAL ARCTIC SCIENCE COMMITTEE

Representatives of national scientific organizations from all 21 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 a 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.

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 bipolar cooperation through interaction with relevant science organizations.

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[IASC] · STRUCTURE

Representatives of national scientific organizations from all 21 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 a 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

Canada	Canadian Polar Commission	www.polarcom.gc.ca
China	Chinese Arctic and Antarctic Administration	www.chinare.gov.cn
Czech Republic	Czech Centre for Polar Research	http://polar.prf.jcu.cz/
Denmark/Greenland	The Agency for Science, Technology and Innovation	www.fi.dk
Finland	Delegation of the Finnish Academies of Science and Letters	www.tsv.fi/international/akatemiat/
France	Institut Polaire Français	www.institut-polaire.fr
Germany	Deutsche Forschungsgemeinschaft	www.dfg.de
Iceland	RANNÍS, The Icelandic Centre for Research	www.rannis.is
India	National Centre for Antarctic and Ocean Research (NCAOR)	www.ncaor.gov.in
Italy	National Research Council of Italy	www.cnr.it
Japan	Science Council of Japan, National Institute of Polar Research	www.nipr.ac.jp
The Netherlands	Netherlands Organisation for Scientific Research	www.nwo.nl
Norway	The Research Council of Norway	www.forskningsradet.no
Poland	Polish Academy of Sciences, Committee on Polar Research	www.kbp.pan.pl
Russia	The Russian Academy of Sciences	www.ras.ru
Republic of Korea	Korea National Committee on Polar Research	www.kopri.re.kr
Spain	Comité Polar Español	www.micinn.es
Sweden	The Swedish Research Council	www.vr.se
Switzerland	Swiss Committee on Polar Research	www.polar-research.ch
United Kingdom	Natural Environment Research Council	www.nerc.ac.uk
USA	Polar Research Board	www.dels.nas.edu/prb/

PHOTO: BENJAMIN HELL
Take-off for an ice reconnaissance flight. Amundsen Basin, Arcic Ocean.

IASC 2014

BULLETIN

INTERNATIONAL ARCTIC SCIENCE COMMITTEE

[IMPRINT]

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Editors: Ursula Heidbach, Yoo Kyung Lee and Volker Rachold
Production and Layout: www.redpear.de
Printing: www.druckereiarnold.de

ISSN: 1654-7594
ISBN: 978-3-9813637-6-0

COVERPHOTO: MARIO HOPPMANN
Sea-ice physicist measuring light under sea ice in the central Arctic.

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[PREFACE]

Each year the International Arctic Science Committee (IASC) compiles and presents this Bulletin, providing an overview of the diverse activities conducted and sponsored by IASC. In addition to providing an annual report of new and continuing initiatives, the Bulletin also introduces future activities.

In 2013, IASC´s main attention has been directed to planning the Third International Conference on Arctic Research Planning (ICARP III). A Steering Group, involving all IASC partner organizations, has been established and the overall strategy and plan of procedures were agreed upon at a meeting in Potsdam in September 2013. IASC Working Groups and Networks will be fully integrated in the ICARP III process and seed money for developing cross-cutting, forward-looking activities has been made available. Additional funding has also been set aside to support joint activities with ICARP III partner organizations.

ICARP III will be formally launched at the Arctic Science Summit Week (ASSW 2014), which also includes the 2nd Arctic Observing Summit (AOS). ICARP III will include a series of events, culminating in the final conference to be convened at the ASSW 2015 in Toyama, Japan. This final ICARP III event will be held in conjunction with IASC´s 25th anniversary, presenting the opportunity to review IASC contributions and recognize those who have been instrumental in its founding, development and growth. A special issue of the IASC Bulletin, with contributions from individuals involved in the planning and implementation of IASC over the past 25 years is in preparation.

Initial ICARP III plans were presented and discussed at the ASSW 2013 in Krakow, Poland. About 400 participants from 25 countries attended the conference, including the three-day Science Symposium focused on the interactions between the Arctic and the lower latitudes and the regional and global implications of Arctic changes. The engagement of the Arctic Council Indigenous Peoples Secretariat (IPS) and the Association of Polar Early Career Scientists (APECS) made it possible to fully integrate both Arctic people and early career scientists in the five disciplinary and four cross-cutting sessions of the Science Symposium "The Arctic Hub - Regional and Global Perspectives".

ICARP III plans were also presented to the Arctic Council (AC). The Permanent Participant organization and AC Working Groups were invited to engage in the ICARP III. IASC is also closely cooperating with the other two scientific observer organizations on the Arctic Council, the University of the Arctic (UArctic) and the International Arctic Social Science Association (IASSA). The overall goal of ICARP III is to identify Arctic science priorities for the next decade, so APECS is another key partner in the planning process.

IASC Action Groups provide strategic advice to the IASC Council concerning both long-term activities and urgent needs. At the ASSW 2013, three Action Groups presented their final reports. To reinforce IASC's commitment to robust data management and sharing activities, the Data Policy Action Group had been mandated to develop and recommend a data policy, including steps toward implementation of the policy. The Action Group developed a „Statement of Principles and Practices for Arctic Data Management" which was presented to IASC Council and formally approved on 16 April 2013. The Action Group on Geosciences (AGG), which had been established by Council to strengthen geoscience research possibilities in the IASC Working Group structure, presented a final report including a central recommendation for IASC to develop an assessment on the "Geodynamic Evolution of the Arctic" as a major geoscience contribution to ICARP III. Finally, the Bipolar Action Group, established jointly with the Scientific Committee on Antarctic Research (SCAR), presented its final report. Based on these recommendations, the Executive Committees of SCAR and IASC agreed to consider holding another joint Open Science Conference in 2018 and a workshop to review the outcome of IASC´s ICARP III and SCAR´s Horizon Scan in the second half of 2015.

Many, many individuals have contributed their time and energy to the successful development of IASC during the past year and we would like to thank everyone involved for supporting IASC. In addition, we would like to express our sincere thanks to the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, the German Science Foundation, the Korea Polar Research Institute and the US National Science Foundation for generously supporting the IASC Secretariat. We are extremely pleased that Germany decided to extend the offer to host the central Secretariat in Potsdam for another five years, until the end of 2018.

David Hik | IASC President
Volker Rachold | IASC Executive Secretary

PHOTO: IÑIGO GARCIA ZARANDONA
A melting ice block in the Greenland Sea.

PHOTO: THOMAS OPEL
Close-up of winter ice in the Lena Delta, Siberia.

1. IASC Internal Development

» 1 IASC Internal Development

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 multi-disciplinary 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, began operations in 1991, and today comprises 21 member countries. The IASC member organizations are national science organizations covering all fields of arctic research.

Country	Organization	Representative
Canada	Canadian Polar Commission	David Hik, President
China	Chinese Arctic and Antarctic Administration	Huigeng Yang, Vice-President
Czech Republic	Centre for Polar Ecology	Josef Elster
Denmark/Greenland	The Agency for Science Technology and Innovation	Naja Mikkelsen, Vice-President
Finland	Delegation of the Finnish Academies of Science and Letters	Kari Laine
France	Institut Polaire Français	Yves Frenot
Germany	Deutsche Forschungsgemeinschaft	Karin Lochte
Iceland	RANNÍS, The Icelandic Centre for Research	Thorsteinn Gunnarsson
India	National Centre for Antarctic and Ocean Research (NCAOR)	Sivaramakrishnan Rajan
Italy	National Research Council of Italy	Carlo Barbante
Japan	Science Council of Japan	Tetsuo Ohata
The Netherlands	Netherlands Organisation for Scientific Research	Louwrens Hacquebord
Norway	The Research Council of Norway	Susan Barr, Vice-President
Poland	Polish Academy of Sciences, Committee on Polar Research	Jacek Jania
Russia	The Russian Academy of Sciences	Vladimir I. Pavlenko
Republic of Korea	Korea National Committee on Polar Research	Byong-Kwon Park
Spain	Comité Polar Español	Manuel Catalan
Sweden	The Swedish Research Council	Mats Andersson
Switzerland	Swiss Committee on Polar Research	Martin Luethi
United Kingdom	Natural Environment Research Council	Cynan Ellis-Evans
USA	Polar Research Board	Jackie Grebmeier, Vice-President

TABLE: An overview of all IASC Council members, including the countries and organizations they represent.

PHOTO: PIOTR LEPKOWSKI
The IASC Council Meeting at the ASSW 2013 in Kraków, Poland.

The Arctic Science Summit Week 2013
13-19 April 2013, Kraków, Poland

IASC Council

Representatives of national scientific organizations from all IASC member countries form the IASC Council that meets once a year during the Arctic Science Summit Week (ASSW). The Council members ensure an input of a wide range of scientific and technical knowledge and provide access to a large number of scientists and administrators through their national committees.

The IASC Council has the responsibility to:

- Develop policies and guidelines for cooperative arctic research;
- Establish Working Groups (WGs) that address and act on timely topics in arctic science;
- Recommend, in cooperation with the WGs, implementation plans for IASC programs and activities;
- Decide on the participation of national scientific organizations from the non-arctic countries; and
- Organize arctic science conferences.

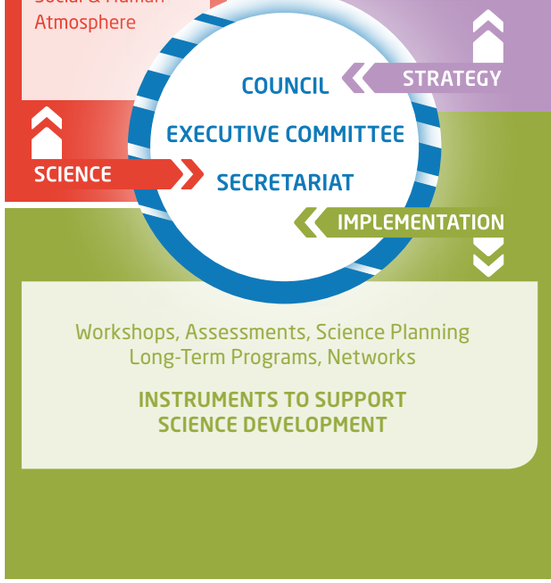

FIGURE: Diagram representing key elements of the IASC organizational structure.

IASC Executive Committee

The 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 and four Vice-Presidents, and the Executive Secretary.

The current IASC Executive Committee members are:

David Hik, President
Huigeng Yang, Vice President
Jacqueline Grebmeier, Vice-President
Susan Barr, Vice-President
Naja Mikkelsen, Vice-President
Volker Rachold, IASC Executive Secretary

IASC Secretariat

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

- Communicating with Council members;
- Communicating with other organizations including the Arctic Council and its subsidiary bodies and the International Council for Science (ICSU);
- Publication of the IASC Bulletin and IASC material as required;
- Maintaining the IASC website, preparing the IASC newsletter Progress, and in general facilitating outreach; and
- Administration of IASC finances.

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PHOTO: MARTIN LÜTHI
Greenland ice sheet, West Coast, near Ilulissat: Deep drilling with a hot water jet to access the base of the ice. The aim of the project ROGUE is to explore how ice deformation and basal motion control ice movment on an ice sheet.

PHOTO: COLLIN FAIR
A zodiac is being prepared during a students on ice expedition in Nunavut, Canada

2. IASC Working Groups

» 2 IASC Working Groups

Encouraging and supporting science-led international programs

IASC is engaged in all fields of Arctic research. Its main scientific working bodies are 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.

The members are experts in their field, with an international reputation and from different scientific disciplines so that the full range of Arctic research is represented in the WGs. Though the WGs are disciplinary, they also address cross-cutting science questions by initiating activities which involve at least three WGs.

PHOTO: KRISTINA BÄR
Scientists sort our polar cod and Atlantic cod during an arctic expedition on the RV Heincke.

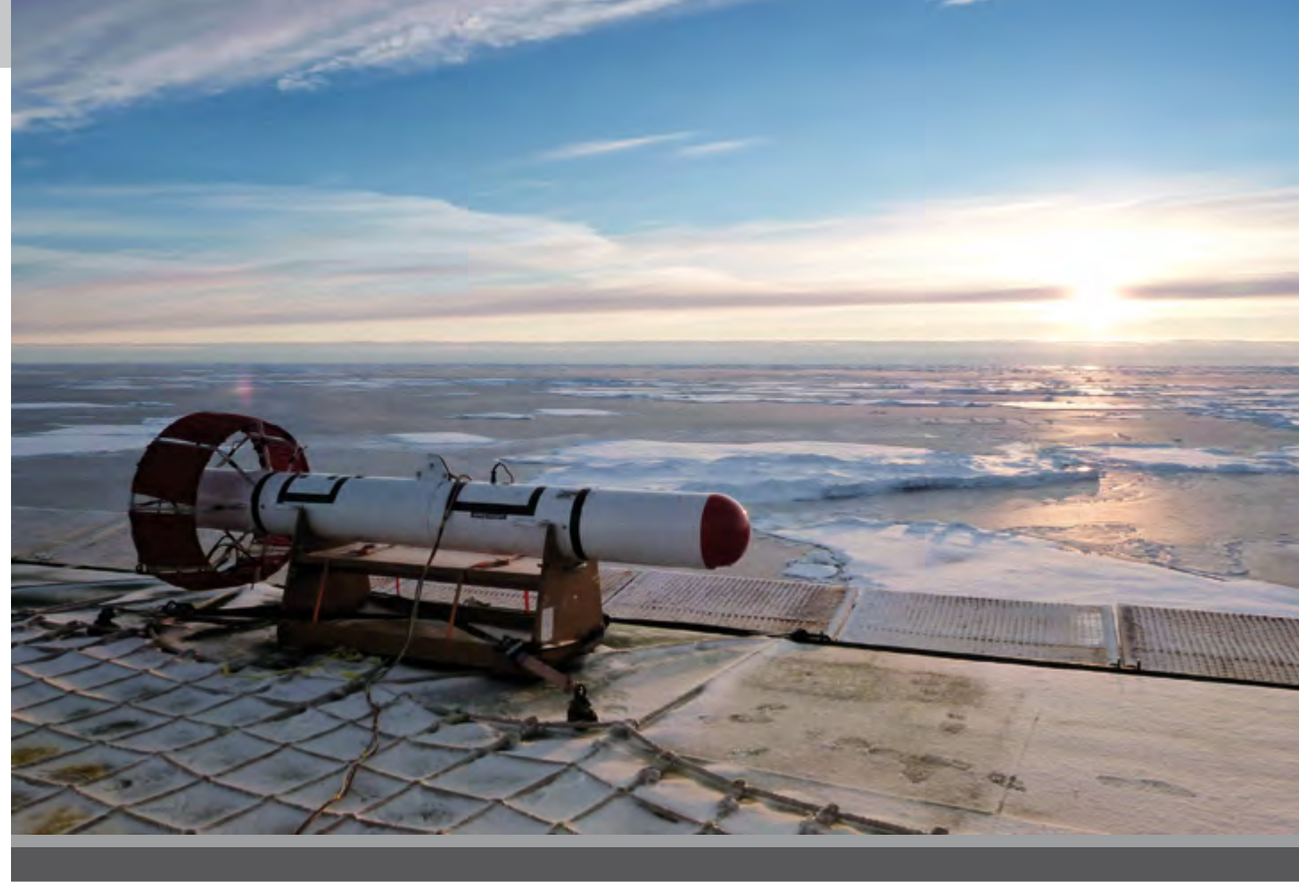

PHOTO: MAR FERNÁNDEZ-MÉNDEZ
Central Arctic: EM-Bird prepared to be towed to the helicopter to make sea-ice thickness measurements from the air.

Atmosphere Working Group (AWG)

Membership

Jim Overland - USA, Chair | **Hiroshi L. Tanaka** - Japan, Vice Chair | **Michael Tjernström** - Sweden, Vice Chair
Kathy Law - France, Vice Chair

Claude Labine - Canada | **Bian Lingen** - China | **Kamil Laska** - Czech Republic | **Henrik Skov** - Denmark
Timo Vihma - Finland | **Eila Lehmus** - Finland | **Klaus Dethloff** - Germany | **Günther Heinemann** - Germany
Halldor Bjornsson - Iceland | **Gudrun Nina Peterson** - Iceland | **Suresh Babu** - India | **Nuncio Murukesh** - India
Vito Vitale - Italy | **Kaoru Sato** - Japan | **Young Jun Yoon** - Korea | **Seong-Joong Kim** - Korea
Peter van Velthoven - Netherlands | **Kjetil Tørseth** - Norway | **Anna Sjöblom** - Norway | **Tadeusz Niedźwiedź** - Poland
Rajmund Przybylak - Poland | **Angel Frutos Baraja** - Spain | **John Cassano** - USA

Scope

- Polar Climate Predictability
- Long-term, International Sea Ice Observatory
- Historical Data Retrieval and Reanalysis
- Atmospheric Chemistry

Current Activities

Polar Prediction Workshop

(Tokyo, Japan / January 2013)

The 3rd AWG-sponsored Polar Prediction Workshop was held in Tokyo in January 2013. Recent rapid Arctic warming is regarded as a research frontier in Arctic research and the AWG considers the Arctic amplification as one of the most important research subjects. It is important to realize that the Arctic amplification is the most effective cooling mechanism of the Earth in response to anthropogenic global warming. The Arctic amplification results in the Arctic Oscillation (AO) negative, causing a warm Arctic and cold mid-latitudes, and cooling the entire Earth system. The results of the workshop suggest that the melting of Arctic sea ice decelerates global warming.

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IASOA Workshop

(Vancouver, Canada / May 2013)

The International Arctic Systems for Observing the Atmosphere (IASOA) half-day workshop at the Arctic Observing Summit (AOS) was convened for the purpose of initiating two IASOA topical working groups (Black Carbon and Surface Radiation), focusing on the near-term goal of developing two contributions to the 2013 Arctic Report Card. The IASC-supported meeting combined a local (Vancouver) audience of 14 participants with more than 10 additional remote participants via webinar. IASOA has spent five years developing its coordinating potential across ten independently-funded observatories. Those efforts to date have resulted in a growing community of science collaborators, improved documentation of the observatories, platforms and observing assets, as well as initial documentation of the hundreds of datasets collected from these observatories over several decades.

It has long been the intention of IASOA founders that the consortium would move towards creating pan-Arctic synthesis science. IASOA is ecologically broad in its coverage of the Arctic atmosphere including tundra, estuary, coastal and high elevation; it is deep in its concentration of dozens of long-term measurements at single locations – process studies, systems science, interdisciplinary; and it is long in its decades long records of parameters. Many topical areas of potential interest have been identified by the IASOA steering committee; of these, Black Carbon and Surface Radiation emerged as two areas of valuable long-term data, strong interest and willing participation.

The charge to these working groups was both general (identify the specific datasets of interest, their level of readiness for inter-comparison, recommendations for standardization, etc.) and specific: How can these datasets contribute to the discourse on Arctic change, as represented in the annual Arctic Report Card publication?

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Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC): MOSAiC – Building a Process-level Understanding of the New Arctic

(jointly with the Cryosphere and Marine Working Group)

Multi-year, detailed, and comprehensive measurements, extending from the atmosphere through the sea-ice and into the ocean of the central Arctic Basin are needed to improve our understanding and modeling of the changing Arctic climate and weather, and enhance Arctic sea-ice predictive capabilities. The MOSAiC initiative aims to address this fundamental need through cross-cutting, observational and modeling activities. The program is organized around the central science question: "What are the causes and consequences of an evolving and diminished Arctic sea ice cover?" Scientific emphasis will focus on processes that transfer heat, moisture, density, momentum, and nutrients through the Arctic climate system. To address the science objectives, the program will include an intensive observational component designed to provide a process-level understanding of interdependent atmosphere, sea-ice, ocean, and biological processes that are leading to, and responding to, drastic changes in the sea-ice. Observations will be made from a manned, transpolar drifting observatory, wherein an ice-hardened ship will serve as a central hub for comprehensive, interdisciplinary observations over 1-2 years' time. Information on spatial variability and heterogeneity in the system will be obtained using a coordinated network of distributed measurements from buoys, unmanned aerial systems, autonomous underwater vehicles, additional ships, aircraft, and satellites. A hierarchy of modeling activities will capitalize on these observations to study detailed climate processes, evaluate and improve model parameterizations, facilitate regional model inter-comparisons, and elucidate the impacts of Arctic processes on hemispheric circulation patterns. The International Arctic Science Committee is helping to facilitate and coordinate this international activity.

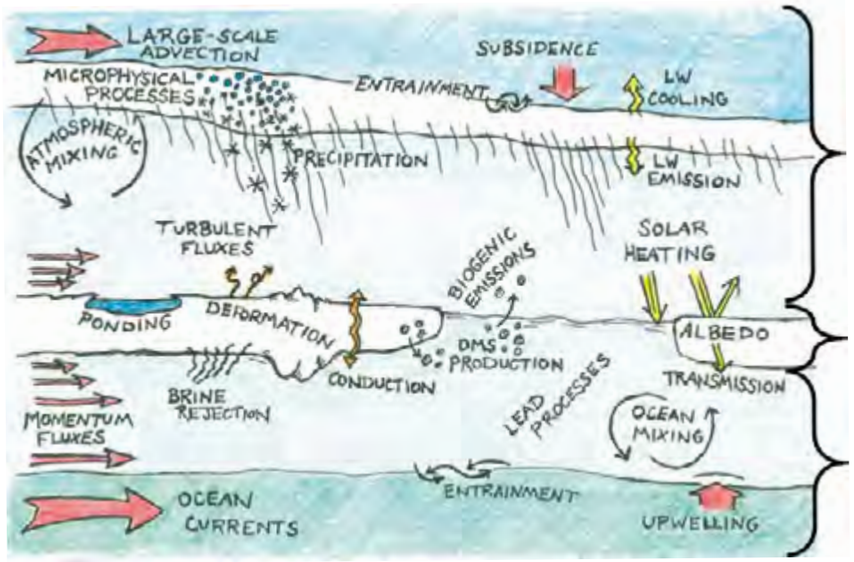

FIGURE: Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC): A Mosaic of Interdependent Arctic Climate Processes

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www.mosaicobservatory.org

Northern Hemisphere Polar Jet Stream and Links with Arctic Climate Change Workshop

(Reykjavik, Iceland / 13-15 November 2013)

The goal of the workshop was to assess the state of knowledge of Northern Hemisphere polar jet stream change and mechanisms, focusing on mid-high

latitude linkages and the recent occurrence of extreme weather events as noted in the popular press. Such events have been particularly seen in eastern North America, northern Europe and far eastern Asia and are generalized by regional changes in geo-potential heights, increased meridional flow, a slowing of the jet, and a tendency for a negative Arctic Oscillation pattern to occur in three of the last four winters and in the last six summers. Potential Arctic mid-latitude linkages in these events are controversial, although there are several recent science articles in support of such connections. Thus, we will investigate the importance of Arctic forcing relative to the more chaotic flow at mid-latitudes. Are the mechanisms similar or different in these separate regions?

The workshop met the core international science objectives (IASC, CliC and WCRP) of Polar Prediction and potential global impacts of Arctic change. An series of presentations based on recent scientific work was held, finishing with a matrix laying out current understanding based on geographic location and relevant dynamics: for example direct forcing, stratospheric control, or amplification of a downstream jet stream pattern. We recommended further modeling statistical and dynamic analyses of recent and future jet stream and storminess changes. Synthesis on this topic will be a theme for the Third International Conference on Arctic Research Planning (ICARP III) in 2015.

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Atmospheric chemistry workshop: Local sources of Arctic pollution and their impacts

(AGU San Francisco / December 2013)

It is traditionally thought that Arctic pollution (ozone, aerosols) is primarily imported from mid-latitudes. However, local Arctic pollution sources such as metal smelting, flaring also appear to be important although such emissions are poorly quantified. Boreal/agricultural fires are also an important pollution source. In addition, due to rapid climate change and economic development, Arctic emissions from shipping, oil/gas extraction, mining and associated industrialization are likely to increase in the near future. This session invited contributions on local Arctic pollution sources and their current/future impacts on regional air quality, climate and ecosystems as well as studies contrasting local versus remote pollution sources.

contact: Kathy Law
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http://www.iasc.info/index.php/home/groups/working-groups/atmosphere

PHOTO: IASC SECRETARIAT
IASC Atmosphere Working Group at the Arctic Science Summit Week 2013 in Krakow, Poland

Cryosphere Working Group (CWG)

Membership:

Martin Sharp - Canada, Chair | **Julian Dowdeswell** - UK, Vice Chair | **Walter Meier** - USA, Vice Chair
Jon Ove Hagen - Norway, Vice Chair

Sun Bo - China | **Jan Kavan** - Czech Republic | **René Forsberg** - Denmark | **Signe Bech Andersen** - Denmark
Pentti Kujala - Finland | **Jari Haapala** - Finland | **Michel Fily** - France | **Peter Lempke** - Germany
Hans-Wolfgang Hubberten - Germany | **Helgi Bjornsson** - Iceland | **Thorsteinn Thorsteinsson** - Iceland
Arun Chaturvedi - India | **Parmanand Sharma** - India | **Hiroyuki Enomoto** - Japan | **Shin Sugiyama** - Japan
Soon Do Hur - Korea | **Elisabeth Isaksson** - Norway | **Carleen Tijm-Reijmer** - The Netherlands | **Jacek Jania** - Poland
Krzysztof Migala - Poland | **Pedro Elosegui** - Spain | **Francisco Navarro** - Spain | **Veijo Pohjola** - Sweden
Martin Lüthi - Switzerland | **Martin Schneebeli**- Switzerland | **Elizabeth Hunke** - USA

Scope

- Sea-ice boundary layer dynamics
- Permafrost
- Tidewater glacier dynamics

PHOTO: JAKOB SIEVERS
Closeup of frozen crystals on a glass-plate, taken during a sea-ice experiment at the Sea ice Environmental Research Facitity (SERF) in Canada.

Current Activities

National Correspondents Workshop on Global Terrestrial Network for Permafrost (GTN-P) - Implementation and Data Policy

(Geneva, Switzerland / May 2013)

The objective of the Geneva National Correspondents Workshop was the training of the National Correspondents (NC) who were recently appointed by the countries involved in GTN-P. This IASC-supported workshop helped them to establish a strong national participation in this program and to actively contribute to the achievement of the GTN-P goals and obligations. In total there were 50 registered attendees including 19 NC representing Austria, Canada, China, Denmark/Greenland, France, Germany, Japan, Italy, South Korea, Kyrkyz Republic, Norway, Poland, Portugal, Russia, Sweden, Switzerland, USA, Antarctica, Svalbard. The workshop discussed how to partner with other international organizations and platforms of climate data collection, and how to provide products to the public.

www.gtnp.org

Climate and Cryosphere (CliC) Arctic Sea Ice Working Group

Workshop (Tromsø, Norway / June 2013)

CliC sea-ice activities make it possible to offer an international platform for discussing the progress made in Arctic and Antarctic sea-ice research, identify weaknesses in knowledge and methods used in observations, data processing, model validation and

calibration to concentrate on perspective avenues of improving all aspects of sea-ice research. This workshop for 30 researchers from around the world, supported by IASC, included specialists working on sea-ice modeling, observations, remote sensing and forecasting.

The main goals of the workshop were to:
(1) establish optimal linkages between international groups involved in sea ice modeling, observations, data assimilation, prediction and service provision; and (2) find avenues for future research efforts that are most productive for addressing the gaps in knowledge and weaknesses in our ability to observe sea ice, generate sea-ice data products and strengthen sea-ice modeling capabilities. (3) outline observational needs for sea-ice models.

