PHOTO: Pauline Snoeijs Leijonmalm

IASC INTERNATIONAL ARCTIC SCIENCE COMMITTEE

FALL 2015

IASC PROGRESS

Encouraging and supporting science-led circumarctic international programs

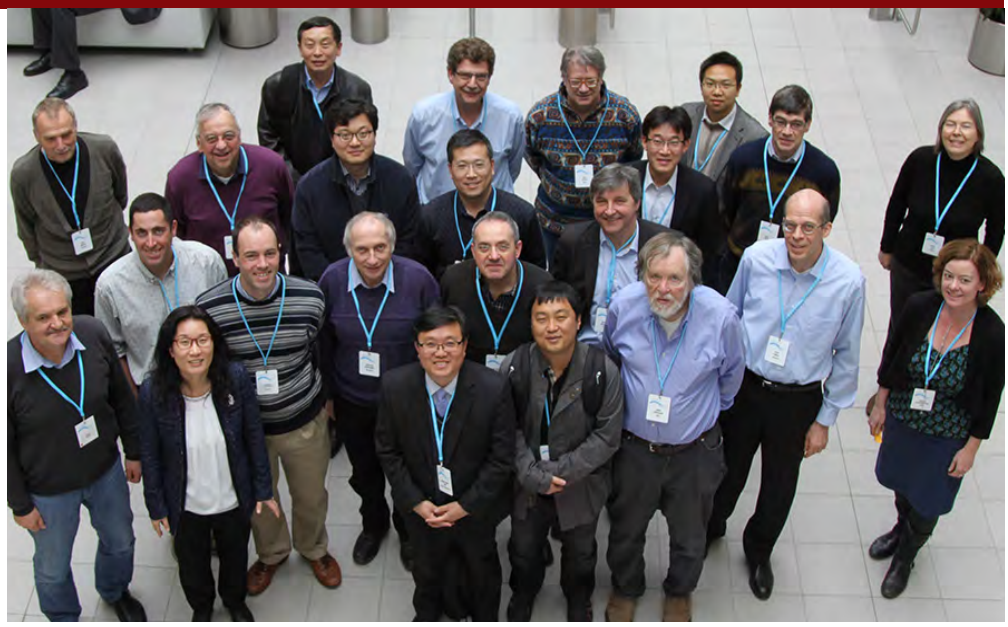
IASC is engaged in all fields of Arctic research. Its main scientific working bodies are five Working Groups (WGs): Atmosphere, Cryosphere, Marine, Social & Human and Terrestrial. The primary function of the WGs is to encourage and support science-led circumarctic international programs by offering opportunities 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, and engages Early Career Scientists through the IASC Fellowship Program.

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.

This edition of IASC Progress provides an overview of ongoing activities and initiatives of all five IASC WGs.

Atmosphere Working Group (AWG)

IASC Atmosphere Working Group at ASSW 2014 in Helsinki, Finland



Scientific Foci:

- Arctic mid latitude weather linkages (linked to the Year of Polar Prediction)
- Arctic air pollution
- Data recovery

AWG: Arctic Air Pollution Workshop (February 3-5, 2015, Boulder, USA)

The Arctic Air Pollution Workshop was held in Boulder, Colorado from February 3rd to 5th, 2015 with more than 30 members of the research community, representing research institutes from Asia, Europe and North America to discuss future directions for internationally coordinated Arctic air pollution research over the next 10 years. The workshop set future directions in Arctic air pollution research and defined outstanding science questions related to air pollution emissions and their impacts on regional air quality, ecosystems (deposition) & climate. A final synthesis round concluded that a new international Arctic Air Pollution initiative would add substantial value and serve to raise the profile of this issue in the international arena. It would also improve our understanding about impacts of emissions on air quality, climate and ecosystems.

Scientific Highlights:

- Improved understanding of the relative roles of local versus remote sources of Arctic air pollution emissions and their response to past and future Arctic and global change, relative to natural emissions;
- Improved understanding of long-range transport, pollutant processing, scavenging, wet/dry deposition processes and improved representation in models;
- Improved understanding of current and projected impacts of emerging local Arctic pollution sources;
- Improved connectivity with Arctic communities and engagement in citizen science initiatives to increase sampling network, improve knowledge exchange and increase the relevancy of new know ledge. Similar discussions were had about improved connectivity with industry and the regulatory community.
- Extensive and sustained vertical sampling well-coordinated with surface-based sites, and targeted at improved process understanding, especially in poorly sampled locations or time periods (e.g. polar night).