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jbaeseman@gmail.com
www.climate-cryosphere.org

CWG also provided travel support for Early Career Scientists to participate in the 19th Northern Research Basins (NRB) International Symposium and Workshop, held 11 - 17 August 2013, in Alaska.

Upcoming Activities

Tidewater Glacier Initiative

The next phase of the Tidewater Glacier initiative will include a model-data summit to be held in Grenoble, France in June 2014, immediately after the International Glaciological Society Symposium in Chamonix at the end of May on „The contribution of glaciers and ice sheets to sea level change".

CWG will initiate a study to look at the problem of getting regional scale estimates of glacier mass balance for areas outside the ice sheets, especially during periods when there are gaps in satellite records or when available sensors change.

CWG will also continue its support of the Ice Sheet Mass Balance and Sea Level (ISMASS) group which is now co-sponsored by IASC, the Scientific Committee on Antarctic Research (SCAR) and the Climate and Cryosphere (CliC) project (see Chapter 3).

http://www.iasc.info/index.php/home/groups/working-groups/cryosphere

PHOTO: IASC SECRETARIAT
IASC Cryosphere Working Group at the ASSW 2013 in Krakow, Poland.

PHOTO: INGA MAY
Installation of the base station of a differential GPS to measure lithalsa dynamcis east of Umiujaq, Nunavik, Northern Quebec, Canada.

Marine Working Group (MWG)

Membership:

Bert Rudels - Finland, Chair | **Jinping Zhao** - China, Vice Chair | **Rolf Gradinger** - USA, Vice Chair

Oleg Ditrich - Czech Republic | **Naja Mikkelsen** - Denmark | **Morten Holtegaard Nielsen** - Denmark
Kari Strand - Finland | **Heidi Kassens** - Germany | **Michiel Rutgers Van Der Loeff** - Germany
Gudrun Marteinsdottir - Iceland | **Jónsson Steingrimur** - Iceland | **K.P. Krishnan** - India | **Stefano Aliani** - Italy
Koji Shimada - Japan | **Hajime Yamaguchi** - Japan | **Sung-Ho Kang** - Korea | **Baek-Min Kim** - Korea
Hein J.W. De Baar - The Netherlands | **Marit Reigstad** - Norway | **Randi Ingvaldsen** - Norway
Waldemar Walczowski - Poland | **Jan Marcin Weslawski**- Poland | **Miquel Canals** - Spain
Franscisco Gordillo - Spain | **Pauline Snoeijs Leijonmalm** – Sweden | **Jeremy Wilkinson** - UK | **Sheldon Bacon** - UK
Mary-Louise Timmermans - USA

Scope

- Predicting and understanding rapid changes to the Arctic 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
- Enhancing and improving access to the palaeo-record of the Arctic Ocean through Scientific Arctic drilling

PHOTO: MARIO HOPPMANN
Measuring light under sea ice in the central Arctic.

Current Activities

Distributed Biological Observatory (DBO) Data Workshop

(Seattle, USA / 27 February-1 March 2013)

The dramatic seasonal retreat and thinning of sea ice, record-setting seawater temperatures and multiple observations of biological changes in the Pacific Arctic sector has highlighted the need for understanding ecosystem response to climate forcing. The "Distributed Biological Observatory (DBO)" was developed by the international Pacific Arctic Group (PAG) as a change detection array along a latitudinal gradient extending from the northern Bering Sea to the Barrow Arc in the Amerasian Arctic.

A DBO data workshop was held at the NOAA Pacific Marine Environmental Laboratory (PMEL) in Seattle on 27 February - 1 March 2013. The meeting brought together scientists and associated project data sets collected during the 2010 - 2012 DBO pilot effort. The purpose of the meeting was to discuss the results, share data sets, develop an international data policy for this observing effort, and organize collaborative publications. The MWG has endorsed the DBO project, and supports development of similar activities in the Atlantic sector of the Arctic.

contact: Jackie Grebmeier
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www.arctic.noaa.gov/dbo

Internal mixing processes in the Arctic Ocean Workshop

(Woods Hole, US / October 2013)

The MWG arranged an open workshop on „Internal mixing processes in the Arctic Ocean and their importance for water mass formation and heat and freshwater fluxes" on 21 - 22 October 2013 in Woods Hole in connection with the FAMOS (Forum for Arctic Modeling and Observational Synthesis)

workshop held on 23 - 25 October. The rational for the meeting was that the Arctic Ocean is a low energy environment in which mixing and water mass transformation processes could be different compared to most of the world ocean where mechanically generated turbulence predominates. Although often invoked, few hard numbers about the efficiency of these internal processes exist. The aim of the workshop was to identify and examine these mechanisms and determine if they play a major role in the physics and the circulation of the Arctic Ocean. The workshop included invited presentations on the different processes followed by discussions. Insights gained during the workshop will be applied and tested in the plenary and group discussions on the following FAMOS meeting.

contact: Bert Rudels
bert.rudels@afmi.fi

The MWG also supported the Steering Group meeting of Arctic in Rapid Transition (ART), which was held in Copenhagen, Denmark in November 2013 (see Chapter 4).

Upcoming Activities:

Arctic Cod Workshop

(Copenhagen, Denmark / April 2014)

The MWG is supporting an international workshop on arctic cods (Boreogadus saida and Arctogadus glacialis) that will be held in conjunction with the ESSAS Annual Science Meeting in Copenhagen (7 - 9 April, 2014). The goal of this workshop is to synthesize current information on the stock structure, distribution and biology of these two foundational species throughout the arctic and subarctic seas, and to identify potential climate change effects on their distribution and dynamics. The workshop aims to bring together experts from around the circumpolar North to share knowledge about *B. saida* and *A. glacialis*, synthesize what we currently know, and plant the seed for future comparative.

contact: Franz Mueter
fmueter@alaska.edu

http://www.iasc.info/index.php/home/groups/working-groups/marineaosb

PHOTO: IASC SECRETARIAT
IASC Marine Working Group at the ASSW 2013 in Krakow, Poland

PHOTO: SHEIKO & MECKLENBURG
Arctic Cod: *Boreogadus saida* (a pelagic cod adapted to close association with ice (cryopelagic))

Social and Human Sciences Working Group (SHWG)

Membership:

Peter Schweitzer - USA, Chair | **Peter Sköld** - Sweden, Vice Chair | **Gail Fondahl** - Canada, Vice Chair
Louwrens Hacquebord - Netherlands, Past Chair

Long Wei - China | **Ludek Broz** - Czech Republic | **Lone Dirckinck-Holmfeld** - Denmark | **Robert Chr. Thomsen** - Denmark
Arja Rautio - Finland | **Lassi Heininen** - Finland | **Sylvie Blangy** - France | **Joachim O. Habeck** - Germany
Gisli Palsson - Iceland | **Joan Nymand Larsen** - Iceland | **Dhurjati Majumdar** - India | **Hiroki Takakura** - Japan
Dongmin Jin - Korea | **Gunhild Hoogensen Gjorv** - Norway | **Halvor Dannevig** - Norway | **Ryszard Czarny** - Poland
Michal Luszczuk - Poland | **Elena Conde** - Spain | **Philippe Geslin** - Switzerland | **Michael Bravo** - UK
Sven D. Haakanson - USA | **Andrey Petrov** - USA

Scope

- The Arctic in a global context
- Natural resources, use, exploitation and development: past, present, future
- Histories and methodologies of arctic sciences and arts
- Human health, wellbeing and ecosystem change
- Perceptions and representations of arctic science
- Arctic residents and change: dynamics of mitigation and sustainability
- Security, governance and law
- Collaborative community research on climate change
- Competing forms of resource use in a changing environment

PHOTO: RANE WILLERSLEV
Reindeer Herder during the Chukchi Festival in Achaivayam, Kamchatka.

PHOTO: IASC SECRETARIAT
IASC Social and Human Working Group at the ASSW 2013 in Krakow, Poland

Current Activities

Russia and Arctic Anthropology: Toward an Agenda for the 21st Century

(St. Petersburg, Russ. Federation / May 2013)

Ten Arctic social scientists from eight countries, convened in St. Petersburg, Russian Federation, for a workshop on "Russia and Arctic Anthropology: Toward an Agenda for the 21st Century". The workshop was organized by Nikolai Vakhtin and Peter Schweitzer, and supported by European University – St. Petersburg and the IASC SHWG. The participants included one indigenous scholar originally from the Russian Arctic. The group discussed the current state and future of Arctic anthropology and other social sciences research both broadly and specifically in Arctic Russia. Participants then worked toward developing a framework for a new, large-scale research initiative focusing on key elements of change in the Russian Arctic. The group expects to continue elaborating the framework in the next months.

contact: Peter Schweitzer
peter.schweitzer@univie.ac.at

Supporting the preparation of the 2nd Arctic Human Development Report (AHDR II)

The SHWG is supporting the Arctic Human Development Report II (see Chapter 7) by providing financial assistance for SHWG members to participate in the meetings of the writing teams. IASC has also assumed responsibility for the review process of the AHDR II, which is coordinated by the IASC Executive Secretary. The final AHDR II will be presented at ASSW 2014 to feed into the ICARP III process.

contact: Joan Nymand Larson
jnl@unak.is
www.svs.is/AHDR%20II/AHDR%20II.htm

Upcoming Activities:

As an early planning activity in the lead up to ICARP III in 2015 (see Chapter 6), a town hall meeting will be convened at the International Congress of Arctic Social Sciences (ICASS) in May 2014, with support from the SHWG.

ICASS, which is held every three years, brings together several hundred social scientists and humanities scholars from a wide range of disciplines and institutions. The Congress also includes indigenous research partners, northern residents, policy makers, members of NGOs and government officials interested in the North. The ICARP III town hall meeting will allow these social scientists and humanities scholars to have input into the ICARP III planning process. The event will be 'live-streamed' so that IASSA members who cannot attend the Congress will still be able to participate in the town hall meeting. Two early career scientists will be engaged to provide a written record summarizing the input, for submission to the ICARP Steering Committee.

contact: Gail Fondahl
fondahlg@unbc.ca
http://resweb.res.unbc.ca/icass2014/index.htm

http://www.iasc.info/index.php/home/groups/working-groups/socialahuman

Terrestrial Working Group (TWG)

Membership:

Ingibjorg Svala Jonsdottir – Iceland, Chair | **Warwick F. Vincent** - Canada, Vice Chair
Torben Christensen - Denmark, Vice Chair | Terry Callaghan - Sweden, Past Chair
Josef Elster- Czech Republic | **Wei Luo** – China | **Mads Forchhammer** – Denmark | **Antero Järvinen** – Finland
Otso Suominen – Finland | **Thierry Boulinier** – France | **Eva-Maria Pfeiffer** – Germany | **Karsten Piepjohn** - Germany
Jon S. Olafsson - Iceland | **Manish Tiwari** – India | **Ratan Kar** - India | **Atsuko Sugimoto** – Japan
Takayuki Nakatsubo - Japan | **Yoo Kyung Lee** – Korea | **Jelte Rozema** – The Netherlands | **Inger Greve Alsos** – Norway
Steve Coulson - Norway | **Wieslaw Ziaja** – Poland | **Piotr Glowacki** - Poland | **Benjamin Vinegla Pérez** – Spain
Daniel Sanchez-Mata – Spain | **Victoria Pease** – Sweden | **Phil Wookey** – UK | **Donald A. (Skip) Walker** – USA
Vladimir Romanovsky – USA

Scope

- Improving knowledge at multiple spatial scales of the current state of Arctic terrestrial geo-systems and ecosystems
- Determining terrestrial and freshwater environmental and biosphere processes that amplify or moderate climate warming
- Understanding the interactions of species and their environment, and the biology of life in extreme environments
- Observation of changes in arctic geo- and biodiversity
- Development of high spatial resolution models of terrestrial geo-system and eco-system Change
- Determining the role of connectivity in the functioning of arctic terrestrial systems, including connections within the arctic and the global system

PHOTO: MICHAEL RUDY
A chipmunk gathering supplies for winter storage during climate and ecological research at Pika Camp, a University of Alberta research camp in the Yukon Territories, Canada

Current Activities

Shaping forces of biodiversity in the Arctic

(Reykjavik, Iceland / January 2013)

The TWG initiated an activity aiming at identifying the key shaping forces of biodiversity in the Arctic. The first step was to run a small workshop of sixteen scientists, representing a wide range of disciplines, in Reykjavik, January 2013. The workshop explored the feasibility of building a coherent research framework that would address the shaping forces of arctic biodiversity across temporal and spatial scales in search for commonalities across biological hierarchies and organism groups. A special emphasis was on distinguishing between external and internal forces, how they interact and whether they differ between small and large organisms and how they relate to organism mobility and dispersal. To reach a wider audience the outcome of the workshop was presented at the Science Symposium during the ASSW 2013 in Krakow and was also presented at the International Tundra Experiment (ITEX) Conference in Switzerland in September 2013. The next step will be to write up a conceptual paper on the workshop outcomes to be published in a special issue of a relevant scientific journal together with invited papers on case studies.

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Arctic Vegetation Archive Workshop

(Kraków, Poland / April 2013)

The Arctic Vegetation Archive (AVA) Workshop sponsored by the TWG, the Conservation of Arctic Flora and Fauna (CAFF) Flora Group, and NASA Land Cover and Land Use Change Program, took place during the business meetings of ASSW 2013. The goal of the AVA is to unite and harmonize the vegetation-plot (relevé) data from the Arctic tundra biome for use in developing a pan-Arctic vegetation classification and as a resource for climate-change and biodiversity research. The AVA will be an open access database that will be the first to represent an entire global biome. Forty-two people participated in the workshop and presented 25 papers. The topics of the papers included reviews of the history and need for the AVA, the status of vegetation data collection and classification in each of the circumpolar countries, potential applications of the AVA and reviews of the various database approaches that are being used.

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www.geobotany.uaf.edu/ava/

The International Tundra Experiment (ITEX) – an international conference and synthesis Workshop

(Grisons, Switzerland / September 2013)

The International Tundra Experiment is a scientific network of experiments focusing on the impact of climate change on selected plant species in tundra and alpine vegetation. Research teams at more than 61 circumpolar sites in tundra ecosystems have carried out similar, multi-year plant manipulation experiments for up to 20 years that allow them to compare annual variation in plant performance with respect to response to climate conditions.

More than 70 researchers from 15 different countries attended the conference in Switzerland on 17 - 20 September 2013. The venue was the Hotel Kurhaus, a charming art-nouveau hotel in Bergün, a small mountain village in a breath-taking alpine landscape of the south-eastern Swiss Alps.

Researchers reported on different aspects of changes in arctic and alpine tundra. Contributions ranged from experiments with open top chambers, to other climate

change experiments and long-term observations of tundra change. A workshop discussion laid out paths for upcoming ITEX syntheses. The excursion after the conference led us to Davos, Switzerland, to visit research sites of the Swiss Federal Institute for Forest, Snow and Landscape.

This conference was one of the larger ITEX meetings in ITEX history, and IASC enabled 17 early-career researcher to attend.

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www.wsl.ch/alpine-arctic-flora/itex/index_EN

Upcoming Activities:

THermokarst Aquatic Ecosystem (THAW) Workshop

(Quebec City, Canada / March 2014)

Another activity that the TWG decided to co-sponsor is the THAW (THermokarst Aquatic ecosystem) Workshop 2014 which will be held in Quebec City on 11 - 14 March 2014. The workshop will include a study on "freshwater ecosystems in changing permafrost landscapes" and the activity will be closely linked to the Arctic Freshwater Systems synthesis (see cross-cutting, below) and the Global Change, Arctic Hydrology and Earth System Processes workshop.

contact: Warwick F. Vincent
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Global Change, Arctic Hydrology and Earth System Processes (ARCHES) Workshop

(Edinburgh, UK / Spring 2014)

The role of changing hydrology and active layer moisture regimes for ecosystems, biogeochemical and biophysical processes in the arctic terrestrial realm (including surface waters) has been overlooked relative to the much clearer emphasis on climate warming as a key driver of change. The „Global Change, Arctic Hydrology and Earth System Processes (ARCHES)" scoping exercise will bring together a small group of experts to review the current state of knowledge on arctic hydrological change, to identify research gaps, and to horizon-scan based on best available predictions of change in the arctic terrestrial realm. The exercise will be closely linked to the THAW workshop (see above) and the Arctic Freshwater Synthesis (see Chapter 4).

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http://www.iasc.info/index.php/home/groups/working-groups/terrestrial

PHOTO: IASC SECRETARIAT
IASC Terrestrial Working Group at the ASSW 2013 in Krakow, Poland

Cross-Cutting Initiatives

IASC Council, at its meeting at the Arctic Science Summit 2011, decided to allocate funds for cross-cutting activities that are supported by at least three of the five IASC Working Groups. The objective of this WG-spanning program is to promote system-scale activities within IASC and to encourage the WGs to explore activities, which should be of interest to three or more of the WGs. Because the IASC WGs are set up along disciplinary lines, it is possible that their activities will be focused only on one or two disciplines. While this is to be expected, IASC wishes to promote cross-cutting themes and encourage interaction between the working groups.

Current Activities

Arctic in Rapid Transition (ART): now officially an IASC Network

ART is a pan-Arctic scientific Network developed and steered by early-career scientists, which aims at studying the impact of environmental changes on the Arctic marine ecosystem. ART has a focus on bridging across time-scales, by incorporating palaeo-studies with modern observations and modeling. Initially endorsed by the IASC MWG, ART recently transited to a new status by becoming an official IASC Network (see Chapter 4 for more details).

Historical Data Retrieval

(Reykjavik / November 2013)

This workshop developed research strategies based on data rescue and the use of large, high data rate, or previously technically intractable data sets. It has long been recognized that progress in many areas of Arctic science is hampered by sparse data or by data that are inherently difficult interpret. Large quantities of historical data are available that have not been utilized because they are not easily converted into a readily analyzable form, such as manuscripts, instrument traces, photographs and video/audio recordings. This activity built on existing country programs with the potential for large increases in easily useable Arctic data across disciplines.

Synergistic objectives included: Increase in easily available relevant historical data for all Arctic scientists; the leaders of active projects (i.e. Old Weather – Arctic) became familiar with research objectives in other Arctic disciplines fostered through data/information sharing or by contributing technical insight; and all benefitted from an exploration of end-to-end ideas for data sources, technical processing, and research applications.

contact: Kevin Wood
kevin.r. wood@noaa.gov
http://iasc.info/home/groups/working-groups/cross-cutting

PHOTO: THOMAS OPEL
Spring expedition 2013, Lena-Delta: the first scientist-team in the new Samoylov-Station. Here, AWI permafrost scientists are busy studying the snow structure.

PHOTO: MAR FERNÁNDEZ-MÉNDEZ
Central Arctic: Scientists sampling a melt pond with RV Polarstern in the background.

3. Other IASC Groups

» 3 Other IASC Groups

IASC Action Groups

IASC Action Groups are short-term expert groups, established by the IASC Council. They provide strategic advice to the Council concerning both long-term activities and urgent needs.

Joint IASC/SCAR Bipolar Action Group

The Bipolar Action Group (BipAG) was initiated in 2008 by the Scientific Committee (SCAR) on Antarctic Research and IASC. The Action Group explored options for effective cooperation concerning bipolar issues and the development of mechanisms to nurture the International Polar Year (IPY) legacy.

Membership

Heinz Miller - Germany (Chair)
Elena Andreeva - Russia
Fridtjof Mehlum - Norway
Sue Moore - USA
Nick Owens - UK
Wayne Pollard - Canada
Bryan Storey - New Zealand
Huigen Yang - China
Jenny Baeseman - APECS

PHOTO: IASC SECRETARIAT
Bipolar Action Group (BipAG)

The two-year mandate for BipAG was prolonged in 2010 and the 2nd Bipolar Action Group on Science Cooperation (BipAG II) concentrated first and foremost on bipolar scientific opportunities of cooperation.

Membership

Cynan Ellis-Evans - UK (Chair)
Francisco Navarro - Spain
Detlef Damaske - Germany
Sung-Ho Kang - Korea
Alexander Klepikov - Russia
Thamban Meloth - India
Gail A. Fondahl - Canada
Mark Parsons - USA
Jenny Baeseman - APECS (later CliC)
Angelika Renner - APECS
Volker Rachold - ex officio
Mike Sparrow - ex officio

BipAG II presented its first report in 2011 (see Annex 2.1.1) and a final report in 2012 (see Annex 2.1.2). Based on the recommendations included in this report, the Executive Committees of SCAR and IASC agreed that a permanent bipolar SCAR/IASC group would be no longer required. A joint workshop, convened every few years, would be sufficient to identify bipolar science needs. Existing SCAR and IASC scientific groups would be requested to consider potential for bipolar activities when feasible. The first workshop will possibly be held in the second half of 2015 and review the outcome of IASC's ICARP III and SCAR's Horizon Scan. As recommended by BipAG II, SCAR and IASC will also consider holding another joint Open Science Conference in 2018.

http://iasc.info/home/groups/action-groups/bipolar-action-group

PHOTO: IASC SECRETARIAT
IASC/SCAR Bipolar Action Group II, Potsdam 2012

Membership	Country of Residence	Affiliation
Mark Parsons- Chair	USA	• National Snow and Ice Data Center (now: Research Data Alliance)
Hironori Yabuki	Japan	• Japan Agency for Marine-Earth Science and Technology
Arkady Tishkov	Russia	• Institute of Geography, Russian Academy of Sciences
Peter Pulsifer	USA	• National Snow and Ice Data Center
Robert Huber	Germany	• PANGAEA Data Publisher for Earth & Environmental Science
Volker Rachold	Germany	• IASC

Data Policy Action Group

IASC has strongly supported the IPY Data Policy, with its emphasis on ensuring security, accessibility and free exchange of relevant data that both support current research and leave lasting legacy. The IPY policy provided initial guidance for achieving this objective, but post-IPY there is still a need to continue supporting, creating and sustaining Arctic data management resources.

Although IASC had been involved in several data management activities, for example Sustaining Arctic Observing Systems (SAON) and the Polar Information Commons (PIC), IASC had not yet considered a formal data policy. Such a policy would establish a commitment to best practice in relation to repository management and related aspects of Arctic data systems.

To reinforce IASC's commitment to robust data management and sharing activities, IASC Council decided to form a small advisory group of external experts and interested Council members to develop and recommend a data policy, including steps toward implementation of the policy, to provide guidance for IASC supported activities.

The Action Group developed a „Statement of Principles and Practices for Arctic Data Management" (see Annex 2.2) which was presented to IASC Council and formally approved on 16 April 2013.

http://iasc.info/home/groups/action-groups/data-policy-action-group

PHOTO: IASC SECRETARIAT
IASC Data Policy Group (Potsdam): Peter Pulsifer, Mark Parsons, Volker Rachold, Arkady Tishkov and Robert Huber

Membership	Country of Residence	Affiliation
Carlo Barbante -Chair	Italy	Geochemistry, Palaeoclimate
Benoit Beauchamp	Canada	Sedimentology
Bernie Coakley	USA	Marine Geology
Mikhail Grigoriev	Russia	Geocryology/Geomorphology/Permafrost
Naja Mikkelsen	Denmark	Marine Geology
Victoria Pease	Sweden	Tectonic Evolution
Karsten Piepjohn	Germany	Hardrock Geology
Volker Rachold- Secretary	Germany	Permafrost

The Action Group on Geosciences (AGG)

The five Working Groups (WG) Terrestrial, Cryosphere, Marine, Atmosphere and Social & Human are IASC´s scientific core elements. The overall responsibilities of these WGs are to identify and formulate scientific content and foci, act as scientific advisory boards to the IASC Council and to assist IASC in the implementation of its science mission. The WGs are designed to cover the full breadth of Arctic research, but two years after their formation it became apparent that geological research is underrepresented in the current WG structure. To address this issue, IASC Council agreed to form an Action Group on Geosciences (AGG) with the terms of reference to provide strategic advice to the IASC Council and WGs on both long-term opportunities and priorities in the field of Geoscience research in a broader sense. Since geosciences embrace a wide variety of scientific disciplines, emphasis is given to the overarching aspects of research.

The Action Group developed a report, including a set of recommendations, which was presented to the IASC WGs and IASC Council.

The final report, including the central recommendation for IASC to develop an assessment on the "Geodynamic Evolution of the Arctic" as a major geoscience contribution to the 3 International Conference on Arctic Research Planning (ICARP III, see chapter 6), is given in Annex 2.3.

http://iasc.info/home/groups/action-groups/action-group-on-geosciences

PHOTO: IASC SECRETARIAT
The Action Group on Geosciences (AGG) (from left to right: Carlo Barbante, Karsten Piepjohn, Victoria Pease, Mikhail Grigoriev, Naja Mikkelsen, Volker Rachold)

International Science Initiative in the Russian Arctic (ISIRA)

The longest-standing IASC Advisory Group is the International Science Initiative in the Russian Arctic (ISIRA). ISIRA is an international cooperative initiative to assist Russian Arctic science and sustainable development in the Russian Arctic by:

- Initiating planning of multinational research programs that address specific key problems in the Russian Arctic;
- Providing a forum for linking on-going or planned bilateral projects;
- Facilitating improved scientific access to the Russian Arctic, and;
- Advising on funding and organizing implementation of projects.

Membership

Arkady Tishkov, Russia (Chair)
David Scott, Canada
Juha Pekka Lunkka, Finland
Dieter Piepenburg, Germany
Atsuko Sugimoto, Japan
Winfried Dallmann, Norway
Vladimir Kotlyakov, Russia
Sergey Priamikov, Russia
Boris Morgunov, Russia
Åsa Lindgren, Sweden
Gareth Rees, UK
Lee Cooper, USA
Volker Rachold, IASC

http://www.iasc.info/index.php/home/groups/advisory-groups/isira

Ice Sheet Mass Balance and Sea Level (ISMASS)

Ice Sheet Mass Balance and Sea Level (ISMASS) is an expert group co-sponsored by SCAR, the Climate and Cryosphere (CliC) project and IASC. The goals of ISMASS are to promote the research on the estimation of the mass balance of ice sheets and its contribution to sea level, to facilitate the coordination among the different international efforts focused on this field of research, to propose directions for future research in this area, to integrate the observations and modeling efforts, as well as the distribution and archiving of the corresponding data, to attract a new generation of scientists into this field of research, and to contribute to the diffusion, to the society and policy makers, of the current scientific knowledge and the main achievements in this field of science.

ISMASS Co-Chairs:

Francisco Navarro (representing IASC)
Frank Pattyn (representing SCAR)
Edward Hanna (representing WCRP/CliC)

http://www.climate-cryosphere.org/activities/groups/ismass

PHOTO: MANUEL CATALAN
Preparing bongos launching on the Spanish Research Vessel Hesperides.

PHOTO: PETER PROKOSCH

Cape Flora, Franz Josef Land/Russian Arctic National Park, third largest national park in Russia and the largest marine protected area in the Arctic. The park is of high importance for Arctic marine mammal populations and hosts one of the largest bird colonies in the Northern Hemisphere.

4. IASC Networks

» 4 IASC Networks

The IASC 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 region. One specific instrument that IASC is providing to foster the development of thematic groups is the support and endorsement of Networks. IASC Networks are international, address specific scientific issues on a circum-Arctic scale and strive to involve early career scientists. Networks may be created by IASC or may apply for affiliation with IASC. Once accepted as IASC networks, they carry the IASC logo.

Please see Annex 3 for more information about the Terms of Reference for IASC Networks.

The IASC Bulletin 2014 provides an overview of the ongoing Networks. More information can be found on the Networks´ websites.

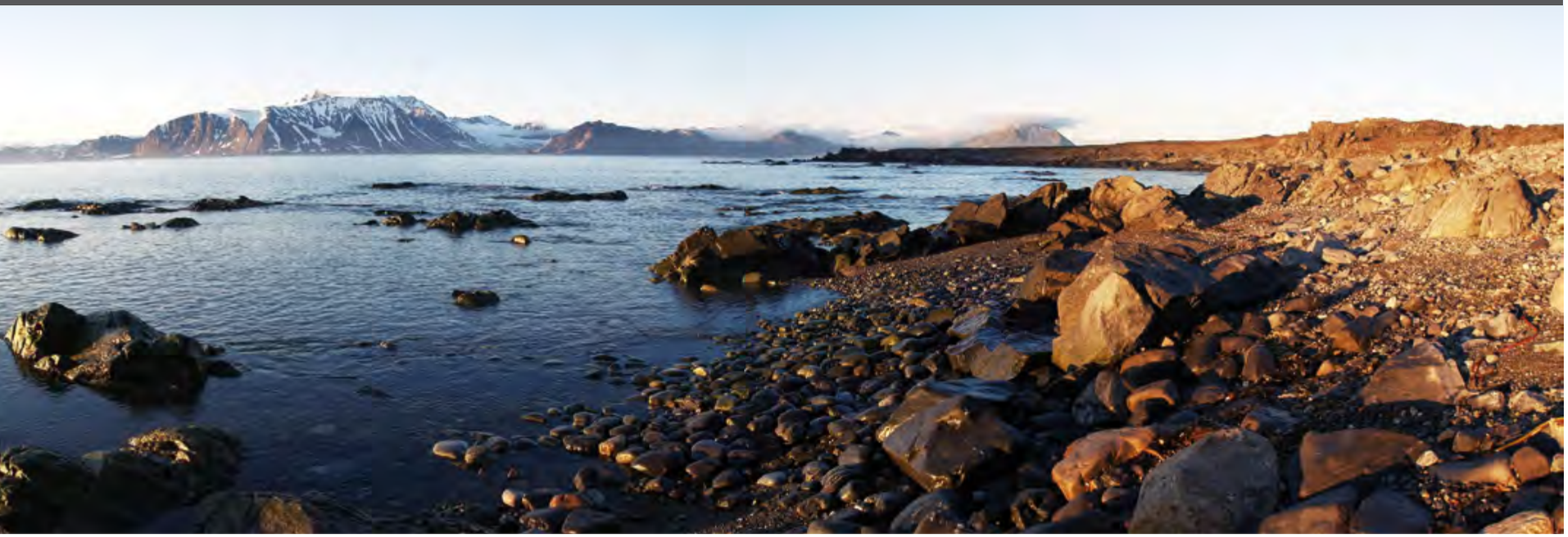

PHOTO: MAREK KASPRZAK
Early morning view on the Wilczekodden cape in Hornsund fjord, Wedel-Jarlsberg Land, Svalbard.

The Arctic Coastal Dynamics (ACD) Network

Current and planned activities

An important challenge facing Arctic coastal research is creating and maintaining monitoring capabilities in order to detect changes in this sensitive region. A key recommendation of the State of the Arctic Coast (SAC) Report (Forbes, 2011) was the establishment of a circumpolar coastal observatory network, as an offshoot of ACD and its International Polar Year (IPY) activities.

Recommended steps include:

- creating an inventory of existing coastal stations, actors, and networks.
- developing common mapping tools for circumpolar data.
- improving communication about Arctic coastal issues.
- enlisting the critical support of government agencies for monitoring.
- involving coastal communities as important proponents and players in monitoring.

A modular approach to building a monitoring network could capitalize on support from national agencies, research funding bodies, academia, and communities.

Representatives of the ACD Network, IASC, the International Permafrost Association (IPA), and Land-Oceans Interactions in the Coastal Zone (LOICZ) met at the ArcticNet conference in Montréal, Canada in April 2012 and at IASC offices in Potsdam, Germany in December 2012. Talks have also been held with members of the International Arctic Social Sciences Association. Discussions have focused on coordinating future arctic coastal research. Other recent activities include coastal contributions to the Arctic Resilience Report, an Arctic Council project spearheaded by the Stockholm Resilience Institute, which describes the important socio-ecological shifts underway in the Arctic and identifies ways to increase the resilience of human-natural systems. An interim version of the report issued in 2013 is available online (http://www.arctic-council.org/arr/). Significant increases in infrastructure that support Arctic coastal research have recently been achieved through expanded monitoring facilities - for example at Alaska (Barrow), Greenland (Zackenberg) and Svalbard (Ny Alesund) - improved stations such as the Samoylov Station in Russia's Lena Delta, and the allotment of resources for the Canadian High Arctic Research Station (CHARS) in Cambridge Bay. Researcher exchange is being facilitated by such projects as the EU's INTERACT network (http://www.eu-interact.org/). All these activities feed into meetings planned for 2014 that will focus on developing the coastal component of the 3rd International Conference on Arctic Research Planning (ICARP III) in 2015.

References

Forbes, D. L. (ed.) 2011. State of the Arctic Coast 2010: Scientific Review and Outlook. International Arctic Science Committee, Land-Oceans Interactions in the Coastal Zone, Arctic Monitoring and Assessment Programme, International Permafrost Association. Helmholtz-Zentrum, Geesthacht, Germany, 178p.

http://arcticcoasts.org

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ACD Steering Committee

www.arcticportal.org/acd

PHOTO: P. P. OVERDUIN
Ground ice is exposed at Mamontovy Khayata on on the Bykovsky Peninsula in the central Laptev Sea, East Siberia.

Arctic Freshwater System Synthesis (AFS) Network

The Arctic Freshwater Synthesis is a joint initiative of IASC, the Climate and Cryosphere (CliC) Project and the Arctic Monitoring and Assessment Program (AMAP). It combines our current scientific understanding of Arctic freshwater sources, fluxes, storage and effects, with the project structured around 6 major components: atmosphere, ocean, terrestrial hydrology, terrestrial ecology, resources and modeling.

During 2013, planning of the structure of the synthesis was carried out. A total of twelve scientific co-leads were identified, with strong early career representation, and are responsible for leading writing on the six components, with the co-chairs responsible for managing the process and for scientific integration across components. An initial workshop was held in Stockholm, 11-12 November 2013, where component co-leads were gathered for interactive discussions on AFS structure and goals, including identifying recent advances and knowledge gaps in the Arctic freshwater system, and identifying synergies between components. A follow-up meeting with attending co-leads and steering group members was held in conjunction with the AGU Fall Meeting on 9 December 2013, where steering group members also convened a session on Arctic freshwater changes.

Zero order drafts of the component review papers have now been delivered, and work continues towards first order drafts during spring 2014. In the coming months, a full writing team, consisting of an additional three to five authors for each component, will be formed. A co-lead meeting is planned for Spring 2014, and a larger meeting including also relevant co-writers is planned for Fall 2014.

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http://www.climate-cryosphere.org/activities/targeted/afs

Activities of the Arctic Climate System Network (ACSNet)

The introductory meeting of ACSNet was held during the IPY2012 Conference in Montreal, Canada on 23 April 2012. The meeting was attended by Arctic researchers and program managers with interest in the ACSNet goal of fostering interdisciplinary and international collaborations in field research in the Western Arctic in the coming years. A broad overview was given of the potential participating field programs, and an activity timeline for ACSNet was discussed. Approximately 20 field programs spanning a range of observational efforts to understand the Arctic atmosphere, ice, ocean system were presented and discussed. The broad time line for ACSNet activities includes a main field effort in 2014 - 2015 and a synthesis effort in 2015 - 2016. We anticipate planning workshops and meetings before the main field phase.

One immediate action item for ACSNet is to update its web presence. This involves a reworking of the old website to make it more user-friendly and to include a consolidation of projects and investigators. The UK Arctic Office has kindly offered to provide support

for development of the ACSNet site, and the ACSNet coordinating committee is working with Dr. Cynan Ellis-Evans (head of the NERC Arctic Office, British Antarctic Survey) to this end.

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PHOTO:
ART Executive Committee meeting in Copenhagen, Denmark 2013.

Arctic in Rapid Transition (ART) Network

ART is a pan-Arctic scientific Network developed and steered by early-career scientists, which aims at studying the impact of environmental changes on the Arctic marine ecosystem. ART has a focus on bridging time-scales by incorporating palaeo-studies with modern observations and modeling, science disciplines and geographic regions to better understand past and present response of Arctic marine ecosystems to sea ice transitions and climate change and to improve our predictive capability of future scenarios. Initially endorsed by the IASC MWG, ART transited to a new status by becoming an official IASC Network in 2013.

During the ART Executive Committee (EC) meeting at the International Council of the Exploration of the Sea (ICES) in Copenhagen, Denmark, 11 - 13 November, 2013 the personal structure of the ART EC was adapted in a way to ensure the unique ART characteristic of early career involvement. So far, the ART EC originated from a network of early-career Arctic marine scientists who have been involved in multidisciplinary national and international research programs during the last decade. Part of the initial EC members stepped back into an active Scientific Advisory Committee. Members of the committee will support the new EC members, take part in ongoing and future ART activities, and will organize "senior" ART activities additionally. 6 new early career scientists from 5 different nations and different disciplines stepped in.

The ART cruise proposal TRANSSIZ (Transitions in the Arctic Seasonal Sea Ice Zone) is included in the trip planning of the German research vessel Polarstern. Intended period of time is likely to be 05/2015 (ARK-XXIX / 1). The TRANSSIZ expedition will include a full suite of multidisciplinary approaches through sediment, water column and sea ice sampling.

The ART Special Issue on "Interdisciplinary and multi-scale approaches to understanding and modeling the Arctic in Rapid Transition" as a long-term outcome of the ART-APECS Science Workshop 2012 in Sopot, Poland, is planned to be submitted as part of the peer-reviewed journal Polar Research by beginning of 2014.

ART is joining forces with the Association of Polar Early Career Scientists (APECS) and the European Institute for Marine Studies ((IUEM) Brest, France), to organize an international workshop entitled "Integrating spatial and temporal scales in the changing Arctic System: towards future research priorities" (ISTAS workshop), planned for 21 - 24 October 2014 in Plouzané, France. This workshop aims at drafting research priorities assessments from an early to mid-career perspective that will feed into the larger 2015 ICARP III event in Japan.

ART is currently in the process of developing collaboration with the Canada-France program "Green Edge" (lead by the Takuvik Joint Laboratory) in order to create a large scientific consortium on the study of marine productivity, diversity and ecosystem services in the seasonal ice zone. This project will comprise a field work synergy between TRANSSIZ and Green Edge as well as advanced analyses through remote sensing and modeling.

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Circum-Arctic Lithosphere Evolution (CALE) Network

Circum-Arctic Lithosphere Evolution (CALE) is a multinational and multi-disciplinary research program investigating important questions associated with understanding circum-Arctic lithosphere evolution. The CALE project was officially launched in 2011.

Current activities

The 2013 year began with working group meetings of six of the seven CALE teams: Greenland & Ellesmere Island (Team A) and the Arctic Canada (Team B) teams met in Halifax, Nova Scotia in March 2013. The Bering Strait Team (Team C) met at Stanford University, California in January 2013. A 'supergroup' of the Taimyr, Timan, and N. Atlantic teams (Teams E, F, & G, respectively) met in St. Petersburg in April 2013. These meetings are the primary venue for assessing/refining the state of team project deliverables and were attended by our 'cross-team fertilization' representative (J. Skogeid).

In 2013 industry sponsorship for the CALE project was expanded when SHELL subscribed to the project for its final 3 years. In addition, 2013 provided the first distribution of several CALE Small Grants in support of research within the project. These included basic support to Team A, field support for work in the Brooks Range (Alaska) to Team C, and partial support for a one-year post-doc for advancement of knowledge on Arctic magmatism, a topic which is shared between Teams A, E & F. Additional Small Grants are anticipated for 2014.

Annual Workshop 2013

The third CALE Annual Workshop:

Our one-day Workshop was held 8 Dec 2013 preceding the international conference of the American Geophysical Union (AGU) in San Francisco, California, USA. This third Annual Workshop included Team leaders, team members, and industry sponsors, and is also linked to an AGU session on Circum-Arctic Lithosphere Evolution chaired by CALE Team Leaders (Pease & Miller). The annual meeting was important for consolidating, unifying, and sharing Team goals, as well as for connecting Team leaders with CALE sponsors. In addition, progress on deliverables were presented, discussed, and revised as needed, and then integrated with the coming year's goals. The major deliverable at this meeting is expected to be the regional 2D integration of geology and geophysics along the defined transects in preparation for our final 3D synthesis.

Date of next Annual Workshop:

The 2014 CALE Annual is likely to be linked to the 2014 International Conference on Arctic Margins to be held in St. Petersburg.

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Network on Arctic Glaciology (NAG)

The IASC Network on Arctic Glaciology aims at making a significant contribution to assessments on the impact of climate change in the Arctic region. The focus is on the effect of glaciers on sea-level change and on the fresh water input into fjords and embayments. The Network works by initiating scientific programs and facilitating international cooperation between glaciologists and climate modelers.

In order to facilitate international cooperation, the Network annually organizes the Workshop on the Dynamics and Mass Budget of Arctic Glaciers. In 2013 the annual workshop and the Network's annual open forum meeting took place in Obergurgl, Austria, from 26 – 28 February, 2013. The meeting included an open discussion session on tidewater glacier research, which is part of an effort started by the Network and the IASC Working Group on the Cryosphere to develop an ongoing research and training program in this area of science. The tidewater glacier initiative already resulted in a very successful training workshop for young scientists on board the Polish Research Vessel MV Horyzont II in Svalbard in September 2012, and the next workshop, with the title ‚glacier and ice-stream calving – Observations and Modeling' will take place from 2 - 3 June 2014, in Grenoble, France. The coming Workshop on the Dynamics and Mass Budget of Arctic Glaciers & the IASC Network on Arctic Glaciology Annual Meeting, will take place from 3 - 5 February 2014 in Ottawa, Canada. This meeting will mark the 20th anniversary of the network, formed out of the Working Group on Arctic Glaciology, which held its first formal meeting in Wisla, Poland, in September 2014.

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Polar Archaeology Network (PAN)

The Polar Archaeology Network (PAN) is an international organization dedicated to issues impacting archaeology in the Arctic, Subarctic, and Subantarctic. Its main goals are 1) the protection of cultural heritage; 2) the promotion and support of research, particularly through the expansion of international networks and cooperation; 3) the meaningful integration of archaeology with communities; and 4) the dissemination of research results in both scholarly and popular forums.

This year, a new PAN working group was organized by Debora Zurro Hernández: "PAN Archaeobotanical Net". This working group is designed to counter the longstanding neglect of archaeobotanical remains by archaeologists working at high latitudes, which results from generally poor preservation and difficulties in recovery, and also from the ethnographically documented dependence of the regions' peoples on animal food sources. Nevertheless, archaeobotanical remains are seasonally important sources of calories and vitamins, and also served technological and medicinal functions. Thus, there is a need for a working group to coordinate communication among relevant researchers, and to build databases of reference collections and publications, to be made available via the internet. Interested individuals are encouraged to contact Ulla Odgaard (contact information next page).

PAN executive members Max Friesen and Maribeth Murray attended the Arctic Observing Summit (AOS)

PHOTO:
NAG annual open forum meeting, Obergurgl, Austria.

in Vancouver in April. The purpose of this participation was to introduce the issues surrounding modern climate change impacts on the archaeological record to the broader scientific community, and to assess whether AOS is a good forum for pursuing a more formal monitoring regime for heritage resource management.

Additional PAN activities over the past year have centered on organizational aspects of the network. In particular, the PAN website has been extensively re-worked and updated by Hans Peter Blankholm, with Spanish translations provided by Debora Zurro Hernández.

PAN is currently in the process of planning two upcoming events. First, PAN is collaborating with the International Polar Heritage Committee (IPHC, affiliated with the International Council on Monuments and Sites) in the organization of a conference in Copenhagen to be held in May of 2014. The conference will bring together experts working in both polar regions to discuss common challenges and best practice in relation to modern climate change impacts on the archaeological and built heritage records. Second, in collaboration with colleagues from the University of Groningen, PAN is in the initial phases of organizing a workshop on Archaeology and Arctic Climate Change, to be held in late 2014 or early 2015. This event will focus on long-term human-environment interactions in the context of past climate change, and will be linked to planning for ICARP III.

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PHOTO: MAX FRIESEN
One of the Polar Archaeology Network's main goals is to encourage monitoring and mitigation of archaeological sites being destroyed by erosion and development. Here, Lawrence Rogers of Inuvik examines the remaining portion of a half-destroyed prehistoric Inuvialuit house in the Mackenzie River Delta, northwestern Canada. All driftwood in the eroding bluff face was once part of the walls and floor.

PHOTO: PAST GATEWAYS
Participants at the First PAST Gateways International Conference and Workshop, Zelenogorsk, Russia, May 2013.

Palaeo-Arctic Spatial and Temporal Gateways (PAST Gateways) Network

PAST Gateways is a network research program which started in 2012. The scientific goal of the program is to understand Arctic environmental change during the period preceding instrumental records and across decadal to millennial timescales. The focus of the six-year program is on the nature and significance of Arctic gateways, both spatial and temporal, with an emphasis on the transitions between major Late Cenozoic climate events such as interglacials to full glacials and full glacial to deglacial states, as well as more recent Holocene fluctuations. There are three major themes to the program:

(1) Growth and decay of Arctic Ice Sheets
(2) Arctic sea-ice and ocean changes; and
(3) Non-glaciated Arctic environments and permafrost.

The First PAST Gateways International Conference and Workshop was organized by St. Petersburg University and held in Zelenogorsk, St. Petersburg, Russia from 13 -17 May, 2013. The meeting brought together over 50 scientists for a fieldtrip and several days of oral and poster presentations. The group comprised a balanced mix of senior scientists and early career researchers including postgraduate students. Presentations were given on a wide range of topics as befits the inter-disciplinary focus of the network including Arctic palaeoceanography, ice sheet history, recent glacier change, reconstructions of palaeoclimatic change from lacustrine and terrestrial palaeo-ecological archives and the history of circum-Arctic palaeo-river discharge. The second PAST Gateways International Conference and Workshop will be held in Trieste, Italy, from 19 – 23 May, 2014.

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PHOTO: IASC SECRETARIAT
The city of Krakow, Poland during the ASSW 2013.

5. Arctic Science Summit Week 2013

» 5 Arctic Science Summit Week 2013

About 400 participants from 25 countries attended the Arctic Science Summit Week (ASSW) 2013, which was held in the beautiful city of Krakow in Poland on 13-19 April 2013. The ASSW was initiated by IASC in 1999 to provide opportunities for coordination, cooperation and collaboration between the various scientific organizations involved in Arctic research and to economize on travel and time. Any organization engaged in supporting and facilitating Arctic research may participate and also use the summit to hold its business meeting.

Since 2009, every second ASSW includes a three-day Science Symposium and the 2013 symposium "The Arctic Hub - Regional and Global Perspectives" focused on the interactions between the Arctic and the lower latitudes and the regional and global implications of Arctic changes. Five disciplinary and four cross-cutting sessions dealing with both environmental and socio-economic conditions and addressing multidimensional changes and linkages were convened. The engagement of the Arctic Council Indigenous Peoples Secretariat (IPS) made it possible to – for the first time at an ASSW - fully integrate Arctic people in the scientific program of the Symposium. Thanks to the efforts of the Association of Polar Early Career Scientists (APECS), about 25% of the participants were early career scientists. A political panel „Arctic Dialogue, Science-Policy Interface", organized by the Polish Ministry of Foreign Affairs, complemented the program of a very productive and highly interesting week in Poland.

PHOTO: IASC SECRETARIAT
Conference Dinner during the ASSW 2013 in Krakow, Poland.

ASSW 2013 Science Sessions

Atmosphere Processes and Global Climate Connections

Timo Vihma, Günther Heinemann and Sara Strey

Arctic climate change is occurring at an increasingly alarming rate. One large and many faceted contributor to observed changes are changes in atmospheric processes including but not limited to: atmosphere-ice-ocean interactions, cloud processes, radiative transfer, atmospheric chemistry, feedbacks between the boundary layer and the free atmosphere, interaction between the stratosphere and troposphere and teleconnections between the Arctic and mid-latitudes. The understanding of the key processes in the Arctic atmosphere is incomplete, and the representation of said processes in present-day weather and climate models includes vital inaccuracies that require further investigation and understanding.

This symposium assembled a variety of researchers working on both numerical model-based and observational studies of Arctic atmospheric processes and studies on global change relative to the Arctic.

Cryospheric Changes: Drivers and Consequences

Francisco Navarro, Hiroyuki Enomoto and Yulia Zaika

The cryosphere is a sensitive and critically important component of the climate system. Components of the cryosphere such as glaciers, ice caps, ice sheets, ice shelves, icebergs, sea ice, lake and river ice, snow cover and permafrost are changing. Some of these components are changing rapidly in the Arctic area due to global climate warming. These changes in the Arctic may have global multidimensional environmental, economic and social impacts as a consequence of associated changes in the Earth's energy balance, sea level, greenhouse gas concentrations and atmospheric circulation, transport of the heat through ocean circulation, changes to ecology, infrastructures and human well-being. With continued climate warming it is likely that the cryospheric components will play an increasingly important and critical climatic role. Understanding the drivers of such cryospheric changes is therefore crucial.

Marine Processes and Variability

Jinping Zhao, Wieslaw Maslowski and Monika Kedra

The accelerated melt of the Arctic sea ice since the late 1990s and the new record minimum set in September 2012 amplify the importance and timeliness of research into the causes and consequences of climate warming in the Arctic. Recent studies unambiguously point to the need for improved understanding of critical Arctic processes and feedbacks and their adequate representation in global climate and Earth System models. Many of these processes occur in the ocean and they exert control on marine ecosystems. Contributions that advance a system-level knowledge of the Arctic Climate System through understanding of critical ocean physical and biogeochemical processes and feedbacks among them were invited to this session.

Terrestrial Ecosystem Responses to Environmental Stressors

Yoo Kyung Lee, Warwick Vincent and Sonal Choudhary

Arctic terrestrial and freshwater ecosystems are currently experiencing the effects of multiple stressors including rapid warming, reduced ice thickness and area, shifts in snowfall and water balance, increasing ultraviolet-b exposure, herbivory, the arrival of exotic species and the input of long range contaminants, combined in some cases with local pollutants and nutrient enrichment. Some of these environments such as thermokarst lakes and wetlands are also biogeochemical hotspots for globally significant emissions of greenhouse gases and are undergoing large, but regionally variable changes in activity. This session brought together terrestrial and freshwater researchers to examine how northern ecosystems are responding to environmental change, and the variability in response among sites in the circumpolar North.

Impact of Global Changes on Arctic Societies

Grete Hovelsrud, Rasmus Ole Rasmussen and Gerlis Fugmann

The session highlighted the impact of global environmental and societal changes on Arctic societies in recent years. Politics, industry and the general public worldwide have increasingly turned their attention to the circumpolar Arctic due to the geopolitical perspectives of the upcoming options for easier access to its resources. Similarly its importance as an "early warning system" for the rest of the planet in regards to climate change has become an issue of interest. Last, but definitely not least, the ongoing changes have generated a situation where the Arctic population has become an important player in the process of globalization! The changes in this fragile region in relation to environment, increased accessibility, the growing global demand for its natural resources (in particular fossil fuel) and increased interaction with the rest of the world have consequences for its residents. The session included presentations that focus on the response, adaptation and resilience of Arctic societies to the global processes and changes that are currently affecting their communities and way of life.

Arctic People and Resources: Opportunities, Challenges and Risks

Nancy Maynard, Alona Yefimenko and Julia Skupchenko

Climate change, the reduction of sea-ice, new technologies, and increasing global pressure for energy are causing unprecedented access to the rich natural resources of the circumpolar Arctic. The Arctic plays a key role in world energy, possessing around 13 percent of undiscovered oil and about 25 percent of global gas resources. Exploration and mining activities are accelerating additional development in the Arctic through the creation of roads, ports, economic activity and new settlements. Arctic indigenous peoples are looking forward to the rich opportunities that a warmer Arctic will open up in resource development, shipping and the service industries that will flourish around them. However, there is also a real threat to indigenous communities living in the Arctic and, in particular, their ability to preserve traditional lifestyles in the presence of increasing extensive petroleum and mineral development. The potential enrichment of Arctic countries could not compensate for the costs of runaway Arctic warming. Also, Arctic species, habitats and quite possibly whole ecosystems – critical to indigenous life ways - could be lost.

This session addressed some of the economic, environmental and social challenges and opportunities for sustainable economic development in a rapidly changing Arctic: What are the opportunities, challenges and risks? Governance and enabling institutions? What role will indigenous peoples play in the decision-making? And, how will their concerns be included? Potential for disasters, pollution, accidents, and their impacts on local indigenous peoples? How

can the Arctic Council best respond to the impacts of rapid changes on the Arctic peoples? Of particular interest to this session were presentations on how natural resource exploitation and politics involving the interests of Arctic peoples and their land use have played out in the past and in the present.

Applying Local and Traditional Knowledge to Better Understanding of the Changing Arctic

Claudio Aporta, Igor Krupnik and Sandra Juutilainen

The Arctic has long been identified by scientists as a key to our understanding of the drivers and impacts of global change. As we chart a new vision of the Changing Arctic, the perspectives and insight of Arctic residents become increasingly important to our assessment of the current and future trends and at multiple scales. Many polar communities have documented significant shifts in the world as they knew it, in the weather, sea ice, behavior of animals, status of land and water and the entire environmental context of their home areas. Arctic peoples' reports and understanding of change are based on careful monitoring and generations of accumulated expertise stored in stories, language, safety practices, ethics and teaching. This session discussed the present state of partnership and communication between polar communities and scientists studying the impact of global change in the North. Prospective topics were wide-ranging and may included: incorporation of Indigenous knowledge in scholarly studies and publications; specific examples of approaches and practices used in community-based monitoring, research and data management, in which local knowledge is translated into action; ethical issues in partnership with local communities; long-term relations among Indigenous communities, local organizations, science and management agencies, Indigenous and non-Indigenous researchers; interface between natural and social drivers of change; resilience, vulnerability and sustainability of local knowledge-based practices and co-management regimes.

Arctic System Science for Regional and Global Sustainability

Josef Elster, Gunn-Britt Retter and Michał Łuszczuk

The natural and social landscapes of the Arctic are confronted today with a multitude of unprecedented and salient consequences of the climate change and development of the human activity in the region. The implications of this transformation are increasingly and comprehensively monitored, evaluated, understood and communicated, which makes the Arctic System Science important and influential as never before. Its significance is particularly evident in the efforts to envision, advance and secure a sustainable future and development for the peoples in the Arctic. This session addressed and highlighted the relation between the Arctic System Science and the sustainability, with a focus on the integrative role of both the science and traditional knowledge in recognizing the past, present and future links and interdependencies between regional and global processes. Ultimately the session contributed to efforts to synthesize interdisciplinary perspectives and multidisciplinary interpretations generated in recent years to expand our understandings of the human-environment connections and related implications for coming generations.