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AWG: Dynamics of Atmosphere-Ice-Ocean Interactions in the High-Latitudes (March 23-27, Rosendal , Norway)

The Dynamics of Atmosphere-Ice-Ocean Interactions in the High Latitudes Workshop was held from March 23rd to 27th, 2015 in Rosendal, Norway. The workshop was organized into four main themes: polar predictability: state of the art and challenges ahead; the coupled atmosphere-ocean-ice system: current understanding and processes; extreme events in the Polar Regions: dynamics and characteristics; and the polar climate: large scale circulation and interaction with mid-latitudes. The workshop aimed to synthesize a fundamental understanding and description of small-scale processes in the coupled atmosphere-ocean-ice climate system at high latitudes in order to assess and reduce bias and uncertainties in weather prediction and climate models. The workshop featured breakout group discussion on the afternoon of the 26th, where participants were grouped into the following three themes: Year of Polar Prediction (YOPP), Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) and Large-scale processes (LSP).

Scientific Highlights:

- Discussed the definition of an extreme event and the difference between extreme and high-impact weather, considering not only strong wind events, but also sudden warming events, fog, avalanches, as well as extreme events in the ocean, such as abrupt changes in the ocean convection or in the biological components of the Arctic environment.
- Discussed how observational systems should be designed, considering what kind of device, and what spatial and temporal resolution is needed in order to deal with large fluxes in ocean-atmosphere during the fall season, summer cyclones and melt onset in spring.
- Illustrated that advanced diagnostics in operational numerical weather or medium-range prediction systems can be implemented. This would be made possible by improving understanding of the genesis of polar lows using the adjoint model.
- Discussed the shortcomings and advantages in observation and modelling, considering topics such as Arctic Amplification (AA), latent heat transport, CMIP5 and CMIP3 time series, and NWP models.

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Helicopter over meltwater pond on Helheim Glacier (Southeast Greenland) Photo: Andreas Peter Ahlstrom

AWG:
Arctic Climate Change and Mid-Latitude Weather Extremes (April 16-17, Vienna, Austria)

From April 16th to 17th, during the European Geophysical Union (EGU) General meeting in Vienna, a session was organized to discuss Northern Hemisphere extreme weather events, entitled "Atmospheric circulation, Arctic climate change, and to debate the links between these phenomena". With a number of extreme weather events in the Northern Hemisphere mid-latitudes during the past decade, much attention is focused on mid-latitude atmospheric circulation, especially planetary waves and the polar jet stream. There is an ongoing debate on whether these changes are related, and also whether they may be influenced by Arctic climate change.
Rather than reaching a conclusion regarding linkages between Arctic climate change and mid-latitude weather extremes, the session attained the goal of fostering a scientific debate on the issue, with the many presentations and posters highlighting the complexity of the climate system and the fact that the atmospheric circulation is affected by various factors, of which Arctic climate change is but one.

Scientific Highlights:

- Evidence of climate models showing a strong consensus on stationary wave response in global warming scenario stimulations was presented, which has implications for dry/wet hydroclimate change across North America and Europe, such as wetting on the west coast of the USA, drying in the southwest USA, drying in the eastern Mediterranean and also on Arctic amplification. However, the forcing driving this stationary wave response was not Arctic change per se.
- Evidence was presented for a multi-link chain linking North Atlantic Oscillation to Pacific variability through sea ice and El Nino Southern Oscillation variability. While connections between processes involving such a multi-link chain may appear tenuous, this talk served as a reminder that the system under study is complex with many inter-connected processes.
- A study was presented on the question of a hiatus in global temperatures and especially whether the data sparsity in the Arctic is responsible for some of the regional warming being missed in global summaries of temperature. It related the hiatus to data gaps in the Arctic. Interestingly enough, this was countered with the claim that the hiatus was due to a lack of warming at low latitudes (and especially processes in the Equatorial Pacific). The fact that such an important topic was debated in this way reinforced the importance of maintaining good observation systems, especially in the Arctic.

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AWG: Polar Climate and Environmental Change in the Last Millennium (August 24-26, Torun, Poland)

With the success of the 1st International Conference 'Polar climate and environmental change in the last millennium' was organized in Torun, Poland, from Feb 1-3, 2010, it was decided that this kind of conference should take place periodically, every 5 years. Thus, from Aug 24-26, 2015 the 2nd international 'Polar climate' conference was held in Torun, Poland.