Changing North: Predictions and Scenarios

Georgia Destouni, Vera Metcalfe and Adam Naito

Climate change leads to a host of Arctic system alterations, for instance in its hydrologic, cryospheric and ecological characteristics. Permafrost degradation, conversion of tundra to scrubland, and sea ice melt, following changes in precipitation and temperature are but a few examples of environmental alterations that have also socio-economic and cultural implications, not least for the livelihoods of indigenous Arctic peoples. This cross-cutting section addressed different types of projections and scenario formulations that provide insights into a future Arctic. The session focused on two broad themes: a) projected changes and scenarios of future environmental development, e.g., with regard to temperature, precipitation, hydrology, vegetation, sea ice, pollution of the Arctic, and b) the use of and interplay between such projections and scenarios, and environmental, socio-economic and cultural sustainability in the Arctic.

Connecting both Poles

Recognizing that there are many common interests and that there is much to be gained from developing a synergy, IASC and the Scientific Committee on Antarctic Research (SCAR), are working closely together. At the ASSW 2013, the two Executive Committees held a joint meeting to discuss the recommendations of their Bipolar Action Group and to talk about major upcoming activities, such as the Third International Conference on Arctic Research Planning (ICARP III), the International Polar Initiative (IPI) and SCAR´s Horizon Scan.

PHOTO: IASC SECRETARIAT
The city of Krakow during the ASSW 2013.

PHOTO: IASC SECRETARIAT
Joint SCAR/IASC Executive Committee meeting at ASSW 2013 (From left to right: Volker Rachold, Karin Lochte, Mike Sparrow, Susan Barr, Geronimo Lopez Martinez, Jackie Grebmeier, David Hik, Yoo Kyung Lee).

IASC Medal awarded to Leif Anderson

The 2013 IASC Medal was awarded in recognition of Leif Anderson´s pioneering work on the functioning of the Arctic Ocean and his groundbreaking scientific contributions to understanding the chemistry and carbon cycle of this very special ocean system. The Medal Lecture entitled „Utilizing Chemical Signatures to Study the Arctic Ocean" was presented during the ASSW 2013 Science Symposium.

Upcoming ASSWs:

The Arctic Science Summit Week 2014 and Arctic Observing Summit (AOS)

The ASSW 2014 and Arctic Observing Summit will be held in Helsinki, at the University of Helsinki and the Finnish Meteorological Institute located on the science campus Kumpula on 5 - 8 April and 9 – 11 April, 2014.

ICARP III will be launched on the Common Day on 8 April, in the middle of the ASSW 2014 (for more information on ICARP III see Chapter 6).

www.assw2014.fi/

Arctic Science Summit Week 2015

The ASSW 2015 will be held at the Toyama International Conference Center, Toyama, Japan, on 23 – 30 April, 2015. The final event of ICARP III and IASC's 25th anniversary will be celebrated during ASSW 2015 (for more information on ICARP III see Chapter 6).

www.assw2015.org/

PHOTO: IASC SECRETARIAT
IASC President David Hik awarding the IASC Medal to Leif Anderson.

PHOTO: IASC SECRETARIAT
The city of Krakow, Poland, during the ASSW 2013.

PHOTO: MICHAEL HARDWOOD
A lone Inukshuk in Alert, Nunavut (Canada).

6. Third International Conference on Arctic Research Planning (ICARP III)

» 6 Third International Conference on Arctic Research Planning (ICARP III)

Integrating Arctic Research – a Roadmap for the Future

ICARP III
3RD INTERNATIONAL CONFERENCE ON ARCTIC RESEARCH PLANNING

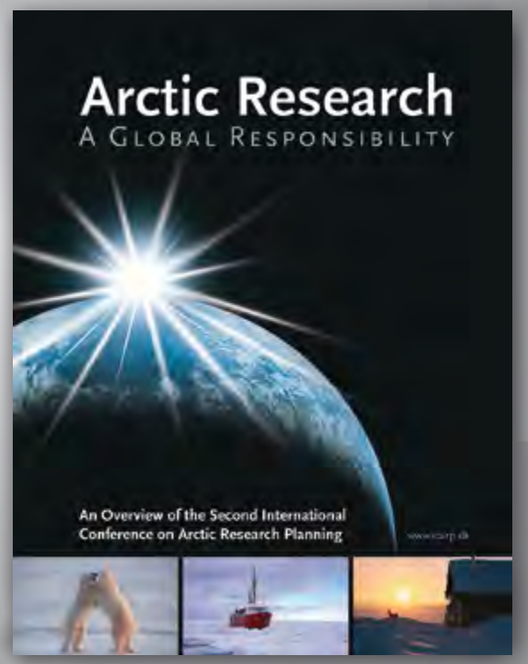
Over the past two decades, IASC has been organizing forward-looking conferences focused on international and interdisciplinary perspectives for advancing Arctic research cooperation and applications of Arctic knowledge. In 2015, it will have been 10 years since the ICARP II and 20 years since the first ICARP in 1995.

The political and economic interests in the Arctic are already multifold of what they were just 5 years ago, and consequently national funding agencies and various large companies have a marked interest in Arctic science. Consequently, new Polar/Arctic research programs are currently being developed and some have already been launched. More programs require improved coordination in order to secure the best value for funding spent. Agreeing on shared objectives, across Arctic states as well as internationally, is becoming increasingly important. The third ICARP is being designed to facilitate this sharing of priorities, expertise and resources to achieve these goals.

The development of ICARP III is a specific area of cooperation in the agreement between IASC, the International Arctic Social Science Association (IASSA) and University of the Arctic (UArctic). The preliminary plans for ICARP III were presented at the Arctic Science Summit Week (ASSW) 2013 for research community input, and all partner organizations were invited to participate in the planning and implementation. Subsequently, a Steering Committee composed of one representative of each of the initial ICARP III partner organizations and the IASC Working Groups was established and met in Potsdam in September 2013. The committee is chaired by the current President of IASC and also includes the chairs of ICARP I and ICARP II and representatives of the local hosts of the Arctic Science Summit Week (ASSW) 2014 (www.assw2014.fi) and 2015 (www.assw2015.org). Secretarial support is provided by IASC.

The ICARP Process:

IASC´s Founding Articles call for an Arctic Science Conference, convened periodically to identify key scientific questions and issues. The first International Conference on Arctic Research Planning (ICARP I) was held in Hanover NH (USA) in 1995. ICARP I reviewed the state of Arctic science, provided scientific and technical advice, promoted cooperation with other national and international organizations and resulted in a series of IASC-supported research projects. The second conference, the ICARP II organized in Copenhagen (Denmark) ten years later, used a different format. Building upon the planning efforts of the Arctic Climate Impact Assessment (ACIA) and the International Polar Year (IPY 2007/2008), the ICARP II Steering Group identified twelve areas of potential research needs. International teams of scientific experts and indigenous leaders were appointed for each of these areas and mandated to develop forward-looking science plans to guide international cooperation over the following 10-15 years. This comprehensive pre-conference process engaged over 140 experts in the preparation of twelve science plans. The science plans were presented at the conference which brought together scientists, policy makers, research managers, indigenous peoples and others interested in and concerned about the Arctic. Many of the scientific priorities identified in the science plans were addressed in follow-up international projects and programs, in particular within the framework of the emerging IPY.



ICARP II Conference, Copenhagen, Denmark

PHOTO:
ICARP III Steering Group Meeting, September 2013, Potsdam

ICARP III will provide a framework to identify Arctic science priorities for the next decade, to coordinate various Arctic research agendas, to inform policy makers, people who live in or near the Arctic and the global community, and to build constructive relationships between producers and users of knowledge. Unlike ICARP II, it will not include the development of new science plans, but rather build on the many comprehensive science plans that exist already and compliment these with processes to identify gaps that may need attention. Considering the outcomes of both ICARP II and the International Polar Year (IPY) 2007/2008, ICARP III will provide a process for integrating priorities for forward-looking, collaborative, interdisciplinary Arctic research and observing and for establishing an inventory of recent and current synthesis documents and major developments in Arctic research.

The Steering Committee agreed that ICARP III would be structured along scientific themes and include a series of meetings and events during 2014/15, beginning with a formal launch at the ASSW 2014 in Finland and culminating in a final conference during ASSW 2015 in Japan. Engaging all partners, including funders, in shaping the future of Arctic research needs, ICARP III will produce a consensus statement identifying the most important Arctic research needs for the next decade, provide a roadmap for research priorities and partnerships and identify the potential and specific contributions of Arctic research partners to the development of the International Polar Initiative (IPI) (see Chapter 7). The outcomes of ICARP III will also be linked to the conclusions of the forward-looking Horizon Scan being conducted by the Scientific Committee on Antarctic Research (SCAR) during 2014 (www.scar.org/horizonscanning/).

IASC presented the plans for the upcoming ICARP III to the Arctic Council and invited in particular all Permanent Participants to engage in the ICARP III process because involvement of people who live in the Arctic is crucial to achieve the goals of ICARP III. Also, given that ICARP III aims at developing a roadmap for the next decade, the integration of early career scientists in the planning process is of high priority. In that respect, IASC and the ICARP III partners are closely collaborating with the Association of Polar Early Career Scientists (APECS).

ICARP III will fully integrate IASC's Working Groups (WGs) and Networks. Seed funding for the WGs and Networks to develop cross-cutting activities that identify and address new and emerging scientific issues within the framework of ICARP III has been made available. Additionally, IASC also decided to set aside ICARP III funding for joint activities with its ICARP III partner organizations. These activities will take place within the ICARP III timeframe (April 2014 to April 2015) and include, for example, ICARP III sessions or Townhall meetings at upcoming conferences, ICARP III related workshops or other planning activities.

The final ICARP III event at the ASSW 2015 will be held in conjunction with IASC 25th anniversary in 2015. This anniversary also presents the opportunity to review IASC contributions and recognize those who have been instrumental in its founding, development and growth. A special issue of the IASC Bulletin, devoted to the history of IASC, will be presented. The IASC history publication is edited by Odd Rogne, Louwrens Hacquebord, Bob Corell and Volker Rachold and based on contributions by individuals involved in the planning and implementation of IASC over the past 25 years.

For more information on ICARP III please visit the website **icarp.arcticportal.org** or contact **icarp@iasc.info**.

List of ICARP III Partners as of 2013

Arctic Council Indigenous Peoples Secretariat (IPS)

Arctic Monitoring and Assessment Program (AMAP)

Association of Polar Early Career Scientists (APECS)

Climate and Cryosphere (CliC)

Conservation of Arctic Flora and Fauna (CAFF)

European Polar Board (EPB)

Forum of Arctic Research Operators (FARO)

International Arctic Science Committee (IASC)

International Arctic Social Sciences Association (IASSA)

International Association of Cryospheric Sciences (IACS)

International Council for the Exploration of the Sea (ICES)

International Permafrost Association (IPA)

International Study of Arctic Change (ISAC)

Northern Research Forum (NRF)

Ny-Ålesund Science Managers Committee (NySMAC)

Pacific Arctic Group (PAG)

Scientific Committee on Antarctic Research (SCAR)

University of the Arctic (UArctic)

PHOTO: IÑIGO GARCIA ZARANDONA
Fragmented ice in the Greenland Sea.

7. International Science Initiatives

» 7 International Science Initiatives

To promote Arctic science at a global level, IASC is involved in science planning and the initiation and development of international initiatives from major research programs to thematic workshops. Although IASC is not a funding organization, it does make its connections, expertise, and secretarial support available for selected international science initiatives. Initiatives are usually carried out in cooperation with other arctic and international organizations.

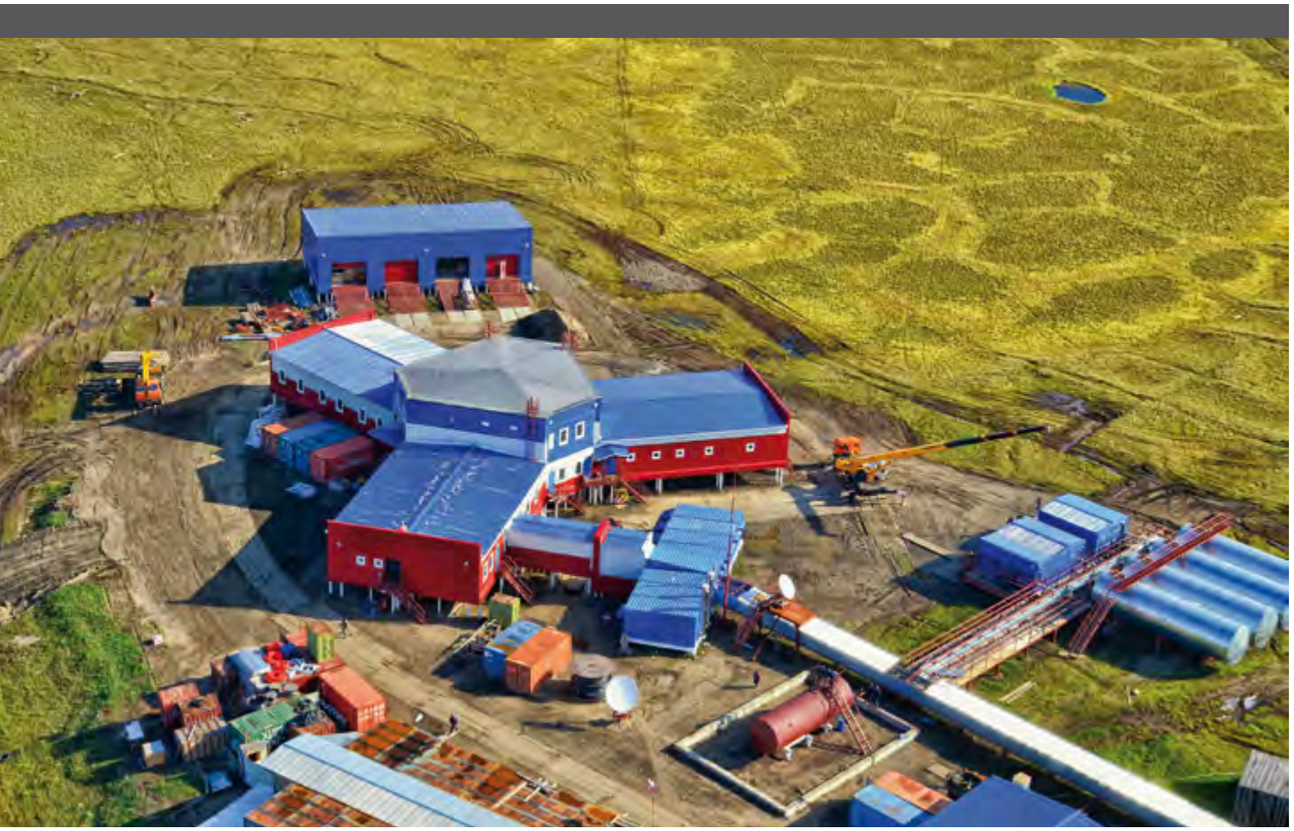


PHOTO: MIKHAIL GRIGORIEV
The Samoylov Research Station is located at the southern coast of Samoylov Island (N72°22, E126°28) within the Lena Delta close to the Laptev Sea.

Sustaining Arctic Observing Networks (SAON)

SAON
SUSTAINING ARCTIC OBSERVING NETWORKS

(Jan Rene Larsen)

The Sustaining Arctic Observing Networks (SAON) is a process that was initiated during the International Polar Year. The purpose of SAON is to support and strengthen the development of multinational engagement for sustained and coordinated pan-Arctic observing and data sharing systems. SAON promotes the vision of well defined observing networks that enable users to have access to free, open and high quality data that will realize pan-Arctic and global value-added services and provide societal benefits.

SAON has been established on the initiative of the Arctic Council and IASC, and both organizations support SAON by providing secretariat assistance, representation on the SAON Executive Committee and Board. The Arctic Council's Arctic Monitoring and Assessment Program (AMAP) provides the SAON Chair, and the IASC President is the SAON Vice-Chair.

The third meeting of the SAON Board was held in Vancouver on 29 April, 2013. The meeting was attended by representatives of seven Arctic Council member countries, the Aleut International Association (AIA), the Gwich'in Council International (GCI), the Inuit Circumpolar Council (ICC), the SAON Secretariat sponsors (AMAP and IASC), five non-arctic countries (Germany, Italy, Japan, South Korea, Poland), and several partner organizations (CAFF, CliC, EU, EEA, GEO, ISAC, PAG, WMO). The Board continued discussions on the strategic development of SAON, including establishing two committees as homes for the SAON Tasks. The two SAON committees will facilitate coordination of SAON Tasks and affiliated Networks, and will report to the SAON Board. New SAON Tasks and Networks will be added as specific requirements or interests develop. The Committee on Observations and Networks will cover the coordination of observing assets, while the Committee on Information and Data Services will cover data integration and data delivery. The Board repeated its commitment to have Community Based Monitoring as an integrated part of its work.

The Board will continue to have outreach as one of its basic activities, and will continue to support the Arctic Observing Summit (AOS). The first Summit was held in Vancouver, 30 April – 2 May 2013 and brought together a cross-section of the arctic community to deliberate on community-driven, science-based guidance for the design, implementation, coordination and sustained long-term operation of international networks of arctic observing systems. The second AOS will be held in Helsinki (Finland) on 9 - 11 April 2014. It will be hosted by the Finnish Meteorological Institute (FMI) and held in conjunction with the Arctic Science Summit Week (ASSW) 2014. (see paragraph "Arctic Observing Summit" next page)

SAON issues a quarterly newsletter, which can be downloaded from the SAON website under **www.arcticobserving.org.** You can subscribe to the newsletter by sending an email to **jan.rene.larsen@amap.no**.

International Study of Arctic Change (ISAC)

(Lizemarie Van der Watt)

Introduction

The International Study of Arctic Change (**www.arcticchange.org**) is an arctic environmental change program initiated in 2003 by IASC and the Arctic Ocean Sciences Board (AOSB). ISAC's vision is one of timely, relevant, and accessible scientific information for responding to rapid arctic change.

Activities

In 2013, ISAC took an important step towards implementing the observing element of its science plan (Murray 2010) through leading the inaugural Arctic Observing Summit (AOS) in Vancouver BC, Canada, on 30 April – 1 May 2013. The AOS brought together representatives of the arctic community at large to deliberate on ways and means to guide and support the design, implementation, coordination and sustained long-term (decades) operation of an international network of arctic observing systems. The AOS is a task of the SAON (**www.arcticobserving.org**) process, which is led jointly by the Arctic Council and IASC. Subsequent summits will take place in conjunction with the Arctic Science Summit Week, starting with the ASSW in April 2014, Helsinki, Finland, and thereafter biennially. The AOS 2014 will build on the foundation laid in 2013 and will continue to be a key platform for SAON and the arctic community to address the observation needs of arctic stakeholders and to foster international communication and coordination of long-term observations for improving understanding and responding to system scale arctic change. The themes for the 2014 summit include data and the Arctic observing system, integration of stakeholders in observing system design and use, operational coordination of the Arctic observing systems, remote sensing, and technology and innovation. (For more on the AOS see next contribution.)

Following the successful ISAC Responding to Change (RtoC) Workshop organized at Queen's University, Kingston, Canada in 2011, the Tromsø Scoping Meeting – a side-event to Arctic Frontiers 2014, seeks to bring together major programs in arctic research to address stakeholder integration into research and learning for RtoC. Co-organized by ISAC and ACCESS the scoping meeting is designed to inform and structure the implementation of ISAC RtoC activities.

Specifically participants at the Scoping Meeting are asked to consider three matters:

1. What mechanisms are needed to better engage stakeholders in the research design and implementation process? What research activities are tractable now and over the longer term?
2. How can the Biennial Arctic Observing Summit be better aligned with stakeholders´ desired outcomes for information for observational activities?
3. What capacity is missing from our current Responding to Change initiatives (key stakeholder groups, key research communities?)

A report on the RtoC scoping meeting will be released in Autumn 2014.

Furthermore, ISAC remains active in science policy and planning activities, such as the 3rd International Conference on Arctic Research Planning ICARP III (http://icarp.arcticportal.org) and participation in the EU Arctic Impact Assessment Consultations (www.arcticinfo.eu).

Contact

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Arctic Observing Summit (AOS)

(Lizemarie Van der Watt)

The inaugural Arctic Observing Summit (see **www.arcticobservingsummit.org**), held from 30 April to 2 May 2013 in Vancouver, BC, Canada, brought together representatives of the arctic community at large to deliberate on ways and means to guide and support the design, implementation, coordination and sustained long-term (decades) operation of an international network of arctic observing systems. The AOS is a task of the SAON (www.arcticobserving.org) process, which is led jointly by the Arctic Council and IASC. The International Study of Arctic Change leads this SAON task. The AOS addresses the implementation of the 'observing change' component of the ISAC Science Plan, which also encompasses understanding and responding to arctic change (Murray et al. 2010).

The format of the AOS 2013 did not follow that of a conventional conference. The summit was informed by white papers and shorter statements written by the wider community, which were reviewed, and made available for online public comment at www.arcticobservingsummit.org. A total of sixty white papers and statements were posted, with observing system design, stakeholder perspectives on system design and integration, and issues surrounding data management strongly represented. The white papers are available on the AOS website.

The AOS 2013 addressed four themes: the status of the current observing system; observing system design and coordination; stakeholder perspectives on observing system design and integration, and mechanisms for coordination of support, implementation and operation of a sustained arctic observing system. Recommendations were made to foster the coordination of observing activities and help implement collaborative networking of arctic observing systems. The long-term goal of the Arctic Observing Summits is to complement the SAON process in developing sustained dialogue, coordination and implementation of an international Arctic observing network.

At the summit, the organizers sought to create a space for integrative interaction between the more than 170 summit participants. The participants came from 12 different nations and represented a diverse set of groups interested in Arctic observations including funding agencies, northern residents, policy makers, industry, science planners and a variety of scientific disciplines. The organizing committee synthesized information from the white papers and statements by theme. Keynote talks and panel discussions further elaborated on the AOS 2013 themes.

The AOS program balanced international and national level perspectives with the interests of northern residents and indigenous peoples, especially from the Canadian and U.S. Arctic. Panel contributions by representatives from North American Arctic indigenous organizations on stakeholder engagement with observing system design emphasized both the need and the benefits to be derived from an early engagement of these groups in the design and execution of an observing network that does more than pay lip service to information needs by Arctic residents. A strong presence by participants in a range of different community-based observing networks suggests that there is critical mass to advance on these issues. The strong representation from China, Japan, and South Korea, including several plenary presentations, highlighted the importance of Arctic observing programs for operational weather forecasts in eastern Asia as well as growing economic interests

in the Arctic particularly with respect to resource development and shipping activities. An international panel brought together agency representatives from four countries and the EU to provide important perspectives on international collaboration. This panel stimulated a vigorous question and answer session from AOS participants, particularly with respect to opportunities and limitations of funding strategies for international observing activities.

Drawing on the plenaries, panel discussions, and white paper syntheses, participants were divided into thematic working groups, to address the status of the observing system, stakeholder perspectives, funding, observing system design and coordination. Each group consisted of a cross-section of the participants, which resulted in rewarding and multi-faceted discussions in which various stakeholders, including academics, had to make recommendations on how to move forward in coordinating and implementing an international, integrated Arctic observing system.

The working groups made more than forty individual recommendations, many of which were applicable across all themes. Regardless of theme, all the groups emphasized the importance of access to data, stakeholder integration and improved observing system design.

The AOS 2013 recommended improved cross-sectoral and collaborative approaches to the collection and maintenance of data. This entails pushing for multi-disciplinary science-industry collaborations, as well as mechanisms to create partnerships that increase access to observational data. It is also crucial to improve linkages between data sets, including reporting to global networks and developing open-access, interoperable approaches, and prioritizing high-use data in order to demonstrate the usefulness of transparent data management.

The participants strongly advocated for the creation of a stakeholder advisory group to provide advice on observational need, including representation from different groups of stakeholders, including but not restricted to local communities, state and military maritime agencies, industry, scientists, regional indigenous peoples associations, resource users, governmental and non-governmental organizations, transport agencies, tour operators, the education sector, conservation sector, direct and indirect data users, as well as representatives on local, regional, national levels and non-Arctic countries. This group should assist in identifying observations and products most useful for decision-making by a wide range of stakeholder groups. A variety of instruments should be used to interact with the different stakeholders, ensuring that the process is open and a continued conversation with adaptable criteria.

Observing system design can be improved with better utilization, development and adoption of modern technology for both direct observations with real-time data transmission and for comprehensive process studies in high spatial and temporal resolution in multiple dimensions. Closer cooperation with global systems should also be encouraged, already during the design phase.

Subsequent summits will take place in conjunction with the Arctic Science Summit Week, starting with the ASSW in April 2014, Helsinki, Finland, and thereafter biennially. The AOS 2014 will build on the foundation laid in 2013 and will continue to be a key platform for SAON and the arctic community to address the observation needs of arctic stakeholders and to foster international communication and coordination of long-term observations for improving understanding and responding to system scale arctic change. The themes for the 2014 summit include data and the Arctic observing system, integration of stakeholders in observing system design and use, operational coordination of the Arctic observing systems, remote sensing, and technology and innovation.

Arctic Human Development Report (AHDRII)

The "Arctic Human Development Report II – Regional Processes and Global Linkages" is a project of the Arctic Council´s Sustainable Development Working Group (SDWG). The IASC Secretariat is coordinating the scientific peer-review.

The AHDR II moves the study of human development in the Arctic beyond the AHDR (2004) baseline and provides the second assessment and synthesis report on the state of human development in the Arctic. The report will be presented in 2014 and contribute to our increased knowledge and understanding of the consequences and interplay of physical and social global change processes for human living conditions and adaptability in the Arctic. It will identify trends that affect sustainable human development among residents of the circumpolar world and compare and contrast cultural, economic, plitical and social conditions throughout the Arctic with similar conditions in other parts of the eight Arctic countries and in the world at large. The guiding questions are:

- How does the Arctic differ from the outside world and especially from the metropoles or heartlands of the Arctic states?
- How do indigeneity, ethnicity, and geography, age and gender affect perceptions of changes in the Arctic?
- What are the impacts of climate and environmental change on human development in the Arctic?
- How much variance is there from one part of the Arctic to another?
- What are the major trends unfolding at this time?
- What are the main regional processes and global connections?
- What are the main changes in the past decade (since AHDR I, 2004)?

AHDR II Co-leads
Gail Fondahl (Canada)
Joan Nymand Larsen (Iceland)
Henriette Rasmussen (Greenland)

Arctic Resilience Report (ARR)

Interactions and Change Dynamics in Focus

(Annika E Nilsson)

While scientists and environmentalists watch the Arctic as a bellwether of global climate change, multinational companies and states in the Arctic and beyond turn their attention to the region's energy and mineral resources and new shipping routes, creating a situation of accelerating and combined social and environmental change. In making decision, both types of changes need to be taken into account, not least in decision about adaptation. Yet most discussions of the Arctic look at ecosystems, economics and people separately and rarely ask how they interact.

The Arctic Resilience Report (ARR) set out to fill that gap by applying resilience analysis as an integrative approach to better understand the dynamics of change. It is an Arctic Council project, initiated as a priority of the Swedish chairmanship, led by the Stockholm Environment Institute (SEI) and the

Stockholm Resilience Centre at Stockholm University (SRC). In May 2011, the project delivered a first report.[1]

In addition to setting out the framework for a resilience analysis of Arctic change, the report highlights some of the abrupt environmental shifts that have been observed in the past few years and the fact that more surprises are likely. One of the key conclusions is that strategies for adaptation therefore have to be responsive, flexible and appropriate for a broad range of conditions. The report also highlights the fact that policy and development choices matter a lot. Past decisions shape today's options for adaptation and transformation, and the choices we make today will shape our capacities for facing new challenges in the future. Another key point is that decision about the future are likely to require some difficult choices that must grapple with different and sometimes conflicting priorities. This becomes especially important when we have to make decisions about guiding and facilitating change into something new.

The ARR is a circumpolar collaboration, including experts representing both scientific and traditional knowledge. In addition to those who take part in the writing, a review process organized by IASC helped ensure a broad input of perspectives.

The ARR is now in its second phase, aimed at delivering a final report. This will to a large extent be based on case studies, where the aim is to better understand the mechanisms of resilience and transformation in social-ecological systems. What are the social and ecological feedbacks that maintain certain important features? What interaction between different external drivers of change and internal processes are likely to cause instabilities or radical shifts that affect ecosystems services and people's wellbeing? The idea is to elaborate on the methods that have been applied in a regime shifts database[2] at the SRC but with more emphasis on including the social processes than in the Arctic cases that have been analyzed[3] so far. The analysis in the final report will also place particular emphasis on identifying the policy decisions that might play a role for resilience and transformation.

The ARR project does not in itself have the capacity to develop case studies and will therefore depend on ongoing or already published work. Anyone who has ideas or is interested in contributing is welcome to contact us.

http://www.arctic-council.org/arr/contact/

International Polar Partnership Initiative (IPPI)

(David Hik)

IASC has been participating in the development of the International Polar Initiative (IPI) concept since the first meeting was held in St. Petersburg in April 2011. The most recent meeting of the extended Steering Group was held on 10 – 11 February 2014 in Paris, hosted by the Intergovernmental Oceanographic Commission (IOC) of UNESCO. The meeting was attended by leaders from a wide range of organizations involved in polar research, observing systems and delivery of services, including: IASC, International Arctic Social Sciences Association (IASSA), AMAP and Arctic Council, World Meteorological Organization (WMO) and World Climate Research Program (WCRP), International Hydrographical Organization (IHO), Intergovernmental Oceanographic Commission (IOC) and other UNESCO programs, GRID/Arendal (on behalf of UNEP), International Council for Science (ICSU) and Future Earth, European Polar Board (EPB) and European Science Foundation (ESF), Association of Polar Early Career Scientists (APECS), Mountain Research Initiative (MRI), University of the Arctic (UArctic), Canadian Polar Commission (CPC), Smithsonian Institution and Museum national d'Histoire naturelle. Several other partners were unable to attend. The meeting was chaired by the President of IASC in his role as co-chair of the IPI Steering Group.

The premise of the original IPI concept paper (www.internationalpolarintiative.org) is that the polar regions, where rapid physical, biological and social changes are occurring, must be considered within the framework of a fully coupled human-natural system. The extent and rate of change in the polar regions is outpacing any understanding of the consequences of these changes, and thus it is difficult to convey the knowledge necessary for making decisions that will influence future Arctic, Antarctic and mountain activities and conditions.

During early discussions of the IPI concept a number of emerging challenges in the polar regions were considered, including improving research infrastructure for services and operations; engaging with local residents; facilitating transfer of knowledge that would lead to tangible actions and outcomes;

1 Arctic Council (2013). Arctic Resilience Interim Report 2013. Stockholm: Stockholm Environment Institute and Stockholm Resilience Centre. ISBN: 978-91-86125-42-4
2 http://www.regimeshifts.org/
3 Up-to-date information on the case study template will be available at arctic-council.org/arr

PHOTO: ANTOINE BARTHÉLEMY
Expedition research crew deploys a deep-water mooring. This is an autonomous device moored to the seafloor and is used for long-term oceanic measurements aboard the Russian research vessel Akademik Fedorov.

delivering more reliable scientific information for policy-making; better coordinating existing resources and facilities; and developing mechanisms for new investments in areas where required activities are lacking.

One outcome of the Paris meeting was a decision to rename this process the IPPI, or International Polar Partnership Initiative. Several motivations for an IPPI were considered, including a need to develop and sustain a mechanism to support the wide range of polar interests and activities being addressed by international organizations and national research programs. Importantly, the Paris meeting recognized the compatibility of IPPI with the current ongoing planning and assessment process being conducted by various polar communities and organizations such as the Third International Conference on Arctic Research Planning (ICARP III) led by IASC, Horizon Scan led by SCAR, and the Arctic Human Development Report II and Adaptation Actions for a Changing Arctic (AACA), led by the International Arctic Social Sciences Association (IASSA) and Arctic Council, respectively.

The next proposed steps will require potential partner organizations to identify contributions to IPPI. Efforts will also be made to discuss IPPI at national levels and involve funding agencies in shaping the IPPI program at its earliest stage of development. In order to accommodate both bottom-up ideas from research communities and more centralized coordination of service oriented programs, and with a focus on achieving practical results, the IPPI Steering Group will work to support data interoperability among stakeholders; lead a discussion on "achieving more with less"; and consider the possibility of establishing a "micro-secretariat" to support future developments of IPPI. During 2014, the Steering Group will prepare a Framework Agreement for a multi-agency program of international stakeholders and develop a common Implementation Plan for activities that would begin in 2017-2018.

Arctic Circle

(Thorsteinn Gunnarsson)

The Arctic Circle is nonprofit and nonpartisan. Organizations, forums, think tanks, corporations and public associations around the world are invited to hold meetings within the Arctic Circle platform to advance their own missions and the broader goal of increasing collaborative decision-making without surrendering their institutional independence. The Arctic Circle is designed to increase participation in Arctic dialogue and strengthen the international focus on the future of the Arctic.

The Arctic Circle held its first annual open conference on 12-14 October 2013 in Reykjavík, Iceland. The program was designed in collaboration with partnering organizations. The Arctic Circle facilitated working meetings across issues and organizations and provided a forum for discussions hosted by different international and Arctic institutions.

http://www.arcticcircle.org/agenda

"The Science of Ice: Global Research Cooperation - Priorities to inform future research collaboration activities in the Arctic"

organized by the Icelandic Centre for Research (RANNIS) and IASC in conjunction with the Arctic Circle Conference in Reykjavik (Iceland) on 12 October 2013

Introduction

The Science of Ice: Global Research Cooperation was a roundtable discussion which took place on October 12, 2013 during the inaugural meeting of the Arctic Circle in Reykjavik, Iceland. The attending 32 participants, from at least 11 countries, included scientists, policy makers, business people and community members. Providing an informal platform for an open dialogue on important issues in Arctic research cooperation on a global level, the session also dealt with the inclusion of local and traditional knowledge. Finally, the session defined priorities that may inform future research collaboration activities in the Arctic. The discussion began with brief opening reflections highlighting research collaboration efforts and challenges in the Arctic from six speakers :

Value of Cooperation

The Arctic is of local, regional, national, and global concern. Changes in the Arctic not only affect the governments and people of the Arctic but also the world as a whole. Therefore, how people cooperate between arenas (e.g., private and public, local and external) and sectors (e.g., academic, industry, and policy-making) and between the disciplines within these sectors calls for collaboration at various levels of society. The dialogue of the session revolved among other things around the value of and priorities for cooperation.

The value of cooperation in research outweighs its costs. Cooperation often facilitates shared expenses and reduces individual costs. It promotes shared resources (i.e., both human and infrastructure) that expand the depth and breadth of research possibilities. Collaboration can improve the dissemination of information through access to more outreach avenues. Collaboration can also improve the quality of science and reduce duplication through increased communication; reduce environmental impacts through shared research efforts and data; improve transparency in research through broader communication and sharing; and increase opportunities for scientists through shared costs and infrastructure.

Changes are taking place quickly in the Arctic and collaboration is a way to increase the pace of research to attempt to understand these changes in a timelier manner. Collaboration may involve limited sacrifices, such as decreased autonomy and increased bureaucracy, but can result in more research opportunities, more data collection, and quicker dissemination of a greater volume of high quality information to the world.

Priorities for Cooperation

Changes in the Arctic will affect places and communities directly – climatically, economically, and politically. These challenges require internationally coordinated research in the Arctic. Global cooperation is a key factor in making research a success, increasing transparency, and improving information dissemination. The research community needs to broaden its geographic focus and relationships. We need to expand collaboration beyond Europe and North America and create more links of cooperation between China, Korea, Japan, Asia and Russia.

The discussion highlighted the extensive work that is currently being done to promote collaboration in the Arctic. It also illustrated the on-going effort placed on developing ways to improve and expand Arctic collaboration. A lack of funding and institutional support (no matter the arena) are reoccurring themes that continue to be challenges that need solutions in the effort to advance cross-sectoral research cooperation in the Arctic.

Priorities for future global research cooperation activities in the Arctic need to:

- Be global and expand the current geographic scope
- Develop flagship projects, yet be mindful of realistic expectations (project scale, funding, political constraints)
- Promote innovation and develop new technology and automated systems
- Focus on long-term data collection needs and gather real time data
- Share resources, infrastructures, expertise, data, and reduce individual costs
- Improve funding
- Include education
- Be inter- and cross-disciplinary, include local and traditional knowledge, and forge relationships between the industry, academia, and policy arenas.

PHOTO: IRINA KRYUKOVA
Siberian Sea: Expedition TRANSDRIFT XVII , Russian-German cooperation "System Laptev Sea".

PHOTO: MARIO HOPPMANN
Accumulations of sea-ice algae (melted into the sea ice) in a meltpond near the North Pole.

8. Relationship to other Organizations

» 8 Relationship to other Organizations

With the goals to develop and stimulate shared initiatives that are of high interest to the broader Arctic research community, to make better use of limited financial resources and to avoid a duplication of efforts, IASC has always been striving for close cooperation with other groups interested in Arctic research. Today IASC maintains excellent relations with many other both polar and global science organizations.

IASC is an accredited observer of the Arctic Council from its very beginning and in this function IASC is in the position to provide independent scientific advice to the main political body in the Arctic. IASC is supporting the work of the Arctic Council, its Working Groups and Permanent Participants by providing scientific expertise from all its members, including the non-Arctic countries, and IASC's contributions resulted in a number of very successful joint ventures.

As an International Scientific Associate of the overarching non-governmental science organization, the International Council for Science (ICSU), IASC is well connected within the broader ICSU family. In particular the cooperation with its Antarctic sister organization, the Scientific Committee on Antarctic Research (SCAR), resulted in various bipolar science activities.

Over the past years, IASC signed formal partnership agreements with several other Arctic or Polar organizations, which resulted in numerous joint scientific and/or outreach activities. Table 1 provides an overview of the organizations that IASC is formally cooperating with.

At the ASSW 2013, a new Memorandum of Understanding (MoU) was signed with the Forum of Research Operators (FARO), through which the two organizations identify a joint commitment to support international Arctic research. By means of this Agreement, FARO and IASC aim to expand the capacity for planning and supporting of major international research initiatives that go beyond the capacity of uni- or bilateral efforts. (see Annex 4.1)

In addition, four existing agreements were renewed.

1. With a renewed 5-year Letter of Agreement, the International Arctic Social Sciences Association (IASSA) and IASC aim to combine efforts in selected fields and activities so as to raise the level of impact of both organizations in terms of making scientific advances and of advising policy makers, as well as to avoid duplication. The focus of IASSA-IASC joint activities should be on interdisciplinary work. (see Annex 4.2)

2. A 5-year Memorandum of Agreement (MoA) between the WCRP Climate and Cryosphere Project (CliC), the Scientific Committee on Antarctic Research (SCAR) and IASC was signed, superseding the WCRP/SCAR/IASC Agreement of 2008. The Parties share common goals of working internationally and across disciplines to increase the understanding of the cryospheric elements of the Earth's climate system and their interconnections. IASC, SCAR and CliC have a long history of successful collaboration through a number of activities and initiatives involving ice sheet mass balance, sea ice, permafrost, and polar oceanography. (see Annex 4.3)

3. A trilateral agreement between the International Association of Cryospheric Sciences (IACS), SCAR and IASC was signed, superseding the Agreement of 2008. The Parties share a number of common interests and practices, which will make it relatively easy for them to work together, for example in arranging workshops, conferences, and reports on topics of mutual scientific interest, in developing integrated plans for cryospheric research, in communicating to the public on cryospheric issues, and in providing advice to policy makers. (see Annex 4.4)

4. A 5-year MoU between the Association of Polar Early Career Scientists (APECS), SCAR and IASC was signed, superseding the MoU of 2008. The MoU identifies a joint commitment to the professional development of early career polar researchers and the need for a continuum of leadership in polar research as important mutual aims of all Parties. (see Annex 4.5)

APECS	Association of Polar Early Career Scientists (APECS)	MoU	2008 renewed 2013	Jointly with SCAR
	Circumpolar Health Research Network (CirchNet)	LoA	2011	
FARO	Forum of Arctic Research Operators (FARO)	MoU	2013	
IASSA	Intern. Arctic Social Sciences Association (IASSA)	LoA	2008 renewed 2013	
IACS	Intern. Association of Cryospheric Sciences (IACS)	LoA	2008 renewed 2013	Jointly with SCAR
ICES CIEM	Intern. Council for the Exploration of the Sea (ICES)	MoU	2011	
	International Permafrost Association (IPA)	MoU	2009	
	Pacific Arctic Group (PAG)	LoA	2009	
SCAR	Scientific Committee on Antarctic Research (SCAR)	LoA	2006 renewed 2011	
UArctic	University of the Arctic (UArctic)	LoA	2011	Jointly with IASSA
CliC	Climate and Cryosphere (CliC)	MoU	2008 renewed 2013	Jointly with SCAR

TABLE 1: List of formal partnership agreements

PHOTO: GRAHAM SIMPKINS
Identifying Plants during the 2010 IPY Polar Field School at Svalbard.

9. Capacity Building

» 9 Capacity Building

IASC recognizes that the next generations of researchers will be faced with increasingly critical challenges due to the impacts of climate change on these regions and their global significance. IASC therefore believes that it is of great importance to foster these young researchers and promotes and involves early career scientists working in the Arctic by:

- Striving for representation of early career researchers in the organization;
- Providing endorsement, support and dissemination of information on activities, projects and request for participation; and
- Providing travel grants to early career scientists for selected conferences.

With these instruments, IASC aims to include more young researchers from the starting phase in the organization of workshops, science planning activities and research programs. Last year, more than 69 Early Career Scientists received IASC travel stipends to attend conferences or workshops (see table on page 96).

Association of Polar Early Career Scientists (APECS)

Yulia Zaika
(APECS Vice-President 2012-2013)

Jennifer Provencher
(APECS Vice-President 2012-2013)

Gerlis Fugmann
(APECS Director)

The partnership between the APECS and IASC has a long-standing history of joint efforts to promote and involve early career researchers (ECRs) working in the Arctic in their numerous activities. To continue this unprecedented international collaboration, the Memorandum of Understanding (MoU) between APECS, the Scientific Committee on Antarctic Research (SCAR) and IASC was renewed this year. The renewed MoU was signed during the Arctic Science Summit Week 2013 (ASSW) in Krakow, Poland where APECS, IASC and SCAR committed to supporting and fostering opportunities for ECRs (see Annex 4.5).

During the ASSW 2013 several ECRs were selected to be co-conveners for the sessions of the Science Symposium during the conference. This provided a very valuable training experience for all of them over several months. The ECRs conveners worked with established researchers in preparing the sessions and deciding on the content. In addition, the ECRs conveners helped with the advertising, the reviewing of abstracts and, most importantly, the co-chairing of the sessions during the conference. APECS also organized a 1-day Career Development Workshop prior to the conference to help ECRs learn and develop important skills and create new collaborations and contacts with both ECRs colleagues and experienced mentors. Twenty-eight ECRs from more than 10 countries and a variety of research disciplines used the opportunity to learn about new approaches in conducting science and to discuss the global relevance of the Arctic. The ASSW 2013 meeting was a great success and many talented ECRs used this conference to present their research projects. The three best posters presented by ECRs during the conference were presented with Poster Awards. The winners were announced in the closing ceremony of the ASSW 2013 and received free registration for the ASSW 2015 in Japan. In addition to the activities involving ECRs at the meeting, IASC has provided travel support for several ECRs attending the conference. Furthermore, a number of APECS members attended the IASC working group business meetings prior to the conference.

One of IASC´s main upcoming activities is the 3rd International Conference on Arctic Research Planning (ICARP III) (see Chapter 6). To ensure the presence of ECRs in science planning activities, APECS Council member, Sanna Majaneva is representing APECS in the ICARP III Steering Group. APECS will be contributing to ICARP III by informing members about all activities, by organizing a workshop in 2015 about the "Goals of ICARP III – the future of Arctic research from the early career scientists' point of view" and the project "Where are they now?". More information on these activities will be made available on the APECS website in the coming months.

IASC has also supported APECS activities during 2012. Along with participation in APECS panels and meetings of National Committees, IASC contributed to the ART-APECS Science Workshop entitled "Overcoming challenges of observation to model integration in marine ecosystem response to sea ice transitions" in October 2012 in Sopot, Poland. Organized for the first time, the workshop addressed the challenges of integrating modeling and observations in order to identify linkages and feedbacks between atmosphere-ice-ocean forcing and biological-geochemical processes that are keys to ecosystem function, land-ocean interactions and to the productive capacity of the Arctic Ocean.

The workshop was divided into two parts: 1) training sessions on theoretical and practical aspects of marine sciences; 2) plenary talks and breakout sessions to discuss and initiate the writing of collaborative papers, which was one of the main outcomes of the workshop. Thirty-five posters were presented during two poster sessions. Results of the workshop are currently being prepared for a special issue in a polar related peer-reviewed journal.

Together with other organizations, APECS and IASC have also been a part of the meeting of a group of Cryospheric organizations at the American Geophysical Union (AGU) Fall Meeting 2012 to discuss the progress on a joint MoU which aims to increase coordination of activities and events with the Cryospheric community. Other partners include the Climate and Cryosphere (CliC) project, AGU, European Geosciences Union (EGU), the International Commission on Snow and Ice Hydrology (ICSIH), the International Association of Cryospheric Sciences (IACS), the International Permafrost Association (IPA), and the Arctic Research Consortium of the United States (ARCUS).

In 2013, APECS has initiated a project funded by the Nordic Council of Ministers (Norden) entitled "Bridging Early Career Researchers and Indigenous Peoples in Nordic Countries". The project included several parts, but culminated in a 2-day workshop entitled "Connecting Early Career Researchers and Community Driven Research in the North" that will be held at the ASSW 2014 in Helsinki, Finland. This workshop will bring together key stakeholders including mentors and experts and ECRs, Indigenous peoples and youth. APECS is working closely with existing partners such as IASC, the Arctic Council Indigenous Peoples' Secretariat (IPS) and the Swedish Polar Research Secretariat to identify and invite workshop participants and mentors. The workshop will include plenary sessions, breakout sessions, panel discussions, and group work. The goal of the workshop is to discuss and develop materials that educate and inform about the interactions between ECRs and Indigenous peoples in Nordic regions.

In addition to the above-mentioned working groups, webinars, and upcoming online events, APECS has a lot of exciting events coming up for 2014 in conjunction with conferences and meetings organized by our partners. Among them are the 8th International Congress on Arctic Social Sciences (ICASS VIII), IGS Sea Ice Symposium, SCAR Open Science Conference, and many more.

APECS is looking forward to continue working with IASC to 'shape the Future of Polar Research'.

To learn more about APECS activities visit
www.apecs.is

Overview of supported Early Career Scientists

Third International Symposium for Arctic Research (ISAR-3)
Tokio, January 2013

NAME	INSTITUTION	COUNTRY
Z. Donatella	University of Sheffield	UK
H. Ikawa	San Diego State University and University of California	USA

Shaping Forces of Biodiversity in the Arctic
Reykjavik, January 2013

M. Ingimarsdóttir	Lund University	Sweden
B. Steven	Los Alamos National Laboratory	USA

Workshop on the Dynamics and Mass budget of Arctic Glaciers & IASC Network on Arctic Glaciology annual Meeting (NAG)
Obergurgl, February 2013

C. Beedlow	Geophysical Institute, University of Alaska Faribanks	USA
A. Clayton	Southampton University	USA
C. Kienholtz	Geophysical Institute, University of Alaska Faribanks	USA
P. Lefeuvre	University of Oslo	Norway
A. Messerli	Centre for Ice and Climate Niels Bohr Institute, University of Copenhagen	Denmark
A. Waechter	University of Ottawa	Canada

Distributed Biological Observatory Data Workshop (DBO)
Seattle, February/March 2013

NAME	INSTITUTION	COUNTRY
K. Matsuno	Hokkaido University	Japan

Gordon Research Conference (GRC)
Ventura, April 2013

G. Castellani	Alfred Wegener Institute for Polar and Marine Research	Germany
M. Fernandez-Mendez	Alfred Wegener Institute for Polar and Marine Research	Germany
C. Katlein	Alfred Wegener Institute for Polar and Marine Research	Germany
L. Schulze	National Oceanography Center	UK
G. Stephenson	Bangor University	UK
E. Stübner	University Center in Svalbard	Norway
A. Ulfsbo	University of Gothenburg	Sweden

Arctic Science Summit Week (ASSW)
Krakow, April 2013

S. Choudhary	University of Sheffield	UK
G. Fugmann	University of Saskathewan	Canada
S. Juutilainen	University of Oulu	Finland
M. Kedra	Chesapeake Biological Laboratory, University of Maryland Center for Environmelntal Science	Poland
A. Naito	Texas A&M University	USA
J. Skupchenko	Syktyvkar State University	Netherlands
S. Strey	University of Illinois	USA
Y. Zaika	Lomonosov State University	Russia

Arctic Vegetation Archive Workshop (AVA) at Arctic Science Summit Week (ASSW)
Krakow, April 2013

A. Breen	University of Alaska Fairbanks	USA
B. Jiménez-Alfaro	Masaryk Univeristy	Czech Republic
S. Laerke	Aarhus University	Denmark
L. Pellissier	Aarhus University	Denmark

International Science Initiative in the Russian Arctic (ISIRA) Meeting at Arctic Science Summit Week (ASSW)
Krakow, April 2013

P. Glazov	Institute of Geography, Russian Academy of Sciences	Russia
S. Lebedeva	Moscow State University	Russia
A. Medvedev	Institute of Geography, Russian Academy of Sciences	Russia
I. Sokolov	Institute of Geography, Russian Academy of Sciences	Russia
V. Stepanenko	Moscow State University	Russia

CliC Sea Ice Modeling and Observing Workshop
Tromsø, June 2013

NAME	INSTITUTION	COUNTRY
J. King	University of Sheffield	UK
A. Orlich	University of Alaska	USA
M. Shupe	University of Colorado	USA

19th Northern Research Basins International Symposium and Workshop (NRB)
Alaska, August 2013

A. Abnizova	York University	Canada

The International Tundra Experiment (ITEX) – an International Conference and Synthesis Workshop
Bergün, September 2013

A. Aleksanyan	Institute of Botany, National Academy of Sciences of Armenia	Armenia
A. Anadon-Rosell	Universitat de Barcelona	Spain
I. Barrio	University of Alberta	Canada
D. Blok	Center for Permafrost	Denmark
M. Carbognani	University of Parma	Italy
C. Chang	University of Washington	United States
M. Dalle Fratte	Insubria University	Italy
S. Lett	Umeå University	Sweden
J. Liebig	Grand Valley State University	United States
D. Moiseev	Institute of Plant and Animal Ecology, Russian Academy of Science	Russia
M. Mörsdorf	University of Iceland and University of Tromsø	Iceland
I. Myers-Smith	University of Edinburgh	United Kingdom
J. Noroozi	University of Vienna	Austria/Iran
S. Olsen	Norwegian University of Life Sciences	Norway
S. Robinson	University of British Columbia	Canada
P. Semenchuk	University of Tromsø	Norway
Y. Yang	Institute of Mountain Hazards and Envionment, Chinese Academy of Sciences	China

Arctic in Rapid Transition EC Meeting (ART)
Copenhagen, November 2013

H. Findlay	Plymouth Marine Laboratory	UK
M. Fritz	Alfred Wegener Institute for Polar and Marine Research	Germany
A. Pavlov	Norwegian Polar Institute	Norway
M. Sampei	Hiroshima University	Japan
K. Werner	Byrd Polar Center	USA

Northern Hemisphere Polar Jet Stream links with Arctic Climate Change
Reykjavik, November 2013

M. L'Heureux	National Oceanic and Atmospheric Administration	USA

Workshop on Arctic Data Rescue, Citizen-Science and Collaborative Research
Reykjavik, November 2013

NAME	INSTITUTION	COUNTRY
A. Pospieszynska	Nicholas Copernicus University	Poland
P. Wyszynski	Nicholas Copernicus University	Poland
T. Aizawa	University Tsukuba	Japan
S. Weijers	University of Bonn	Germany

Atmospheric Chemistry Workshop Session at American Geophysical Union Fall Meeting (AGU): Local Sources of Arctic Pollution and their Impacts
San Fransisco, December 2013

S. Bauduin	Universite Libre de Bruxelles	Belgium

Circum-Arctic Lithosphere Evolution annual Workshop (CALE) Workshop at American Geophysical Union Fall Meeting (AGU)
San Fransisco, December 2013

W. Zhang	Stockholm University	Sweden
X. Zhang	Stockholm University	Sweden

PHOTO: KAMIL JAGODZINSKI
Arctic directions in Rovaniemi, Finland.

PHOTO: PETER PROKOSCH
The Horned Grebe or Slavonian Grebe, *Podiceps auritus*, is a member of the grebe family of water birds. It appears in Northern Norway (here at a breeding site at the Porsanger fjord) when in May the lake ice is opening. The Slavonian Grebe is a migratory bird, which depends on an ecological network of specific fresh water habitats.

PHOTO: ANDREW REED WELLER
Surveying the Carter section on the Titaluk river during the Northern Alaska Landscape History Project on a fieldtrip into the remote reaches of the National Petroleum Reserve of Alaska.