Like the previous Conference, the main objective of the 2nd Conference was to summarize the state of the art of climate and environmental changes in the Polar Regions. Key-note speakers included 8 well-known specialists in fields of sea ice, glaciology, permafrost, climatology and paleoclimatology, terrestrial and ocean ecosystems, climate modelling, and crowdsourcing methods (e.g. to present state of Old Weather project). All in all, the conference served to present scientific achievements and to identify gaps in the field of historical climatology of the Polar Regions based on early meteorological observations, history, dendroclimatology, paleolimnology, geophysics, geomorphology and other sources.

Scientific Highlights:

- "Modeling of Arctic climate" gave a picture about modern methods of investigation climate change.
- "Glaciers and ice-sea history" examined a vast area of marine ice topics. There was exposed mobility of these vulnerable nature formations.
- "Dynamics of permafrost" discussed mountain permafrost in Canada and permafrost in general.
- Findings on the changing contribution of snow in the hydrological regime of Hudson Bay were presented.

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Current and planned activities of AWG IASC Fellows:

Jo Browse will participate in the II Polar Data Forum (27th – 29th October, 2015 in Waterloo, Ontario, Canada).

Cryosphere Working Group (CWG)

IASC Cryosphere Working Group at ASSW 2014 in Helsinki, Finland

Scientific Foci:

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

CWG: Workshop on "Quantifying Albedo Feedbacks and Their Role in the Mass Balance of the Arctic Terrestrial Cryosphere" (September 21-23, Bristol, UK)

The goals of this workshop were to articulate scientific priorities and a research agenda related to the topic "Quantifying Albedo Feedbacks and their Role in the Mass Balance of the Arctic Terrestrial Cryosphere" and to formulate these in a way that would allow them to be presented at the Toyama Symposium and incorporated into ICARP III products, which will include a "consensus statement identifying the most important Arctic research needs for the next decade".
Having 24 participants, the workshop started with six plenary presentations to provide an initial basis for discussion, followed by a brainstorming session. From the breakout groups and open discussion, issues raised included: albedo measurements, temporal evolution of albedo, impacts of mineral impurities and black carbon on snow/ice albedo, biological impacts on cryospheric albedo.

Scientific Highlights:

- The workshop covered a range of issues related to albedo feedbacks. It identified important and urgent needs in observation and modeling, to promote a further understanding of roles of feedbacks in the mass-balance of terrestrial cryosphere.
- As inputs for ICARP III, 10 scientific questions were identified and shared with the participants. This list includes the recent history of albedo changes, variability in the sensitivity of albedo to climate forcing, availability of albedo measurements in the Arctic, calibration/validation of satellite measurements, adequate characterization of snow packs for albedo modeling purposes, modeling of glacier and lake-ice albedo, biological effects on the albedos of snow, firn, glacier ice etc., effects of organic/inorganic particulates and living organisms, and terrestrial component modeling in climate models.

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Measuring albedo on the St-Elias Icefields (Yukon Territory, Canada) Photo: E. McKnight

CWG: Multiple workshops related to the Ice Sheet Mass Balance and Sea Level (ISMASS) initiative

The goals of ISMASS are to promote 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 modelling 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 society and policy makers, of the current scientific knowledge and the main achievements in this field of science.

Along these purposes, multiple workshops are hosted/co-hosted during 2014 and also in 2015:

- Workshop on ice-sheet future projections (Auckland, 26 August 2014)
- Workshop on constraining uncertainty in Greenland surface mass balance models, 19-20 May, 2015 at the University of Sheffield, UK
- Workshop on glacio-isotatic rebound modelling, 26-29 May, 2015, University of Alaska Fairbanks Geophysical Institute, USA
- The marine ice sheet model intercomparison project meeting, 16 August, 2015, Churchill College, UK
- Follow-up workshop of ice-sheet projections (Auckland), as part of the AGU Chapman Conference through the Ice Sheet Mass Balance Inter-comparison Exercise (IMBIE).

Scientific Highlights:

- It was decided that a new marine ice sheet model inter comparison project was needed to assess the impacts of dynamic ice sheet responses to ground line retreat. Marine Ice Sheet Model Intercomparison Project (MISMIP) was launched to test ice sheet models on how to cope with grounding line retreat due to basal melting under the shelf and loss of buttressing.

- There is still very significant disagreement in the amounts of snowfall and meltwater runoff simulated by the different surface mass balance (SMB) models, and so we aim to reconcile model differences through a more thorough and detailed comparison of output from the different models than has previously been undertaken. The workshop also addressed the important question of where there are gaps in information from weather stations and ice-core data which are crucial for validating SMB models over Greenland (from Sheffield WS, 19-20 May 2015).

- The design of three MIPs were presented in the workshop: the third Marine Ice Sheet MIP (MISMIP+), the second Ice Shelf Ocean MIP (ISOMIP+) and the first Marine Ice Sheet Ocean MIP (MISOMIP1). The workshop unfolded in four sessions: 1. Experimental Design, 2. Logistics for Participation, 3. Remaining Design Questions (a. Which basal friction law should be used in MISMIP+), b. How should dynamic calving be handled (if at all) in each MIP), c. To what extent should MISOMIP1 ask participants to submit results in a common configuration?), 4. Future Directions presented possible next steps for each MIP (from Churchill College WS, 16 August, 2015.)

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CWG: 1st European Snow Science Winter School 2015 (February 8-14, Sodankylä, Finland)

Snow is a key component of the cryosphere. Snow grain size (microstructure) of snow is relevant to most physical properties of the snowpack, as albedo, radiative transfer of microwaves, thermal conductivity, trafficability, air permeability. Responding to the recommendation from a recent workshop (Snow Grain Size Intercomparison Workshop 2014), underlined the need to teach modern techniques of snow microstructure characterization to a wider community, especially to graduate and post-graduate scientists. An improved quantification of snow properties is highly relevant to understand the changing arctic snowpack.
In this workshop, state-of-the-art snow measurement techniques were taught, both direct and indirect methods that were developed and are being used by different groups. The focus of this workshop was on field measurements, combined with theoretical lessons in the classroom. Field measurements were done in small groups of 3-4 students. Each group of students prepared a report describing the methods, results and interpretation. The course corresponds to 3 ETCS-Points.

Scientific Highlights:

- 27 scientists, selected from 54 applications (4 Post-Docs, 19 PhD-students, 4 MSc) participated in a training course for modern snow observation techniques.

- The topics covered are: snow deposition, metamorphism and settling, microstructure of snow and mathematical representation, physical properties of snow, optical properties of snow, snow measurement methods: traditional and modern, Snowpack and land-surface modelling, snow climatology and hydrology, aspects of field safety and field organisation.

- Post-workshop responses were very positive. The 2nd Snow Science Winter School will also be held in Preda and Davos, Switzerland in 14-20 February 2016.

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Current and planned activities of CWG IASC Fellows:

Elena Kuznetsova participated as an Early Career Scholar in the Arctic-FROST Annual Meeting in St Petersburg, 15-17 August 2015; and was invited to thematic committee of the Arctic Observing Summit 2016 in Fairbanks. She will also be involved in the II Polar Data Forum (27th – 29th October, 2015 in Waterloo, Ontario, Canada).

Robert Way was also invited to thematic committee of the Arctic Observing Summit 2016 in Fairbanks.

Louis-Philippe Roy was a national correspondent for Canada during the GTN-P workshop (Québec, 19-20 September 2015) (see TWG).

IASC Marine Working Group at the ASSW 2015 in Toyama, Japan

Scientific Foci:

- 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 paleo record of the Arctic Ocean through scientific Arctic drilling

MWG: Big Black Box: Marine Ecological Processes during the Polar Night
(January 18-23, Tromsø, Norway)

The workshop "Big Black Box: Marine Ecological Processes during the Polar Night" was held in Tromsø, Norway, on January 19-20 at UiT, The Arctic University of Norway, organized in conjunction with and as part of the annual Arctic Frontiers conference, Tromso 18-23 January 2015, entitled "Climate and Energy" (http://www.arcticfrontiers.com/).

The main objectives for this workshop were to 1) develop a white paper summarizing existing knowledge on winter ecology in the Arctic, 2) to identify the most critical knowledge gaps and 3) to discuss ideas for a new international initiative/program on polar night ecology.

For the first two objectives, the discussion focused on ecological processes at the base of the marine food web, including the sympagic, pelagic and benthic realms, and covered all organisms from bacteria and protists, to invertebrates to fish.

For the 3rd objective, several ongoing, new and planned projects were presented during the workshop, including suggestions for contributions to the international MOSAiC program. So far, MOSAiC primarily focuses on physical processes, but as part of the Big Black Box initiative we participated in commenting on the MOSAiC science plan and suggested including more biological aspects into the program (http://www.mosaicobservatory.org/). MOSAiC submitted a proposal using RV Polarstern for a year-round study in the Arctic Ocean, which would provide an ideal opportunity for studying ecological processes during winter.