10. Annex

» 10 Annex

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Annex 1

List of Acronyms and Abbreviations // Bulletin 2014

Acronym	Full name
A	
AACA	Adaptation for a Changing Arctic
ABC	Arctic Biodiversity Coalition
AC	Arctic Council
ACA	Arctic Change Assessment
ACCESS	Arctic Climate Change Economy and Society
ACCOnet	Arctic Circumpolar Coastal Observatory Network
ACD	Arctic Coastal Dynamics
ACIA	Arctic Climate Impact Assessment
ACSNet	Arctic Climate System Network
AFWG	Arctic Fisheries Working Group
AGG	Action Group on Geosciences
AGU	American Geophysical Union
AHDR	Arctic Human Development Report
AIA	Aleut International Association
AIDA	Atmospheric Investigations on a Drifting observatory over the Arctic Ocean
AMAP	Arctic Monitoring and Assessment Program
AntClim21	Antarctic Climate Change in the 21st Century
AntEco	State of the Antarctic Ecosystem
AnT-ERA	Antarctic Thresholds – Ecosystem Resilience and Adaptation
AntETR	Antarctic Ecosystems: Adaptations, Thresholds and Resilience
AODS	Arctic Ocean Drift Study
AOS	Arctic Observing Summit
AOSB	Arctic Ocean Sciences Board
APECS	Association of Polar Early Career Scientists
APEX	Arctic Palaeoclimate and its Extremes
ARR	Arctic Resilience Report
ART	Arctic in Rapid Transition
ARCDIV NET	Network for ARCtic Climate and Biological DIVersity Studies
ARCHES	Arctic Hydrology and Earth System Processes
ARCUS	Arctic Research Consortium of the US
ASI	Arctic Social Indicators
ASSW	Arctic Science Summit Week
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
AVA	Arctic Vegetation Archive
AWI	Alfred Wegener Institute for Polar and Marine Research

Acronym	Full name
B	
BipAG	Bipolar Action Group
C	
CAFF	Conservation of Arctic Flora and Fauna
CALE	Circum-Arctic Lithosphere Evolution
CBMP	Circumpolar Biodiversity Monitoring Program
CHARS	Canadian High Arctic Research Station
CHRN	Circumpolar Health Research Network
CliC	Climate and Cryosphere Project
CMIP	Coupled Model Intercomparison Project
CPE	Comité Polar Español
CSIC	Spanish National Research Council
CVII	Commission on Volcano Ice Interactions
D	
DACA-13	Davos Atmospheric and Cryospheric Assembly 2013
DBO	Distributed Biological Observatory
E	
ECORD	European Consortium for Ocean Research Drilling
ECS	Early Career Scientists
ECV	Essential Climate Variables
EEA	European Environmental Agency
EGU	European Geophysical Union
EIWG	Extractive Industries Working Group
EOC	Education, Outreach and Communication
EPB	European Polar Board
ESA	European Space Association
ESSAS	Ecosystem Studies of Sub-Arctic Seas
ESF	European Science Foundation
ESM	Earth System Models
EU	European Union
F	
FARO	Forum of Arctic Research Operators
FRISP	Forum for Research into Ice Shelf Processes
FMI	Finnish Meteorological Institute
G	
GAPHAZ	Glacier And Permafrost HAZards in mountains
GCI	Gwich'in Council International
GCM	Global Climate Model
GCOS	Global Climate Observing System
GDEM	Global Digital Elevation Model (GDEM)
GEUS	Geological Survey of Denmark and Greenland
GEO	Group on Earth Observations
GIA	Glacial Isostatic Adjustment
GIC	Glacier and Ice Cap

Acronym	Full name
G	
GICAC	Glaciers and Ice Cap Assessment Consortium
GLACIODYN	Dynamic Response of Arctic Glaciers to Global Warming
GLIMS	Global Land Ice Measurements from Space
GRACE	Gravity Recovery and Climate Experiment
GRASP	The Greenland Analogue Surface System Project
GTN-G	Global Terrestrial Network for Glaciers
GTN-P	Global Terrestrial Network on Permafrost
GTOS	Global Terrestrial Observing System
I	
IACS	International Association of Cryospheric Sciences
IAI	International Antarctic Institute
IAMAS	International Association of Meteorology and Atmospheric Sciences
iAOOS	integrated Arctic Ocean Observing System
IASOA	International Arctic System for Observing the Arctic
IASC	International Arctic Science Committee
IASSA	International Arctic Social Sciences Association
IAVCEI	Intern. Association of Volcanology and Chemistry of the Earth's Interior
ICAM	International Continental Arctic Margins
ICARP	International Conference on Arctic Research Planning
ICARP	International Conference on Arctic Research Planning
ICARP III	3rd International Conference on Arctic Research Planning
ICASS	International Congress of Arctic Social Sciences
ICC	Inuit Circumpolar Council
ICES	International Council for the Exploration of the Sea
ICSU	International Council for Science
ICSIH	International Commission on Snow and Ice Hydrology
IGS	International GPS Service
IJCH	International Journal for Circumpolar Health
IMBIE	Ice sheet mass balance inter-comparison exercise
IMAU	Institute for Marine and Atmospheric research Utrecht
INCHR	International Network for Circumpolar Health Research
INTERACT	Intern. Network for Terrestrial Research and Monitoring in the Arctic
IODP	Integrated Ocean Drilling Program
IOPAN	Institute of Oceanology Polish Academy of Sciences
IPA	International Permafrost Association
IPCC	Intergovernmental Panel on Climate Change
IPD	International Polar Decade
IPA	International Permafrost Association
IPPI	International Polar Partnership Initiative
IPS	Arctic Council Indigenous Peoples Secretariat
IPY	International Polar Year
IPY IPO	International Polar Year International Programme Office
ISAC	International Study of Arctic Change

Acronym	Full name
ISAR 3	3rd International Symposium on Arctic Research
ISIRA	International Science Initiative in the Russian Arctic
ISMASS	Ice Sheet Mass Balance and Sea Level
ITEX	International Tundra Experiment
IUEM	European Institute for Marine Studies
IUGG	International Union of Geodesy and Geophysics
J	
JC	Joint Committee
JSC	Joint Scientific Committee
K	
KOPRI	Korea Polar Research Institute
L	
LoA	Letter of Agreement
LOICZ	Land-Ocean-Interactions in the Coastal Zone
M	
MARUM	Centre for Marine Environmental Sciences
MOSAiC	Multidisciplinary drifting Observatory for the Study of Arctic Climate
MoU	Memorandum of Understanding
N	
NAG	Network on Arctic Glaciology
NCAOR	National Centre for Antarctic and Ocean Research
NcoE	Nordic Centre of Excellence
NERC	National Environment Research Council
NERI	National Environmental Research Institute
NPI	Norwegian Polar Institute
NRB	Northern Research Basins
NRC	National Research Council
NSF	National Science Foundation
NWP	Numerical Weather Prediction
NySMAC	Ny-Ålesund Science Managers Committee
O	
OGS	National Institute of Oceanography and Experimental Geophysics
OSC	Open Science Conference
P	
PAG	Pacific Arctic Group
PAIS	Past Antarctic Ice Sheet Dynamics
PAN	Polar Archeology Network
PAST Gateways	Palaeo-Arctic Spatial and Temporal Gateways
PCSP	Polar Continental Shelf Program
PEI	Polar Educators International
PI	Principal Investigator
PIC	Polar Information Commons

Acronym	Full name
P	
PICES	The North Pacific Marine Science Organization
POLENET	Polar Earth Observing Network
PONAM	Polar North Atlantic Margin
PYRN	Permafrost Young Researchers Network
Q	
QUEEN	Quaternary Environment of the Eurasian North
R	
RANNIS	Icelandic Center for Research
RCM	Regional Climate Model
RCN	Research Coordination Network
S	
SAC	State of the Arctic Coast
SAI	Stefansson Arctic Institute
SAON	Sustaining Arctic Observing Networks
SCAR	Scientific Committee on Antarctic Research
SCICOM	Science Committee of ICES
SDWG	Sustainable Development Working Group
SEARCH	Study of Environmental Arctic Change
SEI	Stockholm Environment Institute
SERCE	Solid Earth Response and influence on Cryosphere Evolution
SG	Steering Group
SIOS	Svalbard Integrated Arctic Earth Observing System
SPARC	Stratospheric Processes And their Role in Climate
SRC	Stockholm Resilience Centre
SRP	Scientific Research Program
SSG	Scientific Steering Group
SVALI	Stability and Variations of Arctic Land Ice
SWIPA	Snow, Water, Ice and Permafrost in the Arctic
T	
THAW	THermokarst Aquatic Ecosystem
TICOP	Tenth International Conference on Permafrost
TRANSSIZ	Transitions in the Seasonal Sea Ice Zone
U	
UAF	University of Alaska Fairbanks
UArctic	University of the Arctic
UNCLOS	United Nations Convention on the Law of the Sea
UNIS	The University Centre in Svalbard
W	
WCRP/CliC	World Climate Research Program/ Climate and Cryosphere Project
WG	Working Group
WGMS	World Glacier Monitoring Service
WMO	World Meteorological Organization
WWF	World Wildlife Fund

Action Group Reports

Annex 2.1.1

The 2nd SCAR-IASC Bipolar Action Group (BipAG II), Cambridge 2011

The Scientific Committee on Antarctic Research (SCAR) and the International Arctic Science Committee (IASC) are the major international organizations coordinating research in the two Polar Regions on an international level. All nations undertaking research in the Arctic and Antarctic are members of one or both organizations. The Polar Regions are critical areas of the Earth influencing ocean currents and regional weather patterns as well as hosting a unique biodiversity. Due to the effects of global warming, parts of these regions are now the focus of the most rapid environmental changes seen anywhere on the planet and contributing to global issues such as sea-level rise and greenhouse gas emissions. IASC and SCAR therefore have significant roles in organizing the vitally important science needed to understand what is happening in the Arctic and Antarctic and what it may mean for the rest of the world.

Both Polar Regions are cold and remote and share many common features (large ice sheets, extensive sea-ice in winter) but equally also show very many differences. Comparisons of the Polar Regions or research involving both the Arctic and Antarctica is termed bipolar science and it offers great opportunities to better understand what is happening in these regions and how they impact on the rest of the world than if scientists focused only on their own Polar Region. The Executive Committees of SCAR and IASC created a SCAR-IASC Bipolar Action Group (BipAG) that operated for two years (2008-2010) and a second BipAG has recently been established that will operate during 2011 and 2012. The existence of a BipAG ensures that there is an expert group looking at opportunities for bipolar science and its purpose is to provide annual reports to the SCAR and IASC Executive Committees, recommending which bipolar activities should be adopted by the organizations. The recommendations include not only science ideas but also opportunities for developing the next generation of polar scientists, suggestions for more effective science coordination and data management and ideas for better communicating the importance of the Polar Regions for Planet Earth. The BipAG reports will be published on both SCAR and IASC websites.

IASC/SCAR Bipolar Action Group II
Cambridge, 17th May 2011 0845-1800
Darwin College

Attendees

Cynan Ellis-Evans - Chair, UK	Biology
Francisco Navarro, Spain	Ice sheets
Detlef Damaske, Germany	Geology
Sung-Ho Kang, Korea	Marine
Alexander Klepikov, Russia	Oceanography / Climate
Gail A. Fondahl, Canada	Social Sciences
Mark Parsons, USA	Data
Jenny Baeseman, Norway	APECS

Volker Rachold (ex officio)
IASC Secretariat, IASC Executive Secretary

Mike Sparrow (ex officio)
SCAR Secretariat, SCAR Executive Director

Renuka Badhe
SCAR Secretariat, SCAR Executive Officer

Thamban Meloth (by Skype), India Ice cores

Outline Agenda

1. Opening
   - Welcome (Mike)
   - Introduction of the members (Cynan)
2. Objectives of this meeting (Cynan)
3. Structure of SCAR and IASC science activities (Volker, Mike)
4. BipAG I Activities, excluding IPY legacy (Volker)
   - Summary of Oslo Meeting
   - Progress with actions
5. Brainstorming session - discussion of potential bipolar activities (pages 2, 3, 4)
6. Preparation of draft report to EXCOMs, including priority list of recommendations
7. Next meeting

Objectives of the meeting

The terms of reference of the Bipolar Action Group II differ from those of its predecessor in that IPY legacy issues are now dealt with directly by IASC and SCAR Executive Committees.

The focus of BipAG II is to identify opportunities for SCAR and IASC to undertake bipolar research and to make appropriate recommendations to both organizations.

The Action Group will be convened for two years (2011-2012) and will report annually to both IASC and SCAR Executive Committees.

Meeting Summary and Recommendations

It was agreed that the Action Group would not attempt to reproduce the breadth and detail of the BipAG I reports but rather focus on identifying a priority list for SCAR and IASC consideration. This report therefore focuses on outcomes rather than a full record of the discussions at the meeting.

The valuable work of the first SCAR-IASC Bipolar Action Group was recognized. It was noted that a number of the recommendations from the BipAG I reports had not resulted in visible outcomes and so these were re-assessed within the meeting. Where necessary, these have been repeated as stronger recommendations and further guidance for action has or will be developed.

(1) Ice Sheet Mass Balance (ISMASS)

BipAG members, recognizing that the mass balance of polar ice sheets significantly affects global sea level, pointed out that a coordinated bipolar effort would be extremely important. As a first step, ISMASS has recently become a joint SCAR-IASC group.

Recommendation 1a: that organizing a joint workshop on ice sheet mass balance and sea level changes be given high priority. The workshop would be organized by the ISMASS leadership in consultation with the relevant IASC and SCAR groups. This workshop, that should gather specialists from the different areas of ice sheet mass balance research (in-situ observations, remote sensing, modeling, etc.), would focus on identifying the most relevant topics of interest to ISMASS and, correspondingly, setting a 'roadmap' of ISMASS activities for the coming years. It was also proposed that the roadmap could include ISMASS publishing annual or (more likely) bi-annual updates on ice sheet discharges for both Polar Regions. This would complement the current less frequent rhythm of IPCC reporting.

Recommendation 1b: that to improve coordination other organizations with similar subject areas of interest, in particular the International Association of Cryospheric Sciences (IACS), be invited to join ISMASS and that the WCRP/SCAR/IASC Climate and Cryosphere (CliC) Project participates in activities related to ice-sheet mass balance investigations.

(2) Social and Human Sciences

Members discussed methodological issues, perception and representation, understanding or misunderstanding of science. Several other topics under the umbrella of Social Sciences were discussed including tourism, valuing wilderness, the value of research specifically in polar areas, scientific identity of polar researchers and gender balance. It was recognized that the incorporation of social and human sciences on a broader scale are relatively new to both the SCAR and IASC organizations. Building linkages was therefore identified as an appropriate step at this time and that the subject be revisited at a subsequent BipAG II meeting.

Recommendation 2: that SCAR's Social Science Group participates in the IASC Social and Human Working Group meeting to be held at the International Congress of Arctic Social Sciences (ICASS), Akureyi, June 2011, with D Liggett as SCAR Social Sciences representative.

Action: Gail to contact Daniela Liggett about meeting with them in Iceland (done).

(3) Contaminants and Short-lived Climate Forcers

The importance of studying and reporting on short-lived climate forcers (SLCF) like black carbon, some aerosols, and tropospheric ozone and contaminants like POPs, halogen compounds, heavy metals and radionuclides, was discussed. Both SCAR, through their Expert Group (EG) - Environmental Contamination in Antarctica (ECA), and the Arctic Monitoring and Assessment Program (AMAP) have produced reports on contaminants. AMAP does not have a brief to undertake new research. It was recognized that IASC does not take an explicit role in contaminants research at this time and should not impinge on AMAP responsibilities but a more balanced bipolar research approach could utilize expertise that exists within SCAR and IASC to address polar contamination research questions and complement polar assessments.

Recommendation 3a: that opportunities for IASC to work with AMAP on contaminant and SLCF research be explored.

Recommendation 3b: that a common platform for bipolar contaminant and SLCF work between relevant organizations and programs be encouraged.

(4) International Partnership in Ice Core Science (IPICS)

IPICS is a bipolar program that involves a SCAR Expert Group. IPICS is also supported by Past Global Changes (PAGES) and IACS, but there is no relationship with IASC. There was clearly a case for both SCAR and IASC to be linked formally with IPICS to provide the opportunities for future bipolar activities and ensure an effective dialogue.

Recommendation 4: that IASC actively explores the possibility of becoming a co-sponsor of IPICS, with E Wolff (BAS) suggested as a point of contact with IPICS.

(5) Ocean acidification

It was noted that for the Arctic, AMAP is working on an assessment to be presented in 2013 and that for the Antarctic, SCAR has an Expert Group on ocean acidification. Both activities are led by R Bellerby (Bjerknes Center for Climate Research, Norway) but the Arctic activity is assessment rather than research. The Action Group concluded that a bipolar approach to studying ocean acidification was highly desirable but that the existing separate activities led by Bellerby should be continued, rather than SCAR/

IASC reinventing the wheel. A future joint workshop to bring together the results of Arctic and Antarctic studies was considered most appropriate and should be established as a target for both groups. Bellerby has apparently already discussed ideas for a potential final joint workshop and report on bipolar approaches to studying ocean acidification.

Recommendation 5: that a bipolar approach to studying ocean acidification be encouraged with IASC involved in terms of contributing the Arctic science that may be needed, based on the assessments (using contact R Bellerby). The Action Group also endorsed the idea of a joint workshop, possibly in 2013.

(6) Ocean-atmosphere CO2 exchange and CO2 budgets:

Members of the group noted that the recommendation of BipAG I to encourage bipolar approaches to questions of the effects of changes in sea ice on the ocean-atmosphere CO2 exchange has not been implemented so far.

Recommendation 6: that the need to consider ocean-atmosphere CO2 exchange and CO2 budgets as a priority area for research in both polar regions should be discussed by the relevant SCAR and IASC SSGs/WGs.

(7) Permafrost and Carbon

Permafrost and its carbon content has global significance and it links to the previous recommendation. Members agreed that there is a need for bipolar studies to understand dynamics in permafrost and obtain realistic organic carbon budgets to support regional and global modeling efforts. IPA is doing an excellent job but is a small organization and would benefit from the more direct involvement of SCAR and IASC.

Recommendation 7: that IASC and SCAR actively explore the possibility of new collaborative research programs on permafrost and carbon in cooperation with the International Permafrost Association (IPA) and other relevant international programs (such as CliC) and ensure that scientists in both Polar Regions are sharing information.

(8) Polar genomics

Members of the group noted the recommendation of BipAG I to encourage bipolar approaches to polar microbiology and molecular biology had not progressed significantly. Members recognized the inclusion of genomics as a component of existing and developing IASC and SCAR programs but it was felt there may be a unique opportunity to make a significant contribution to broader biological theory through a more explicit bipolar genomics initiative, involving not just microbes but also higher organisms. The different evolutionary timescales of the two regions and their physical separation offer powerful comparisons. This would require discussion between SCAR representatives developing new biological programs and IASC Working Groups and pointed up the need for these two groups to interact more (see recommendations 14a-c). There was some potential for bipolar studies of human health, but the greatest opportunities lay with more environmental studies. There was also discussion by the Action Group of more effectively tagging polar molecular data submitted to international databases for easier access by the polar community.

Recommendation 8a: that relevant representatives of biological research in IASC and SCAR actively consider developing bipolar initiatives, particularly utilizing molecular tools to address issues of evolution, adaptation and biogeography.

Recommendation 8b: that interested IASC and SCAR groups collaborate to develop agreed ways to tag molecular data for archive in international molecular databases. This would include geotagging of all polar genomic data.

(9) Geology

The group discussed the potential of linking geological research programs of SCAR and IASC.

Recommendation 9: that IASC and SCAR explore co-operation on issues of bathymetry, paleoclimate research on geological time scales and plate tectonics and that IASC consider revisiting the disciplinary balance of their Terrestrial WG.

Action: Volker to approach IASC terrestrial Working Group to ensure appropriate inclusion of (hard rock) geology in their "scientific foci" and "priority activities".

(10) Observing Systems

Members discussed the Integrated Arctic Ocean Observing System (iAOOS), the Southern Ocean Observing System (SOOS), and the Global Ocean Observing System (GOOS), all of which have biological components. It was also noted that the IASC Marine Working Group and the Pacific Arctic Group (PAG) recently convened a workshop on Distributed Biological Observatories (DBO).

Recommendation 10a: that IASC and SCAR consider collaborating on biological observatories and discuss the possibility of holding a joint workshop to develop DBO ideas.

Recommendation 10b: that representatives from northern observing systems attend the planned SCAR observing workshops at the XXXII SCAR Science Week in Portland and likewise, representatives from the southern hemisphere attend the Arctic Observing Summit.

Recommendation 10c: that IASC and SCAR continue to support and engage with the WMO Space Task group with respect to effective coordination of satellite remote sensing of the Polar Regions by the national space agencies. The use of PolarView as a tool to easily access polar satellite data in bipolar activities was also recommended to SCAR and IASC.

(11) Engaging the next Generation of Polar Researchers

Under this agenda item various APECS suggestions to motivate young researchers to engage in IASC and SCAR activities were discussed. It was emphasised that young researchers do not just want to be supported, they also want a closer relationship with senior scientists and organizations to better understand what motivates polar research. It was noted that the MoU between APECS, IASC, and SCAR had already produced many beneficial outcomes, including the ICSU funded IPY education and outreach assessment.

Recommendation 11a: that virtual presentations of SCAR and IASC supported young scientists be prepared and presented via the APECS virtual poster sessions.

Recommendation 11b: that the IASC and SCAR Secretariats, with the support of APECS, produce short videos introducing the two organizations, specifically addressing how early career scientists can become engaged with their activities.

Recommendation 11c: that IASC and SCAR identify lecturers for APECS webinars.

Recommendation 11d: that IASC and SCAR identify participants for possible bipolar workshops for early career researchers at polar conferences and meetings.

Recommendation 11e: that SCAR and IASC work with APECS to find funding (perhaps through external funding organizations, and Foundation grants) to allow continuation of Summer Schools. Polar studies have been historically more focused on research stemming from countries with developed polar research programs. With the increased input from the fast developing Asian countries like China, India and South Korea on both Antarctic and Arctic research, it would be useful to organize a thematic summer school on bipolar science issues in a suitable Asian country or in conjunction with an Asian research site.

(12) Data management

Members noted that the main focus of BipAG II is on bipolar science but agreed that data management is an essential element of any scientific activity and therefore makes the following recommendations.

Recommendation 12a: To facilitate Arctic and bipolar collaboration IASC, especially through their involvement with the Sustaining Arctic Observing Networks (SAON), should develop a data policy and associated data management strategy, which could draw on IPY and SCAR data policies and strategies, and that the IASC data policy should be presented at the IPY Montreal Conference in April 2012. The data strategy should include identifying a point of contact for each IASC country (Initial data contact for the Arctic could be the same as the Antarctic SCAR contact in some cases).

Recommendation 12b: that the abstract submission template for the IPY Montreal conference should include four questions about data management to help IPY data managers identify and steward IPY data. The questions build from what was used at the last SCAR conference and are as follows:

1. Where do you store your data (or the data underlying this paper)? (Drop-down menu with 4 options, followed by text box for the „Please specify" bit)

a. on my desktop / laptop computer without back ups / with back ups: .... (please specify)
b. on the file system at my institution: .... (please specify)
c. deposited at a data center: ... (please specify)
d. other: ..... (please specify)

2. Is there a DIF (or other metadata format) description of your data? (multiple answers possible:) (Tickboxes for all 4, with text boxes for (b) and (d))

a. yes, one or more DIFs submitted in the GCMD
b. yes, other format: .... (please specify)
c. no
d. not yet, I intend to write a description in .... (please specify format and/or repository)

3. Are your data publicly accessible? (Tick boxes, with Month and Year dropdown menu for (b))

a. yes
b. not yet, I intend to make them publicly accessible in ..... (please specify estimated month & year)

4. What IPY Project was this work part of. Please indicate IPY project number.

Results from the survey should be sent to the CODATA Polar Data Task Group chaired by Scott Tomlinson and Taco de Bruin.

Recommendation 12c: that the Arctic Spatial Data Infrastructure (ASDI) should be engaged in the development of the data strategy because of ASDI's initial success in getting buy in from all Arctic national mapping agencies.

(13) International Polar Decade (IPD)

BipAG II noted that the recent IPD workshop in St Petersburg recommended setting up a framework for more efficient observing / monitoring systems (sites/devices) during an IPD and that such a program should not start before 2016. It is proposed that an IPD could be announced at the Montreal IPY meeting in April 2012 if key international sponsors (WMO. ICSU, IOC) sign up later this year.

Since the planning of an IPD is still taking shape, BipAG II felt that it was not well placed to make science recommendations at this time and will discuss the issue further at its next meeting.

(14) General Recommendations

To encourage further bipolar studies and to raise the awareness of ongoing SCAR/IASC bipolar activities the group agreed on the following general recommendations.

Recommendation 14a: that relevant activities at the "other pole" be presented at meetings of the SCAR Standing Scientific Groups and IASC Working Groups.

Recommendation 14b: that the SCAR and IASC Secretariats issue a joint bipolar newsletter every 6 months.

Recommendation 14c: that the possibility of regular bipolar meetings combining the SCAR OSC and the ASSW should be explored (every 4 years, possibly starting in 2016).

Recommendation 14d: that the sponsorship of any SCAR and IASC workshop or other activity should necessitate the submission of a short report from conveners (less than one page, one/two paragraphs for public distribution) targeted toward a general audience. This could also take the form of a Frostbyte, ("30 second Soundbytes of cool research") produced by APECS

Annex 2.1.2

The Second SCAR-IASC Bipolar Action Group (BipAG II), Potsdam 2012

The Scientific Committee on Antarctic Research (SCAR) and the International Arctic Science Committee (IASC) are the major international scientific organizations with a focus on the Polar Regions. The Polar Regions are critical areas of the Earth, influencing ocean currents and regional weather patterns as well as hosting a unique biodiversity. Due to the effects of climate change, parts of these regions are now the focus of the most rapid environmental changes seen anywhere on the planet and contributing to global issues such as sea-level rise and greenhouse gas emissions. IASC and SCAR therefore have significant roles in organizing the vitally important science needed to understand what is happening in the Arctic and Antarctic and what it may mean for the rest of the world.

Both Polar Regions are cold and remote and share many common features (large ice sheets, extensive sea-ice in winter) but equally also show very many differences. Comparisons of the Polar Regions or research involving both the Arctic and Antarctica is termed bipolar science. This offers unique opportunities to better understand what is happening in these regions and how they impact on the rest of the world. This is particularly relevant in an Earth System Science context. The Executive Committees of SCAR and IASC created a SCAR-IASC Bipolar Action Group (BipAG) that operated for two years (2008-2010) followed by a second BipAG for 2011 to 2012. The existence of a BipAG ensures that there is a group looking at opportunities for bipolar science, with the purpose of providing annual reports to the SCAR and IASC Executive Committees and recommending which bipolar activities should be adopted by the organizations. The recommendations include not only science ideas but also opportunities for developing the next generation of polar scientists, suggestions for more effective science coordination and data management and ideas for better communicating the importance of the Polar Regions for Planet Earth. The BipAG reports are published on both SCAR and IASC websites.

IASC/SCAR Bipolar Action Group II
Potsdam, 14th May 2012, 0900-1800
IASC Secretariat

Attendees

Cynan Ellis-Evans - Chair, UK	Biology
Francisco Navarro, Spain	Ice sheets
Detlef Damaske, Germany	Geology
Sung-Ho Kang, Korea	Marine
Thamban Meloth, India	Ice cores
Gail A. Fondahl, Canada	Social Sciences
Mark Parsons, USA	Data
Jenny Baeseman, Norway	CliC Executive Director
Angelika Renner, Norway	APECS Vice President
Volker Rachold (ex officio), GER	IASC Executive Secretary
Mike Sparrow (ex officio), UK	SCAR Executive Director

Apologies

Alexander Klepikov	Russia	Oceanography / Climate

Outline Agenda

1. Opening
   - Welcome and housekeeping (Volker)
   - Introduction of the members (Cynan)
2. Objectives of this meeting (Cynan)
3. BipAG II recommendations from the first meeting
   - Progress with actions: IASC (Volker)
   - Progress with actions: SCAR (Mike)
   - Discussion of unaddressed recommendations
4. Feedback from IASC and SCAR
5. Brainstorming session
   - Discussion of other bipolar activities, not considered in the first report
6. BipAG II related future initiatives
   - International Polar Initiative (IPI), see enclosed concept paper
   - Possible joint SCAR/IASC Conference 2016
   - Future of BipAG II
7. Preparation of draft report to EXCOMs, including
   - Priority list of recommendations
   - Recommendation for the future of BipAG II

Objectives of the meeting

The Terms of Reference of the Bipolar Action Group II differ from those of its predecessor in that IPY legacy issues are now dealt with directly by IASC and SCAR Executive Committees.