Scientific Highlights:

- Discussed species active during winter: small zooplankton size fractions (e.g. Oithona, Microcalanus spp., Pseudocalanus spp.), which need to be studied in greater detail as information on them is limited year-round, copepods, which actively feed and reproduce in January-February in Kongsfjorden (high numbers of nauplii found mid-winter) but at a lower level than during spring and Calanus, which ascends already in November in Svalbard fjords and are active before the primary production starts.
- Discussed recent polar night studies on zooplankton ecology (e.g., see Daase et al. 2014; Webster et al. 2015) which demonstrated that marine zooplankton are not necessarily quiescent during the polar night.
- Discussed the need for studies of polar-night physiology and energy use combined with knowledge of behaviour and life cycle strategies as this will improve understanding of the trade-offs inherent in the annual routines of polar zooplankton as well as the role of the polar night in shaping the timing of activities also at other times of the year.
- Agreed that the boundary layers sea ice - sea water, and sea water – sea floor, as well as any stratification of the water column would potentially be places for food/organisms to concentrate in winter.

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MWG: Atmosphere-ocean-ice interactions and aspects related to a future, seasonally ice-free Arctic Ocean
(April 28-29, Toyama, Japan)

"Atmosphere-ocean-ice interactions and aspects related to a future, seasonally ice-free Arctic Ocean" was a session featured in the Fourth International Symposium on Arctic Research (ISAR-4) and the Third International Conference on Arctic Research Planning (ICARP III) during the 2015 Arctic Science Summit Week (ASSW) in Toyama Japan, from April 28-29.

The first sub-session addressed the energy exchange between the Arctic and lower latitudes, the different energy budgets in the Arctic as well as the effects of aerosols in an Arctic with reduced ice cover. The second sub-session was devoted to smaller scale observational studies of heat exchange between ice, ocean and atmosphere in the marginal ice zone and in the high Arctic, using aircraft, autonomous gliders and icebreakers. The third sub-session was mostly on atmospheric processes with three talks addressing respectively the creation, the characteristics and the climatology of Polar lows in the Nordic Seas and in the Japan Sea.

The next sub-session addressed the freshwater balance and the stratification of the Arctic Ocean, the transfer of freshwater between solid and liquid phase, and how it varies seasonally and over longer periods. The final sub-session presented studies on the effects of different forcing, wind or buoyancy, on Arctic Ocean circulation.

Scientific Highlights:

- The possible effects of increased aerosol release connected with a reduced ice cover on the radiative forcing were discussed and found to be smaller than expected due to increased liquid precipitation.
- The atmospheric boundary layer over leads around Svalbard, in Storfjorden as well as north of Svalbard was investigated by aircraft and a study of ocean variability in the

marginal ice zone in the western Arctic using gliders was reported.

- The circulation and the effects of the Atlantic water on the hydrography of the Arctic Ocean were described, concentrating on eddies in the Arctic Ocean and their importance for the large-scale circulation, an example of which is how the halocline can be maintained.

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Ice Measurement in the Svalbard region (Arctic Ocean) Photo: Gerit Birnbaum

MWG: Ecosystem Studies of Sub-Arctic Seas (ESSAS) Annual Science Meeting (ASM) Symposium, "The Role of Ice in the Sea" (June 15-17, Washington, USA)

The 2015 Ecosystem Studies of Sub-Arctic Seas (ESSAS) Annual Science Meeting (ASM) Symposium was co-hosted by the School of Aquatic and Fishery Sciences and the University of Washington from June 15-17, 2015. As the meeting's primary topic was "the Role of Ice in the Sea," four themes were explored during the Symposium: humans, ice and the sea in the Subarctic and Arctic Past, the role of sea ice in the Arctic and Subarctic, the ecological role of tidewater glaciers, and social scientific investigations of changing sea ice conditions.
The "Humans, Ice and the Sea in the Sub-arctic and Arctic Past" session provided a historical framework for the consideration of contemporary ecological dynamics surrounding subarctic and Arctic ice and marine ecology including human integration in the evolution of these systems. The largest session, "The Role of Sea Ice in the Arctic and Subarctic," focused on the multiple roles of sea ice in the Arctic and the Sub-Arctic seas, including its effects on the physical and biological structure of these regions, which shapes their food webs from plankton to fish, birds, and mammals. The extent and nature of sea ice in the Arctic has been rapidly changing, affecting air-ice-sea fluxes with both regional and global consequences. "The Ecological Role of Tidewater Glaciers" session explored the role of tidewater glaciers in marine ecosystems, including the fjords of Alaska, Greenland, and Svalbard. The "Social Scientific Investigations of Changing Sea Ice Conditions" session promoted interaction among social scientists and also provided insights to natural scientists on how their research can best contribute to a better understanding of the importance of sea ice dynamics for resource users and communities in a wider social and economic context.

Scientific Highlights:

- Presentations explored the use of marine sediment records to elucidate large-scale changes in ocean temperature, sea ice cover, and ocean productivity since the last glacial, including its impacts on the migrations and settlement patterns of early people as inferred from archaeological evidence.

- Sea ice influences biogeochemical processes including the flux of CO2 into the ocean, leading to increasing acidification.
Ice algae make up a significant portion of the primary production, especially in the high Arctic, where changes in the extent of first year versus multi-year ice may be altering their role. Changes in the timing of the melting of the sea ice also influence when ice algae become available to zooplankton in spring.

- The presence of sea ice impacts commercial, recreational, and subsistence harvesters through numerous avenues. The nature of the marine food web is significantly impacted by sea ice, so that future declines in sea ice may change the resources available to different communities, potentially altering the mix, spatial distribution, and abundance of species present.

- The ways fishers and hunters respond to changes may influence the species they pursue and the ecosystem as a whole. In addition, those responses will affect and be affected by a range of social and economic factors, likely creating a complex webs of interactions rather than simple and predictable responses to changes in sea ice.

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MWG: 5th Polar Marine Diatom Workshop (July 19-24, Salmanca, Spain)

The Polar Marine Diatom Workshops (PMDW) originated from the need for a forum that would incite exchange of taxonomic skills and associated new techniques as well as providing an excellent training ground for students to receive guidance from experienced diatomists. Since 2005, the workshop has become a successful biannual event, bringing polar diatomists together for exchange of new ideas, sharing of recent results/data and fostering future collaborations enabling researchers from around the world to produce quality science. The 5th Polar Marine Diatom Workshop was held on July 19-24, in Salmanca, Spain. This workshop featured microscope sessions with equal emphasis on Neogene and Quaternary as in the past, but a special emphasis was devoted to Holocene Climatic optimum and the degalciation, addressing biostratigraphic, taxonomic, paleoceanographic and paleoclimatic issues. A special session was dedicated to the shadow's diatoms, those that live at the lower photic zone and are a good indicator of water column stratification (Rhizosolenia spp.)

Overall, the workshop succeeded in achieving the following aims:
1) in transferring sound taxonomic skills and exchanging knowledge relative to modern and fossil diatom records of polar regions,
2) in engaging the international marine phytoplankton and paleontological communities and raise the research profile and opportunity for ongoing training of students and researchers and 3) in bringing about opportunities for project development and student exchange between laboratories, focusing on recent developments or ongoing enigma in the field.

Scientific Highlights:

- Discussed the development of more complete biostratigraphic proxies and of robust proxies for paleoceanography.
- Discussed evolution of sea-ice communities and sea-ice extent and timing of climatic events in the Polar Regions.
- Discussed the building of biogeochemical coupled ocean-atmospheric dynamic models that aim to include species ecology, abundance and biomass data.

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Current and planned activities of MWG IASC Fellows:

Emily Choy and Paul Suprenand were invited to participate in thematic committees of the Arctic Observing Summit 2016 in Fairbanks.

Social & Human Working Group (SHWG)

Scientific Foci:

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

** denotes a priority within the scientific foci

IASC Social & Human Working Group at ASSW 2015 in Toyama, Japan

SHWG:
Improved Health Knowledge in the Arctic (June 2015, Oulu, Finland)

The SHWG supported a workshop during the 16th International Congress on Circumpolar Health to discuss obstacles to sustainable and long-term health monitoring in the Arctic and explore options for improved data collection and construction. Key messages from the workshop included the following:

- Common health statistics such as life expectancy or mortality rates do not provide a sufficient understanding of health status.
- With a range of different methods and terminology in use in each country, it can be difficult to compare quality of life, marginalization, discrimination, mental health, and living conditions across the Arctic regions.
- There is a need to improve the inclusion of quantitative ethnic information pertaining to individuals in the Arctic in official health registers and statistics to better understand the health status of Arctic peoples and support sustainable indigenous cultures.