The focus of BipAG II is to "to advise the SCAR and IASC Executive Committees on the development of instruments such as workshops, programs and networks to address bipolar issues".

Under the Terms of Reference the Action Group is convened for two years (2011-2012) and reports annually to both IASC and SCAR Executive Committees.

The main objectives of this second meeting were

- to review the recommendations of the first meeting and the progress with actions;
- to identify possible bipolar activities, not considered at the first meeting;
- to agree on a recommendation for the future of the joint Action Group.

Meeting Summary and Recommendations

The SCAR and IASC Secretariats presented the report of the first BipAG II meeting and the progress with regards to the recommendations.

Generally, participants noted that many of the recommendations of the first meeting were implemented by IASC and SCAR and that the first BipAG II meeting was useful in terms of initiating activities to address bipolar issues. Members of the group acknowledged that in view of limited resources (both financial and human) it is not possible for SCAR and IASC to address all recommendations made by the Action Group.

Building on the recommendations listed in the first report (see ANNEX 1) and the progress with actions, members agreed to add or restate the following points.

(1) Ice Sheet Mass Balance (ISMASS)
DONE

(2) Social and Human Sciences
Members appreciated that the first step, i.e. building linkages between the social and human sciences communities of SCAR and IASC, had been taken and that a number of joint activities were implemented or are underway.

Recommendation: that (i) IASC should consider forming a History of Science in the Arctic group and (ii) both IASC and SCAR should look into establishing bipolar activity in this subject.

(3) Contaminants and Short-lived Climate Forcers
It was noted that contaminant work in the Arctic is a clear AMAP domain but members agreed that a closer cooperation with AMAP and the feasibility of bipolar contaminant research should be explored.

Recommendation: that SCAR investigates connections with AMAP on contaminants issues.

(4) International Partnership in Ice Core Science (IPICS)
Members of the group understood that due to limited recourses and lack of ice core expertise in its membership, the IASC Cryosphere WG cannot focus on ice core science. It was, however, agreed by the group that ice core studies belong to the domain of cryosphere research and should not be lumped together with geological research.

(5) Ocean acidification
Members noted that the IASC Marine WG would agree strongly with the need to hold a joint workshop after the AMAP assessment is completed and would be willing to work with SCAR and AMAP. The AMAP and SCAR initiatives are both led by Richard Bellerby.

(6) Ocean-atmosphere CO2 exchange and CO2 budgets:
It was noted that the IASC Atmosphere and Cryosphere WGs have initiated planning of a possible drifting ice station experiment looking at these exchanges. The possibility of building this into a broader bipolar activity will be discussed by SCAR´s SSG on Physical Sciences in July.

Recommendation: that IASC should explore the possibility of including subsea permafrost and gas hydrates in its research agenda.

(7) Permafrost and Carbon
Members noted that IASC decided to co-sponsor (together with IPA and CliC) the Vulnerability of Permafrost Carbon Network. It was recognized that in the Antarctic permafrost carbon research is not a priority as there is little terrestrial organic accumulation. There was recognition that there was benefit in sharing knowledge on physical permafrost processes between both poles but that the IPA was addressing this effectively for now.

(8) Polar genomics
It was noted that IASC supported several early career scientists to participate in a bipolar session co-organized with APECS at the CAREX Conference on Life in Extreme Environments.

However, members also noted that the main recommendation of the first meeting, i.e. more effectively tagging polar molecular data submitted to international databases, is still valid and had not yet been addressed.

Recommendation: that SCAR, IASC and APECS should make initial contact to those in charge of polar genomics databases and let them know what the community would require.

(9) Geology
DONE

(10) Observing Systems
Members noted the latest development of the Southern Ocean Observing System (SOOS) and the Sustaining Arctic Observing Networks (SAON) and restated that an exchange of experiences would be beneficial.

Recommendation: that representatives from IASC observing systems attend SCAR observing workshops and vice versa, for example, useful for an invitation for SOOS to attend the Arctic Observing Summit.

(11) Engaging the next Generation of Polar Researchers
It was noted that some of the recommendations of the first meeting have been implemented while others are still ongoing or pending. Unaddressed and new recommendations were further discussed under (14) General Recommendations.

(12) Data management
Members reiterated that data management is an essential element of any scientific activity and acknowledged IASC´s initiative to establish a data policy group. It was noted that SCAR and IASC jointly nominated a candidate to the membership of ICSU´s World Date Service.

Recommendation: that IASC should consult with SCADM and also consider issues of data publications when considering an IASC data policy.

See: http://www.scar.org/news/newsletters/issues2012/SCARnewsletter28_Apr2012.pdf

Recommendation: that SCADM and the new IASC data policy group should ensure interaction with ICSU´s World Data System.

(13) International Polar Initiative (IPI)
BipAG II noted the development of the International Polar Initiative and discussed the draft concept note presented at the IPY 2012 Montreal Conference.

Recommendation: that (i) IPI will need to consider actively engaging COMNAP and FARO (ii) the draft document needs to be more focused (iii) Education and Outreach needs to be emphasized more.

(14) General Recommendations
Under this agenda item the group discussed ways to encourage further bipolar studies, to raise the awareness of ongoing SCAR/IASC bipolar activities and to involve the next generation of polar researchers. Members agreed on the following general recommendations.

Recommendation: that each IASC travel awardee should be asked to produce a FrostByte (30-60 second audio or video recording) which would be made available on the IASC website.

Recommendation: that SCAR and IASC should advertise the Cool Speakers Database (list of speakers with first hand Polar Regions experience and expertise) in their Newsletters etc. to build up the database.

Recommendation: that SCAR and IASC should discuss the renewal of their MoU with APECS.

Recommendation: that IASC should consider forming a Committee on Capacity Building, Education and Training (CBET) (including engaging Arctic Peoples).

Recommendation: that SCAR and IASC should consider a joint bipolar Conference in 2016, but that these events should not happen at less than six year intervals.

Recommendation: that SCAR and IASC should opportunistically attend each others WG/SSG meetings and present bipolar interactions.

Following the review of the recommendations of the first meeting, participants held a brainstorming session during which the following new recommendations, several reflecting IPY legacy, were agreed upon:

Recommendation: that SCAR/IASC/APECS revisit the IPY Education and Outreach report and consider the recommendations listed in the report.

Recommendation: that SCAR and IASC consider support of Polar Weeks in future, with the goals:

- To expand the IPY global networks of motivated and enthused educators;
- To raise the visibility of polar issues and polar organizations;
- To enhance the development of polar science educational materials; and
- To develop long-term education and outreach partnerships for polar science.

Recommendation: that SCAR and IASC further engage with the IPY Communications Officers' network.

Recommendation: that SCAR and IASC explore further engagement with the Polar Educators (e.g. utilise town hall meetings at AGU/EGU).

Recommendation: that the coordination on issues regarding Polar Predictability (e.g. WMO´s Global Integrated Polar Prediction System, GIPPS) which has started between IASC and WCRP should be intensified and expanded to also include SCAR and possibly other partners.

Recommendation: that SCAR and IASC send a joint letter to ICSU expressing interest in becoming more involved in ICSU´s Future Earth program.

Finally, the group had a discussion on the need and possible role of a future joint SCAR/IASC group for bipolar issues and agreed on the following recommendation to the SCAR and IASC Executive Committees:

Recommendation:
(i) that the SCAR/IASC Bipolar Action Group continues but in a more advisory role, with no more than one face-to-face meeting every other year and utilizing teleconferencing and email in between to facilitate communication

(ii) that the new group include more ex officio members from relevant organizations (APECS, CliC etc.) or invites particular experts when a bipolar topic of mutual interest is made apparent ;

(iii) that a pre-call go out to the community to ask for possible bipolar areas of cooperation and that the BiPAG consider the outcomes from such a survey;

(iv) that formation of an advisory BipAG be considered in light of the International Polar Initiative.

Annex 2.2

Statement of Principles and Practices for Arctic Data Management
16 April, 2013

All IASC-endorsed scientific results shall be verifiable and reproducible through ethically open access to all data necessary to produce those results. Data shall be preserved, accessible, and used in accordance with scientific norms of fair attribution and use.

To this end, IASC Council approves the following actions:

1. Endorsement of the Statement of Principles and Practices for Arctic Data Management;
2. Establishment of an IASC Data Standing Committee;
3. To undertake measures towards adoption of national data policies consistent with the principles and practices described below.

Introduction

IASC seeks 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 region."[I] This mission is increasingly important in a time of very rapid Arctic change and to sustain the increase in Arctic cooperation resulting from the International Polar Year 2007-8 (IPY). Data exchange is a central to scientific collaboration, especially interdisciplinary collaboration. IASC has strongly supported the IPY Data Policy with its emphasis on ensuring security, accessibility, and free exchange of relevant data that both support current research and leave lasting legacy, but to date IASC has lacked its own data policy and strategy. IASC, therefore, developed this statement of principle to sustain and continue IASC's mission.

IASC data are multidisciplinary and disparate. This document aims to provide a framework for these data to be handled in a consistent manner, and to strike a balance between the rights of investigators, the rights of indigenous peoples, and the public, thus the need for widespread access through the free and unrestricted sharing and exchange of both data and documentation. The document is compatible with existing policies from the International Council of Science (ICSU) and other IASC organizational collaborators, and it builds on recommendations from the IPY Data Committee[II], the SCAR/IASC Bipolar Action Group[III], and international, strategic, polar-data workshops.[IV]

The central purpose of this document is to support the IASC

mission and especially the following specific objectives.

- Provide mechanisms and instruments to support science development;
- Seek to ensure that scientific data and information from the Arctic are safeguarded, freely exchangeable and accessible;
- Promote international access to all geographic areas and the sharing of knowledge, logistics and other resources;
- Provide for the freedom and ethical conduct of science;
- Promote and involves the next generation of scientists working in the Arctic

And the following IASC Working Group objectives:

- 3.3 Encourage the exchange and dissemination of information;
- 3.4 Encourage means of initiating and maintaining observational systems and the data they produce, and coordinating with other long-term observational programs in the Arctic and globally.

Realizing these objectives requires a focus on basic norms and principles of science, namely that scientific results must be verifiable, reproducible, and recognized. Therefore, data must be preserved and openly accessible. These principles are the heart of this document and IASC will act as a strong advocate for both the principles and clear and forceful implementation.

Data Definition

IASC data are everything necessary to reproduce and verify a scientific result from an IASC endorsed activity.

This is both a broad definition, in that it can include everything from observations and model outputs to software and algorithms, and a restrictive definition, in that it is limited to IASC endorsed results. IASC is neither a research program nor a funding agency. It does not create data per se; rather it acts as a coordinator that facilitates international collaboration. IASC acts as a moral and scientific authority that works to ensure that its endorsed results are truly verifiable, while also actively promoting the principles of verity, openness, and ethics.

Note this definition can also apply to physical samples, biological specimens, cultural artifacts, and other non-digital material. This document focuses on access and preservation to digital materials. Access to physical materials is necessarily more constrained, but materials should still be reasonably open to scientific sharing and investigation in accordance with the International Council on Archives Standards and Guidelines,[V] the Society of American Archivists Core Values Statement and Code of Ethics,[VI] and other community guidance. Basic principles of preservation, documentation, and ethical use also apply.

Ethically Open Access

In accordance with

- the Twelfth WMO Congress, Resolution 40 (Cg-XII, 1995)
- the Thirteenth WMO Congress, Resolution 25 (Cg XIII, 1999)
- the ICSU 1996 General Assembly Resolution
- the ICSU World Data System Data Policy[VII]
- the ICSU Assessment on Scientific Data and Information (ICSU 2004b)

and in order to maximize the benefit of data gathered under the auspices of the IASC, the IASC Council requires that IASC data are made available fully, freely, and openly with minimal delay.

The only exceptions to this requirement of full, free, and open access are:

- where human subjects are involved, confidentiality shall be protected as appropriate and guided by the principles of informed consent;
- where local and traditional knowledge is concerned, rights of the knowledge holders shall not be compromised;
- where data release may cause harm, specific aspects of the data may need to be kept protected (for example, locations of nests of endangered birds or locations of sacred sites).

These ethically allowable restrictions are in accordance with International Arctic Social Science Association's Guiding Principles on the Conduct of Research[VIII] and Article 8 of the Convention on Biodiversity.[IX] In addition, local, national and agency guidelines and policies regarding ethical conduct of research must be followed.

Ethically open access includes recognition of the concerns, rights, and management practices of Indigenous knowledge holders and stewards. In the context of research involving Indigenous knowledge, data management principles based on the concepts of respect, reciprocity, and responsibility should be observed. This includes appropriate engagement of Indigenous people, communities or organizations throughout the entire data life cycle, formal attribution of contributed knowledge, establishment of informed consent for use of knowledge and derived products, and the maintenance of contributor control of data and information resources. Required institutional ethics review processes (e.g. Institutional Review Boards, Research Ethics Boards etc.) will guide data management, however Indigenous communities or organizations may have specific, practices or requirements in place. It is the responsibility of researchers to familiarize themselves with and adhere to these practices and requirements.

Any data access restrictions must be described and justified in a data management plan based on these ethical, rather than proprietary, principles of data sharing. In general, data providers and users should adhere to the Polar Information Commons Ethics and Norms of Data Sharing,[X] especially with regards to fair attribution of and collaboration with data providers.

ICSU (2004b) defines "Full and open access" as equitable, non-discriminatory access to all data preferably free of cost, but some reasonable cost-recovery is acceptable. WMO Resolution 40 uses the terms "Free and unrestricted" and defines them as non- discriminatory and without charge. "Without charge", in the context of this resolution means at no more than the cost of reproduction and delivery without charge for the data and products themselves.

IASC seeks for open data to be an ethical norm of science. In this time of rapid Arctic change, it is more important than ever that data be available with minimal delay. This is meant to accommodate reasonable periods for quality control and verification of the data but does not generally allow for periods of embargo or exclusive use. IASC does not generally support exclusive use periods, and any such periods must be carefully justified in the data management plan.

Data also require documentation (or metadata). Documentation is essential to the discovery, access, and effective use of data. All IASC data must be fully documented and described. In accordance with the ISO standard Reference Model for an Open Archival Information System (OAIS)[XI], complete documentation may be defined as all the information necessary for data to be independently understood by users and to ensure proper stewardship of the data. Regardless of any data access restrictions or delays in delivery of the data itself, all IASC projects must make both digital and analog data discoverable by sharing basic descriptive information of collected data through the Polar Information Commons[XII] or in an internationally recognized, standard format to an appropriate catalog or registry (see Appendix B).

Preservation and Stewardship

Recognizing that the true value of scientific data is often realized long after these data have been collected, and to ensure the lasting legacy of IASC supported activities, it is essential to facilitate long-term preservation and sustained access to IASC data. All IASC data should be archived in their simplest, useful form and be accompanied by a complete metadata description in accordance with the OAIS Reference Model. Projects should identify appropriate long-term archives and data centers and describe preservation processes in their data management plans. Projects are urged to use certified archives such as those within ICSU's World Data System (WDS)[XIII]. If certified archives are not available, the data management plan should describe a path toward the development and certification of an appropriate archive. It must be recognized that data preservation and access should not be an afterthought and needs to be considered when data collection plans are first developed. IASC must be a strong advocate for preservation and work with the relevant national institutions, the WDS, and other organizations to ensure the preservation of IASC data.

A closely related issue is that the intellectual work going in creating a good data set should be recognized and ideally cited in formal publications. Citation also aids reproducibility, which means that the citation must have a persistent locator or identifier to the data such as digital object identifier. This in turn means the data need to be professionally stewarded over time.

Fair attribution is also fundamental to an ethically open data environment. Data creators and associated institutions deserve formally recognizable credit for their scientific contributions. IASC encourages this recognition through citation, appropriate co-authorship, and other means, and encourages IASC members to require appropriate credit and reference when serving as editors and reviewers.

Policy Implementation and Data Management Plans

All IASC-endorsed projects must include a data management plan that describes how the data will be ethically shared and preserved over time. Appendix A provides draft guidelines for data management plans. The IASC Executive Committee will establish an IASC Data Standing Committee with representatives from the Council and each of the Working Groups to review proposed data management plans for cross-cutting IASC projects. Individual Working Groups may develop their own processes within the scope of these principles for reviewing data management plans for projects within their groups. The Data Standing Committee will continually solicit feedback from the community and review and update this document every two years. Additions to the appendices can be proposed at any time.

IASC should not endorse future projects that do not adhere to the principles outlined in this document. IASC should actively encourage adherence to the principles and may withdraw project endorsement if necessary.

Appendix A: Data Management Plan Guidelines

To be further developed by the IASC Data Standing Committee.

Requirements:

» Abstract of research project

- Research question(s)
- Overview of research domain and methods applied
- Summary of expected or achieved results
- Description of research team
- Expected or achieved broader impacts

» Description of data to be collected and managed
- Proposed method(s) for describing data
- Metadata standards/specifications
- Descriptive vocabularies (e.g. domain specific keywords)
- Catalogue or other discovery mechanisms

» Description of mechanisms for data access and sharing
- Description of data formats
- Data structure and semantics (e.g. structure of relational database; definition of measurement scales used, data related vocabularies)
- Data access and sharing methods and tools (e.g. Web mapping tools, file downloads, Web services)

» Preservation plan in an appropriately recognized archive including documentation and advertisement through appropriate portals.

» Documentation of applicable local ethical and data management protocols, and justification for requested exception(s) to open data policy

» Data release schedule

Appendix B: Recommended Data Centers

- To be developed by the IASC Data Standing Committee following consultation with Working Groups. For now use WDS list.

I http://www.iasc.info/home/iasc
II Parsons, MA, T de Bruin, S Tomlinson, H Campbell, Ø Godøy, J LeClert, and IPY Data Policy and Management SubCommittee. 2011. The state of polar data—the IPY experience. In I Krupnik, I Allison, R Bell, P Cutler, D Hik, J López-Martínez, V Rachold, E Sarukhanian, and Summerhayes (ed.). Understanding Earth's Polar Challenges: International Polar Year 2007-2008 Edmonton, Canada: CCI Press. pp. 457-476. Available at http://www.icsu.org/news-centre/publications/reports-and-reviews/ipy-summary
III http://www.iasc.info/files/BiPAG/BipAG%20II%20final%20report%20May%20meeting%202011.pdf
IV http://www.arcticobserving.org/background/data-management-workshop and http://www.arcticobserving.org/tasks/118
V http://www.icacds.org.uk/eng/standards.htm
VI http://www2.archivists.org/statements/saa-core-values-statement-and-code-of-ethics
VII http://www.iassa.org/index.php?option=com_content&view=article&id=13&Itemid=23
VIII http://www.icsu-wds.org/organization/data-policy
IX http://www.cbd.int/convention/articles/?a=cbd-08
X http://polarcommons.org/ethics-and-norms-of-data-sharing.php
XI http://www.iso.org/iso/home/store/catalogue_ics/catalogue_detail_ics.htm?csnumber=57284
XII http://polarcommons.org http://www.icsu-wds.org/our-members/membership-categories

Annex 2.3

IASC Action Group on Geosciences (AGG) Final Report

22 February 2013 | IASC Secretariat, Potsdam, Germany

Participants

Carlo Barbante
Benoit Beauchamp (not available)
Bernie Coakley (Skype 16.00-17.00 CET)
Mikhail Grigoriev
Naja Mikkelsen
Victoria Pease
Karsten Piepjohn
Volker Rachold

Meeting Report and Recommendations

The Chair Carlo Barbante opened the meeting and the participants introduced themselves in a tour de table.

Terms of Reference

Participants reviewed and approved the Terms of Reference of the Action Group:

"The IASC Action Group on Geosciences (AGG) provides strategic advice to the Council and Working Groups on both long-term opportunities and priorities in the field of Arctic Geoscience research in a broader sense. Since geosciences embrace a wide variety of scientific disciplines, emphasis is given to the overarching aspects of research.

AGG will particularly address emerging research questions such as: (i) Arctic solid-earth geoscience, including Arctic tectonic evolution and the exploration of the ridge systems; (ii) sedimentary records and climatic and environmental history obtained from marine and lake sediments, ice cores and permafrost deposits (iii) geologic and geochemical processes especially related to the stability of permafrost and of gas hydrate deposits; (iv) seismic risk of the Arctic regions.

The Action Group will report to the Council and to the WGs on the emerging scientific fields in geosciences, in order to better address, coordinate and prioritize the research efforts at national and international level. An initial report will be presented to the IASC Executive Committee in March 2013, the final report will be delivered to Council at ASSW 2013.

Review of IASC´s ongoing activities related to geosciences

The Executive Secretary provided an overview of IASC´s ongoing activities related to geosciences and the participants discussed possible gaps and mechanisms for IASC to fill these gaps in order to better address geoscience research.

(a) IASC Working Groups´ activities related to geosciences

Terrestrial WG: Current geosciences related activities include the support of permafrost research (e.g. Vulnerability of Permafrost, Carbon Research Coordination Network) and a new initiative on Arctic hydrology (Global Change, Arctic Hydrology and Earth System Processes).

Cryosphere WG: The WG is supporting permafrost research activities (Global Terrestrial Network on Permafrost Vulnerability of Permafrost Carbon Research Coordination Network) and the work of the SCAR/IASC Expert Group on Ice Sheet Mass Balance and Sea Level (ISMASS).

Marine WG: The geosciences related activities of the MWG include the planning of Arctic Ocean Drilling and the support of the Arctic in Rapid Transition (ART) initiative.

Social and Human WG: no activities

Atmosphere WG: no activities

(b) IASC Networks

Participants noted that some of the ongoing IASC Networks are addressing geosciences:
- Network on Arctic Glaciology (NAG)
- Arctic Coastal Dynamics (ACD)
- Circum-Arctic Lithosphere Evolution (CALE)
- Palaeo-Arctic Spatial and Temporal Gateways (PAST Gateways)

(c) Cross-cutting initiatives

The Action Group noted that the current cross-cutting initiatives are not addressing geosciences.

Recommendation 1: that IASC encourages a better representation of geoscientists in its WGs. For each of its WGs, IASC should maintain a list of expertise covered by the current membership and potential gaps. Member organizations that are appointing new members should be asked to consider this list.

Recommendation 2: that IASC strengthens system-oriented research by (a) improving the visibility of its Networks and the flow of information between the organization and the Networks and by (b) making more use of the cross-cutting funding, in particular to address geosciences research. It is recommended that the next cross-cutting funding call prioritizes geoscientific projects.

Brainstorming Session

In a brainstorming session, the Action Group agreed on the following recommendations:

Recommendation 3: that IASC initiates an assessment on the "Geodynamic Evolution of the Arctic" as a major geoscience contribution to the 3rd International Conference on Arctic Research Planning (ICARP III). This would allow (a) IASC´s Terrestrial and Marine WGs to build stronger onshore-offshore connections, (b) the Marine, Cryosphere and Terrestrial WGs to develop mechanisms to better connect marine, terrestrial and ice core records and (c) the Marine WG to addresses the disconnect between the basement and subsea.

The Action Group on Geosciences would be willing to help planning such as assessment and interested in guiding the initiative. A possible outline could be:

Geodynamic Evolution of the Arctic

Part I: Evolution of Arctic Ocean basins and ridges
Correlation of Circum-Arctic orogens, foldbelts and fault zones
History of Arctic Gateways
Hydrothermal activities

Part II: Arctic climate evolution
Pre-Quaternary (Pre-Icehouse)
Long term variability during Mesozoic-Cenozoic times
Millennial-scale climate changes
The Cenozoic climate change: greenhouse vs. icehouse climate
Quaternary (Icehouse)
Milankovitch- to millennial-scale variability during the Quaternary-Neogene time
The Mid-Pleistocene climate transition
Anthropocene (back to Greenhouse?)
The Arctic environment during global warmth

Part III: System response to changes
Permafrost and gas hydrates
Ice sheets
Sea ice
Sea level
Ocean dynamics

Recommendation 4: that IASC promotes the following scientific activities and encourages its members to contribute:

- Arctic Ocean drilling, e.g. Alpha Mendeleev and Chukchi Borderland
- Process studies and mapping of subsea permafrost and the stability of gas hydrates
- Key studies on specific timeframes, e.g. high-resolution studies on short-term climate variability and a comparison between the Eemian and Holocene
- Validation of models using paleo-records
- Synchronization of marine and terrestrial climate records
- Geohazards and climate driven threats in the Arctic

Finally, the Action Group agreed that the scientific part of the outcome of the meeting would be published in an "EOS Future" article.

Terms of Reference for IASC Networks

Networks are IASC-endorsed, thematic groups with a specific scientific mission enhanced by affiliation with IASC. IASC networks are international, address specific scientific issues on a circum-arctic scale and strive to involve early career scientists. IASC Networks do not have an annual budget from IASC, but they are entitled to apply for IASC workshop and early career scientist funding. Networks may be created by IASC or may apply for affiliation with IASC. Once accepted as IASC networks, they carry the IASC logo.

1. Endorsement and Review of Network Activities

1.1. IASC endorsement for Networks may be granted or withdrawn by decision of the IASC Executive Committee in consultation with the Steering Groups of the five IASC Working Groups.

1.2. Network activities will be reviewed by the Steering Groups of the five IASC Working Groups every three years.

2. The responsibilities of a Network are to:

2.1. Conduct a science-led international program;

2.2. Offer opportunities for planning and coordination;

2.3. Ensure the exchange and dissemination of information and data they produce;

2.4. Ensure interaction with related IASC Working Groups;

2.5. Initiate workshops and educational events;

2.6 Promote future generations of arctic scientists.

3. Membership of Networks

3.1. The membership shall be decided at the discretion of the Network. Members should be experts in the thematic field of the Network. Consideration should be given to a mix of gender and seniority.

4. Functioning

4.1. The Network will organize itself as appropriate to its mission and membership.

4.2. The Network may develop collaborative initiatives with other IASC groups and with other scientific groups outside of IASC.

4.3. The Network may organize IASC-sponsored workshops and apply for IASC workshop and early career scientist support.

4.4. Correspondence between the Network and IASC shall be through the IASC Secretariat.

4.5. The Network shall have access to IASC services provided by the Secretariat, including IASC conference call facilities, announcement through the IASC mailing list and website.

5. Funding

5.1. Networks are entitled to apply for IASC funding for cross-cutting activities. Funding opportunities are announced once per year.

5.2. Every second year, Networks may also apply for IASC workshop support, including general meeting logistics and travel stipends for Early Career Scientists. Funding requests are considered by the IASC Executive Committee once per year. Informal proposals shall be submitted to the IASC Secretariat before September 15.

6. Reporting

6.1. The Network shall develop and maintain a web page linked to IASC's web site.

6.2. The Network shall maintain a record of publications and workshops.

6.3. The Network shall provide an end-of-year report to IASC for inclusion in the IASC Bulletin and, on occasion, contributions to the IASC Newsletter or other IASC outreach materials.

IASC Partnership Agreements Formal Agreements signed between IASC and its Partners

Annex 4.1

Memorandum of Understanding (MoU) between the Forum of Arctic Research Operators (FARO), and the International Arctic Science Committee (IASC)

1 The Parties

The Parties to this MoU are the Forum of Arctic Research Operators (FARO), and the International Arctic Science Committee (IASC).