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SHWG:
Special Session on "Resources, Quality of Life and Sustainable Development in the Arctic" (August 2015, Moscow, Russia)

A special session on "Resources, Quality of Life and Sustainable Development in the Arctic" was convened at the International Geographical Union (IGU) Regional Conference in August 2015. The session featured papers that examined the connection between the use of natural resources and human wellbeing in the Arctic in the context of sustainable development in different regional and institutional contexts. Key messages from the special session include the following:

- Sustainable development in the Arctic must be understood and addressed from interdisciplinary perspectives that incorporate approaches, methodologies and data from both the natural and social sciences.
- Comparative studies (between regions and across time) are of high importance and relevance in the Arctic.
- Urban issues in the Arctic, including urban sustainability, are significant and require further examination across the circumpolar region.
- There is a need for knowledge synthesis regarding sustainable development in the Arctic.
- Development of sustainable development indicators is one of the research priorities for the near future.

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Local kids excited, waiting for the sunday school bus on the Chukchi coast Photo: Florencia Mazza

SHWG: Building Arctic Resilience Workshops (October 2015, Reykjavik, Iceland & May or June 2016, Inari, Finland & Tromsø, Norway)

This initiative aims to build sustainable and resilient Arctic institutions to better cope with challenges arising from globalization. The SHWG will support early career researcher participation in a workshop in October 2015 in Reykjavik, Iceland to discuss the state of the globalized Arctic and its implications. Support will also be provided for another workshop in May/June 2016 in Inari, Finland and Tromsø, Norway to discuss new research methods.

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SHWG: Adaptation Options in the Barents Region - Synthesis and Feedback Workshop (January 2016, Bodø, Norway)

This synthesis and feedback workshop will be convened to present, discuss and synthesize published research on adaptation in the Barents region to inform a chapter in the Arctic Monitoring and Assessment Programme's assessment on Adaptation Actions for a Changing Arctic – Part C (AACA-C).

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SHWG: Infrastructure in the Arctic as a Social and Ecological Challenge (January 2016, Vienna, Austria)

This workshop will combine existing Arctic discourses and initiatives with non-Arctic perspectives to explore social and human impacts and better integrate social and ecological perspectives in the study of Arctic infrastructures.

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Indigenous Nenet Reindeer Herders, Arctic Russia Photo: Bruce Forbes

SHWG: Gender Asymmetry in Northern Communities: Building a Research Network for the Nordic Countries, Baltics and Russia (NOR-GA) (February 2016, Hamburg, Germany)

This pilot project consists of a workshop to develop a research agenda and toolkit to address gender-related social concerns in the indigenous and rural areas of the Nordic Countries, the Baltics and the Far North of Russia.

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SHWG: A European Arctic Policy: The Role of EU Non-Arctic Member States (May 2016, Spain)

With a focus on the role played by European non-Arctic Member States in designing a regional Arctic policy, this conference will tentatively take place in Spain in May 2016. It will explore the following five key issues: the European Union (EU) in the Arctic Council; European decision-making power and influence in a changing Arctic; Arctic sustainable development; the European economic crisis; and the EU and the protection of Arctic Indigenous Peoples.

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SHWG: 10th Siberian Studies Conference: Passion for Life: Emotions and Feelings in the North and Siberia (October 2016, St. Petersburg, Russia)

Support will be provided for early career researchers to participate in this conference to increase interest in Siberian anthropology and related studies, and to provide mentoring and networking opportunities for new scholars.

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Current and planned activities of SHWG IASC Fellows:

Andrian Vlakhov co-organized the Arctic-FROST Annual Meeting, St Petersburg, 15-17 August 2015.

Małgorzata Śmieszek was invited to participate in the International Organizing Committee and thematic committee of the Arctic Observing Summit 2016 in Fairbanks. She has also proposed a half-day symposium during the ASSW 2016 Business Meetings on links between natural and social sciences, entitled 'Do we speak the same language of science'.

IASC Terrestrial Working Group at ASSW 2014 in Helsinki, Finland

Scientific Foci:

- Improving knowledge at multiple spatial scales of the current state of Arctic terrestrial geosystems 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 geosystem and ecosystem change
- Determining the role of connectivity in the functioning of arctic terrestrial systems, including connections within the Arctic and the global system

TWG:

Arctic Freshwater Ecosystems Workshop (April 23-30, Toyama, Japan)

Climate change and variability are affecting freshwater systems within the Arctic and subarctic. As water integrates and propagates effects across the Arctic, these transformations will have a profound effect on both society and environment, also beyond the Arctic.
Held on April 28th in Toyama, Japan during the 3rd International Conference on Arctic Research Planning (ICARP III) (April 23-30), "Arctic Freshwater Ecosystems" workshop was a contribution to the Arctic Freshwater Synthesis (AFS), a joint project between the World Climate Research Programme's (WCRP) Climate and the Cryosphere Project (CliC), the International Arctic Science Committee (IASC), and the Arctic Council's Arctic Monitoring and Assessment Program (AMAP).