1.1 Forum of Arctic Research Operators

The Forum of Arctic Research Operators (FARO), founded in 1998, is an international forum for information exchange, establishment of cooperation and development of new ideas among the national logistics operators in countries with Arctic research activities. FARO aims to encourage and optimize logistics and operational support for scientific research in the Arctic. The forum encourages international collaboration, for the benefit of all those involved in Arctic research. This mission is achieved by e.g. networking of national operators, exchange of best practices, offering opportunities for planning and coordination, facilitating access to facilities, supporting coordination of logistics and sharing of operational resources. The decision-making organs of FARO are the annual plenary meetings and the Executive Committee. The day-to-day operations of FARO are supported by its Secretariat headed by the Executive Secretary. Being a rather informal forum, decision making in FARO is by consensus.

1.2 International Arctic Science Committee

The International Arctic Science Committee (IASC) is an International Scientific Associate of ICSU, and was established in 1990. IASC's main aim is to initiate, develop, and coordinate leading edge scientific activity in the Arctic region and on the role of the Arctic region in the Earth system. It also provides objective and independent scientific advice to the Arctic Council and other organizations on issues of science affecting the management of the Arctic region. The decision-making organs of IASC are the Council and the Executive Committee. The day-to-day operations of IASC are supported by its Secretariat headed by the Executive Secretary. IASC's geographical remit covers the Arctic Ocean and the surrounding landmasses.

2 Rationale for the MoU

The Parties share common goals of working internationally and across disciplines to increase our understanding of Earth's polar regions and their connections to the global system. IASC is an umbrella organization for Arctic scientists in all disciplines, and FARO brings together the organizations responsible for research operations, logistics and infrastructure in the Arctic. By means of this MoU, we aim to expand the capacity for planning and supporting of major international research initiatives that go beyond the capacity of uni- or bilateral efforts.

3 Terms of Agreement

This MoU identifies a joint commitment to support international Arctic research. To facilitate the process, FARO and IASC agree:

1. to invite each other to attend meetings of their major bodies (FARO Plenary meeting and IASC Council);

2. to encourage interaction of their relevant working groups and committees;

3. that FARO contributes to the implementation of IASC activities by encouraging and facilitating multilateral collaborations on research infrastructure and operations;

4. that FARO and IASC work together to promote observing systems, data sharing, freedom for scientific exploration and international access, environmental awareness, and ethical conduct of science in the Arctic.

4 Financial Implications of the Agreement

The parties to this Agreement will continue to be responsible for the costs of their own activities, but this does not preclude one party meeting or contributing to the occasional or on-going costs of another activity if they so wish. Actual financial contributions to the activities and other implications of this MoU will be considered and agreed to by representatives of the Parties as they arise, and may be changed in accordance with the Parties requirements without any effect on the substance of this Agreement.

5 Non-binding Implications of the Agreement

This agreement is between FARO and IASC. It does not preclude the Parties agreeing to other MoUs with other programs and organizations, or bilaterally between the Parties.

6 Duration, Revision and Termination of this MoU

This MoU remains in force for 5 years, at which time it will be reviewed for possible extension. No action by any of the parties

will result in the cancellation of this MoU. The MoU may be revised at any time by mutual agreement between the Parties. Any of the parties may propose alterations to the MoU. Parties wishing to withdraw from this agreement should do so by a formal letter signed by the President/Chair and head organizational manager (i.e. Executive Secretary, Executive Director or Secretariat) of their respective organization.

Signed, 16 April 2013
Magnus Tannerfeldt | Chair, FARO
David Hik | President, IASC

Annex 4.2

Letter of Agreement between the International Arctic Social Sciences Association (IASSA) and The International Arctic Science Committee (IASC)

Background

In March 2008, following agreement by IASC and IASSA Councils, the Presidents of IASC and IASSA signed a Letter of Agreement. This letter recognized that there are many common interests between IASSA and IASC in international and multi-disciplinary scientific cooperation in the Arctic, and that increased cooperation between the two organizations would be of mutual benefit. The two organizations agreed to combine their efforts in selected fields and activities so as to raise the level of impact of both organizations in terms of making scientific advances and of advising policy makers, as well as to avoid duplication.

With the present letter IASC and IASSA agree to continue this partnership, taking into account the development of both organizations during the last five years and the lessons learned from the International Polar Year 2007/2008.

1. IASSA

IASSA, founded in 1990, is a professional association based on voluntary membership. For the purposes of the association, both the Arctic and the social sciences are defined in a broad and inclusive manner, encompassing all Arctic and Subarctic regions, and all disciplines pertaining to the humanities and the social sciences. IASSA membership in 2013 numbers over 600, residing in 30 different countries. The IASSA community remains connected through communication channels such as its electronic list, its website and its newsletter. IASSA organizes the triennial International Congresses of Arctic Social Sciences (ICASS), where research is presented and discussed, and which regularly draws about 75% of its membership. The General Assembly, the governing body of IASSA, convenes at the occasion of these congresses. Between congresses, a council of nine members, elected by the General Assembly for a three-year term, leads the Association. IASSA's daily business is carried out by the president and secretariat, the latter located at the president's home institution. The association is widely acknowledged by stakeholders as a legitimate and democratic representative of the international community of Arctic social scientists.

The objectives of IASSA are:

- To promote and stimulate international cooperation and to increase the participation of social scientists in national and international arctic research;
- To promote communication and coordination with other related organizations;
- To promote the active collection, exchange, dissemination, and archiving of scientific information in the Arctic social sciences. This may include the compilation of registers of Arctic social scientists and research projects, and the organization of workshops, symposia, and congresses;
- To increase public awareness of circumpolar issues and research results;
- To promote mutual respect, communication, and collaboration between social scientists and the peoples of the north, while recognizing these are not mutually exclusive groups;
- To promote the development of research and educational partnerships with the peoples of the north;
- To facilitate culturally, developmentally, and linguistically appropriate education in the north, including training in social sciences;
- To promote IASSA's statement of ethical principles for the conduct of research in the Arctic (http://www.iassa.org/index.php?option=com_content&view=article&id=13&Itemid=23).

In order to accomplish its objectives of stimulating the participation of social scientists in national and international arctic research, and of promoting communication and coordination with other related organizations, IASSA has been active in the circles of international Arctic research policy and research planning, such as the International Polar Year, the Arctic Science Summit Week, the International Conference on Arctic Research Planning, the International Polar Initiative and the Arctic Council and especially its Sustainable Development Working Group. IASSA has observer status at the Arctic Council, and contributes to a number of Arctic Council projects and reports prepared under mandate from the working groups. IASSA encourages the participation of Arctic social scientists as full partners in multi-disciplinary projects. IASSA also seeks to increase the profile of Arctic social sciences among others social scientists, and in 2013 became a member of the International Social Sciences Council.

As stated in its objectives, the mission of IASSA includes international scientific cooperation, data management and dissemination, education, outreach, relations with Arctic residents, and research ethics. IASSA advocates responsible research, to be carried out in partnership with Arctic residents, following up-to-date ethical principles.

2. IASC

IASC is a non-governmental organization whose aim 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 region. IASC was established in 1990, began operations in 1991 and today comprises 21 member countries. The IASC member organizations are national science organizations covering all fields of Arctic research. Representatives of the national scientific organizations from all 21 member countries form the IASC Council. Each national member organization has a mechanism to provide ongoing contact between its IASC Council Member and its Arctic science community. IASC draws on this structure to identify scientific priorities. An international science program planned or recommended by IASC should be of high priority to Arctic or global science.

The Council elects the President of IASC and four Vice-Presidents to serve on the Executive Committee. Council usually meets once a year during the Arctic Science Summit Week (ASSW). 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 organizational needs of IASC are served by the IASC Secretariat, currently located in Potsdam, Germany.

IASC is affiliated to the International Council for Science (ICSU) as an International Scientific Associate and, as an observer to the Arctic Council, IASC also provides objective and independent scientific advice on issues of science affecting the management of the Arctic region.

IASC is engaged in all fields of Arctic research. Its main scientific working bodies are five Working Groups (WGs): Atmosphere, Cryosphere, Marine, Social & Human and Terrestrial. The main 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. The members are experts in their field, with an international reputation and from different scientific disciplines so that the full range of Arctic research is represented in the WGs. Though the WGs are disciplinary, they also work together to address cross-cutting and broadly interdisciplinary research activities.

Actions Groups provide strategic advice to the IASC Council concerning both long-term activities and urgent needs.

IASC´s instruments to support science development include workshops, networks, long-term programs, assessments and science planning activities.

3. Common Interests

IASSA and IASC share a number of common interests, which makes it relatively easy for them to work together, in arranging workshops, conferences, and reports on topics of mutual scientific interest, in encouraging the development of integrated plans for scientific research, in communicating to the public, in entering research partnerships with Arctic residents, and in providing advice to policy makers.

4. Declaration of Intent

IASSA and IASC intend to combine their efforts in selected fields and activities (to be decided by mutual agreement) so as to raise the level of impact of both organizations in terms of making scientific advances and of advising policy makers, as well as to avoid duplication. The focus of IASSA-IASC joint activities should be on interdisciplinary work.

Combining efforts in selected fields and activities requires no change to the terms of reference of either organization, and carries no financial implication.

To facilitate the process, IASSA and IASC agree in particular (the list is not exhaustive):

1) To consult each other regularly about Arctic Council issues (including its Working Groups), and to develop common standpoints and initiatives whenever appropriate;
2) To continue involving IASSA in the preparation and participation in the ASSW;
3) To invite each other to meetings of their major bodies;
4) To ensure that IASSA leadership is informed about the activities of IASC´s Social and Human Sciences Working Group;
5) To exchange newsletters and advertise each other's newsletters and web sites;
6) To jointly plan and encourage research activities, in particular to collaborate on the planning for the 3rd International Conference on Arctic Research Planning (ICARP III) and the proposed International Polar Initiative (IPI).

The agreement will remain in force for 5 years, thereafter be reviewed and continued as appropriate.

Signed 16 April 2013
Gail Fondahl | President, IASSA
David Hik | President, IASC

Annex 4.3

Memorandum of Agreement (MoA) between the WCRP Climate and Cryosphere Project, the International Arctic Science Committee, and the Scientific Committee on Antarctic Research

1 The Parties

The Parties to this MoA are the WCRP Climate and Cryosphere Project (CliC), the International Arctic Science Committee (IASC), and the Scientific Committee on Antarctic Research (SCAR).

1.1 WCRP Climate and Cryosphere Project

The World Climate Research Program's (WCRP) Climate and Cryosphere project (CliC) encourages and promotes research into the cryosphere and its interactions as part of the global climate system. It also encourages communication between researchers with common interests in cryospheric and climate science, promotes international co-operation, and highlights the importance of this field of science to policy makers, funding agencies, and the general public. CliC promotes and publishes significant findings regarding the role of the cryosphere in climate, and recommends directions for future study. It is governed by a Scientific Steering Group, and day-to-day operations are carried out by the CliC International Project Office (CIPO) headed by the Director, in cooperation with the WCRP Joint Planning Staff.

1.2 International Arctic Science Committee

The International Arctic Science Committee (IASC) is an International Scientific Associate of the International Council for Science (ICSU). It was established in 1990. The IASC's mission is to initiate, develop, and coordinate leading edge scientific activity in the Arctic region and on the role of the Arctic region in the Earth system. It also provides objective and independent scientific advice to the Arctic Council and other organizations on issues of science affecting the management of the Arctic region. The decision-making bodies of IASC are the Council and the Executive Committee. The day-to-day operations of IASC are supported by its Secretariat headed by the Executive Secretary. IASC's geographical remit covers the Arctic Ocean and the surrounding landmasses.

1.3 Scientific Committee on Antarctic Research

The Scientific Committee on Antarctic Research (SCAR) is an Interdisciplinary Body of ICSU. It was established in 1958 to continue the international coordination of Antarctic scientific activities that had begun during the ICSU-led International Geophysical Year of 1957 - 58. Its mission is to initiate, develop, and coordinate high quality international scientific research in the Antarctic region and on the role of the Antarctic region in the Earth system. In addition it provides objective and independent scientific advice to the Antarctic Treaty Consultative Meetings and other organizations on issues of science and conservation affecting the management of Antarctica. The decision-making bodies of SCAR are the Meeting of Delegates and the Executive Committee. The day-to-day operations of SCAR are supported by its Secretariat headed by the Executive Director. SCAR's remit covers Antarctica and the surrounding Southern Ocean including the Antarctic Circumpolar Current south of the Sub-Antarctic Front.

2 Rationale for the MoA

The Parties share common goals of working internationally and across disciplines to increase our understanding of the cryospheric elements of the Earth's climate system and their interconnections. IASC, SCAR and CliC have a long history of successful collaboration through a number of activities and initiatives involving ice sheet mass balance, sea ice, permafrost, and polar oceanography. This strong collaborative relationship has resulted in many workshops, publications, and tangible progress toward improved understanding of the Polar Regions. A WCRP/IASC/SCAR MoU was signed in 2008 to reflect this collaboration. It expires in July 2013. The current Agreement serves to reflect the evolution of the partnership between the three organizations and to encourage further fruitful and strategic collaborations in the future. It supersedes, with immediate effect, the above mentioned WCRP/IASC/SCAR MoU of 2008.

3 Terms of the Agreement

This MoA identifies a joint commitment to excellence in the field of cryospheric research, to the pursuit of scientific advances and advice to policy makers, as well as improved public awareness and support of early career researchers and countries with less well developed science programs. CliC, IASC, and SCAR intend to combine relevant efforts as efficiently and effectively as possible so as to raise the level of impact of all three organizations. To facilitate the process, CliC, IASC and SCAR agree:

i. to invite each other to attend the meetings of their decision-making bodies (CliC Scientific Steering Group Meetings, IASC Council Meetings, and SCAR Delegates' Meeting);
ii. to encourage representation of each organization in their relevant working committees/groups, as required;
iii. to encourage appropriate linkages between the relevant CliC, IASC and SCAR science projects and to develop joint projects and approaches in areas of common interest;
iv. to work together in arranging workshops, conferences, and reports on topics of common scientific interest;
v. to exchange ideas on best practices in data and information management; and to foster involvement of the parties in their respective data management committees, based on opportunities for greater progress;
vi. to foster and promote integration of cryospheric observing systems promoted by each organization (e.g. SCAR-led Southern Ocean Observing System and IASC-led Sustaining Arctic Observing Networks);
vii. to exchange updates and publications, and to promote each other's newsletters, publications and web sites on their own web sites;
viii. to develop a coordinated approach to communicating the relevance of the cryosphere, climate, and the Polar Regions to society with the wider community; and
ix. to coordinate and sponsor meaningful involvement of early career researchers, especially those from under represented countries, in ongoing activities, strategy, planning, and other opportunities.

4 Financial Implications of the Agreement

Parties to this Agreement will be responsible for the costs of their own activities, but this does not preclude pooling resources or funds for activities of common interest. Actual financial contributions to the activities and other implications of this MoA will be considered and agreed to by representatives of the Parties as corresponding needs arise. Such arrangements may be changed in accordance with evolving requirements of the Parties without any effect on the substance of this Agreement.

5 Non-binding Implications of the Agreement

This agreement is between CliC, IASC, and SCAR. It does not preclude the Parties from establishing other Agreement(s) with other programs and organizations, or bilaterally between the Parties.

6 Duration, Revision and Termination of this MoA

This MoA remains in force for 5 years, at which time it will be reviewed for possible extension. The MoA may be revised at any time by mutual agreement between the Parties. Parties wishing to withdraw from this Agreement should do so by a formal letter signed by the President/Chair and Chief Executive Officer (i.e. Director, Executive Secretary, or Executive Director) at least three months in advance of the withdrawal from the MoA.

Signed 16 April 2013
Jenny Baeseman | Director, CliC
David Hik | President, IASC
Jerónimo López-Martínez | President, SCAR

Annex 4.4

Letter of Agreement between the Scientific Committee on Antarctic Research (SCAR), The International Arctic Science Committee (IASC) and the International Association of Cryospheric Sciences (IACS)

1. Preamble

In July 2008, following agreement by SCAR Delegates, the IASC Council and the IACS Bureau, the Presidents of SCAR, IASC and IACS signed a Letter of Agreement. This letter recognized that the three organizations, each affiliated with the International Council for Science (ICSU), share a number of common interests and practices. The three organizations agreed to combine their efforts in selected fields and activities so as to raise the level of impact of all three organizations in terms of making scientific advances and of advising policy makers, as well as to avoid duplication.

With the present letter SCAR, IASC and IACS agree to continue this partnership, taking into account the development of the three organizations during the last five years and the lessons learned from the International Polar Year 2007/2008.

2. Common Interests and Practices

The three organizations share a number of common interests and practices, which will make it relatively easy for them to work together, for example in arranging workshops, conferences, and reports on topics of mutual scientific interest, in developing integrated plans for cryospheric research, in communicating to the public on cryospheric issues, and in providing advice to policy makers.

3. Declaration of Intent

SCAR, IASC and IACS intend to combine their efforts in cryospheric activities (to be decided by mutual agreement) so as to raise the level of impact of all three organizations in terms of making scientific advances and of advising policy makers, as well as to avoid duplication.

Combining efforts in selected fields and activities requires no change to the terms of reference of any of the three organizations, and carries no financial implication.

To facilitate the process, SCAR, IASC and IACS agree:

(i) to invite each other to attend the meetings of their major bodies (SCAR Delegates' Meeting, IASC Council and IACS Plenary Administrative Sessions);
(ii) to encourage appropriate linkages between the relevant existing SCAR, IASC and IACS cryospheric science projects;

(iii) to encourage their cryospheric science communities to develop joint bipolar projects and approaches in appropriate fields;

(iv) to work together in arranging workshops, conferences, and reports on topics of cryospheric science interest;

(v) to exchange ideas on best practices in data and information management;

(vi) to exchange newsletters and advertise each other's newsletters and web sites on their own web sites; and

(vii) to explore synergies in communicating the relevance of cryospheric research to societal issues with the wider community, including contributing expertise for governments and United Nations, such as within IPCC reports.

The agreement will remain in force for 5 years, thereafter to be reviewed and continued as appropriate.

Signed 16 April 2013
David Hik | President, IASC
Jerónimo López-Martínez | President, SCAR
Ian Allison | President IACS

Outline Description of SCAR, IASC and IACS

1. SCAR (www.scar.org)

SCAR is an Interdisciplinary Body of the International Council for Science (ICSU). Its geographical remit covers Antarctica and the surrounding Southern Ocean including the Antarctic Circumpolar Current south of the Subantarctic Front. SCAR's mission is to initiate, develop, and co-ordinate leading edge scientific activity in the Antarctic region, and on the role of the Antarctic region in the Earth system. It also provides objective and independent scientific advice to the Antarctic Treaty Consultative Meetings and other organizations on issues of science and conservation affecting the management of Antarctica and the Southern Ocean. And it aims to facilitate free and unrestricted access to Antarctic scientific data and information.

SCAR's coordination of scientific research takes place through its three Standing Scientific Groups on Life Sciences, Physical Sciences and Geosciences. They currently focus their efforts on six major international Scientific Research Programs (SRPs) addressing major, priority scientific issues of global or fundamental importance requiring fieldwork and/or observations in the Antarctic. Most of these programs are interdisciplinary in nature and will last 5 -10+ years. Three of them address the issue of climate change and its effects, on timescales ranging from the modern to the geological and extending into the next 100 years. Two have a specific focus on the Antarctic ice sheets. In addition, a number of Expert Groups (EG) and Action Groups (AG) plan and effect cooperative research in areas of special interest requiring attention in the short term (AG; 2-4 years) to medium term (EG 2-8 years). Biodiversity is a major interest, along with human health (in the context of resident populations of scientists). Every two years, SCAR brings the scientific community together in a major international Antarctic Open Science Conference

2. IASC (www.iasc.info)

IASC is affiliated to the International Council for Science (ICSU) as an International Scientific Associate. Its geographical remit covers the Arctic Ocean and the surrounding landmasses. IASC's main aim is to initiate, develop, and co-ordinate leading edge scientific activity in the Arctic region, and on the role of the Arctic region in the Earth system. It also provides objective and independent scientific advice to the Arctic Council and other organizations on issues of science affecting the management of the Arctic region.

IASC is engaged in all fields of Arctic research. Its main scientific working bodies are five Working Groups (WGs): Atmosphere, Cryosphere, Marine, Social & Human and Terrestrial. The main 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. The members are experts in their field, with an international reputation and from different scientific disciplines so that the full range of Arctic research is represented in the WGs. Though the WGs are disciplinary, they also work together to address cross-cutting and broadly interdisciplinary research activities.

Actions Groups provide strategic advice to the IASC Council concerning both long-term activities and urgent needs. Currently IASC is maintaining a joint Action Group with its southern hemisphere counterpart, the Scientific Committee on Antarctic Research (SCAR), addressing bipolar science needs; a Geosciences Action Group examining long-term opportunities and priorities in the field of geoscience research; and a Data Policy Group, developing a data policy providing guidance for IASC supported activities.

IASC´s instruments to support science development include workshops, networks, long-term programs, assessments and science planning activities.

3. IACS (www.cryosphericsciences.org)

IACS is one of the eight Scientific Associations of the International Union of Geodesy and Geophysics (IUGG), which is a Scientific Union within the International Council for Science (ICSU). IACS was launched 2007 by the IUGG Council during the XXIVth IUGG General Assembly in Perugia, Italy.

IACS strives:

- to promote studies of the cryosphere of Earth and other bodies of the Solar System and related physical processes;
- to encourage research on cryospheric sciences through collaboration and co-operation among individuals, institutions, and research programs, both nationally and internationally;
- to provide opportunities for international discussion and publication of the results of research on cryospheric structures and processes;
- to promote education and public awareness about the cryosphere;
- to facilitate the standardization of measurements and the collection of data on cryospheric systems and the analysis, archiving and publication of such data.

Standing and Working Groups form the backbone of IACS scientific activities. Standing Groups fulfil continuing tasks subject to periodic review. For example, the GTN-G Steering Committee is an IACS Standing Group which provides scientific guidance to the World Glacier Monitoring Service (WGMS). Working Groups are finite term bodies that address specific topics in cryospheric sciences which are usually proposed by the community.

Working Groups are assigned to one of the five IACS divisions:

- Snow and Avalanches
- Glaciers and Ice-sheets
- Marine and Freshwater Ice
- Cryosphere, Atmosphere and Climate
- Planetary and other Ices of the Solar System

Annex 4.5

Memorandum of Understanding (MoU) between the Association of Polar Early Career Scientists, the International Arctic Science Committee and the Scientific Committee on Antarctic Research

1 The Parties

The Parties to this MoU are the Association of Polar Early Career Scientists (APECS), the International Arctic Science Committee (IASC), and the Scientific Committee on Antarctic Research (SCAR).

1.1 Association of Polar Early Career Scientists

APECS is an international and interdisciplinary organization for undergraduate and graduate students, postdoctoral researchers, early faculty members, educators and others with interests in Polar Regions and the Cryosphere. By providing networking and career development opportunities, APECS' activities aim to raise the profile of polar research, develop effective leaders in education and outreach, and stimulate interdisciplinary and international research collaborations. APECS builds on extensive national and disciplinary networks to develop integrated research directions, meet career development needs, and communicate the urgencies of polar science to a worldwide audience. APECS decisions are made by an open Council, and an elected Executive Committee. An Advisory Committee of senior polar researchers provides guidance to APECS. Day to day operations of APECS are currently supported through an international directorate lead by a Director.

1.2 International Arctic Science Committee

The International Arctic Science Committee (IASC) is an International Scientific Associate of ICSU, and was established in 1990. IASC's mission is to initiate, develop, and co-ordinate leading edge scientific research in the Arctic region, and on the role of the Arctic region in the Earth system. It also provides objective and independent scientific advice to the Arctic Council and other organizations on issues of science affecting the management of the Arctic region. The decision-making bodies of IASC are the Council and the Executive Committee. The day-to-day operations of IASC are supported by its Secretariat headed by the Executive Secretary. IASC's geographical remit covers the Arctic Ocean and the surrounding landmasses.

1.3 Scientific Committee on Antarctic Research

The Scientific Committee on Antarctic Research (SCAR) is an Interdisciplinary Body of ICSU. It was established in 1958 to continue the international coordination of Antarctic scientific activities that had begun during the ICSU-led International Geophysical Year of 1957-58. Its mission is to initiate, develop, and coordinate high quality international scientific research in the Antarctic region and on the role of the Antarctic region in the Earth system. In addition, it provides objective and independent scientific advice to the Antarctic Treaty Consultative Meetings and other organizations on issues of science and conservation affecting the management of Antarctica. The decision-making organs of SCAR are the Meeting of Delegates and the Executive Committee. The day-to-day operations of SCAR are supported by its Secretariat headed by the Executive Director. SCAR's remit covers Antarctica and the surrounding Southern Ocean including the Antarctic Circumpolar Current south of the Subantarctic Front.

2 Rationale for the MoU

The Parties share common goals of working internationally and across disciplines to increase our understanding of Earth's polar

regions and their connections to the global system. The Parties recognize the importance of fostering the next generation of researchers that will be faced with increasingly critical challenges due to the impacts of climate change on these regions and their global significance. At the closing ceremony of the International Polar Year (IPY) Montreal Conference in 2012, APECS, SCAR, and IASC received the IPY torch (a Norwegian "budstikke"), indicating that these three organizations are now assuming responsibility for securing the IPY legacy. This agreement recognizes APECS as the preeminent organization for young researchers working in the Arctic, Antarctic, and cryospheric regions that strives to provide a continuum of leadership in polar research. This agreement is between APECS, IASC, and SCAR. It does not preclude the Parties agreeing to other MoUs with other programs and organizations, or bilaterally between the Parties.

3 Terms of Agreement

This MoU identifies a joint commitment to the professional development of early career polar researchers* and the need for a continuum of leadership in polar research as important mutual aims of all Parties. Examples of activities through which this joint commitment may be pursued include, but are not limited to:

- Working together to ensure representation of early career researchers in the Parties respective bodies, including but not limited to, participating in Standing Committee/Working Group, Delegates/Council, and other meetings and activities;
- Communicating to each Parties members updates, newsletters, and other communications of interest, as well as working together on education, outreach, and polar science communication activities;
- Agreeing to representatives of IASC and SCAR serving as members of the APECS Advisory Committee to offer assistance and guidance; and representatives of APECS being available to IASC and SCAR for early career perspectives;

4 Financial implications of the Agreement

Parties to this Agreement will continue to be responsible for the costs of their own activities, but this does not preclude one party meeting or contributing to the occasional or ongoing costs of another if they so wish. Actual financial contributions to the activities and other implications of this MoU will be considered and agreed to by representatives of the Parties as they arise, and may be changed in accordance with the Parties requirements without any effect on the substance of this Agreement.

5 Duration, Revision and Termination of this MoU

This MoU remains in force for 5 years, at which time it will be reviewed for possible extension. No action by any of the parties will result in the cancellation of this MoU. The MoU may be revised at any time by mutual agreement between the Parties. Any of the parties may propose alterations to the MoU. Parties wishing to withdraw from this agreement should do so by a formal letter signed by the President and head organizational manager (i.e. Executive Secretary or Director) of their respective organization.

Signed Date 16 April 2013
Alexey Pavlov | Director, APECS
David Hik | President, IASC
Jerónimo López-Martínez | President, SCAR