This symposium-workshop focused on how major Arctic freshwater sources, fluxes and storage components are being modified, including: atmospheric and river transport, precipitation-evaporation-permafrost/soil moisture regimes, glacier and ice cap mass balances, sea-ice formation and dynamics, and marine exchanges including oceanic storage and release of low-salinity water.

The session included a broad range of topics, including biogeochemical processes, water and nutrient fluxes, and biotic communities. The session underscored the importance of Arctic lakes and rivers as integrators of atmospheric and terrestrial processes, as conduits to the near-shore marine environments under a changing climate, and as vital resources for northern communities.

Scientific Highlights:

- This workshop allowed the exchange of key results concerning the Arctic freshwater system, and collated information on current studies on the biodiversity and ecosystem function of Arctic and sub-arctic freshwater ecosystems.
- Identified the need for multi-component numerical models to predict changes in freshwater ecosystems under future climate scenarios and the ability to predict and understand natural variability as distinct from that induced by climate change.
- Identified and discussed the importance of accurate predictions of future changes in freshwater quantity and quality for water resource managers in northern communities and also effects on infrastructure and hydrohazards.

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

TWG:

6th International Conference on Polar & Alpine Microbiology (September 6-9, Ceske Budejovice, Czech Republic)

Climate changes that were observed and documented over the last decades brought polar and alpine areas to the center of attention of the general public and international science community, including microbiologists. Understanding the processes occurring across polar and alpine environments requires a coordinated effort over space and time to capture the naturally high variability associated with Polar and Alpine Regions.
Continuing the series of highly successful meetings previously held in Rovaniemi in 2004 (Finland), Innsbruck in 2006 (Austria), Banff in 2008 (Canada), in Ljubljana 2011 (Slovenia) and Big Sky in 2013 (USA), the 6th international conference on Polar and Alpine Microbiology was held in Ceske Budejovice, Czech Republic from September 6-9, bringing together the scientific community for discourse on the latest in all aspects of cold-living microorganisms and their role in polar and alpine environments.). It was also an opportunity to share ideas and build research collaborations addressing the latest developments in microbiology in polar and alpine habitats.

Scientific Highlights:

- A study conducted field and laboratory experiments in soils from Raisduoddar, Norway and furthered understanding of the links between grazers and microbial responses to global change. The results indicated that reindeer mediated changes in the soil chemical composition and microclimate have a profound influence on the structure and functional adaptation of soil microbial communities. This role of large grazers may be a key mechanism determining the impact of warming in carbon fluxes in the tundra.
- One study showed a clear succession of microbial communities with age where communities in soils previously overridden by the ice (strongly represented by members of the Betaproteobacteria such as the genus Thiobacillus) are important colonizers of new exposed soils up to 5 years after glacier retreat. Thereafter, presence of typical soil communities such as Acidobacteria and certain members of Actinobacteria and Alphaproteobacteria (e.g. Sphingopyxis) become more prevalent.

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TWG:

2nd GTN-P National Correspondents Workshop
(September 19-20, Quebec, Canada)

The Global Terrestrial Network on Permafrost (GTN-P) is the observing network for permafrost sponsored by Global Climate Observing System (GCOS) and the Global Terrestrial Observing System (GTOS) and managed by the International Permafrost Association (IPA). It monitors the two Essential Climate Variables (ECVs) permafrost temperature and active layer thickness through more than 1000 boreholes and nearly 240 active layer grids globally located in all permafrost regions. GTN-P has gained considerable visibility in the broad science community in providing the baseline against which models are validated globally and incorporated in climate assessments.
The 2nd GTN-P workshop was held on September 19-20, as part of the 7th Canadian Permafrost Conference 2015 in Quebec, with the workshop's main focus on the GTN-P data quality control and the development of a specific plan to prepare the first GTN-P bi-annual report on the thermal state and the international monitoring quality of the Earth's permafrost areas. Further, the workshop addressed the meaning and role of GTN-P at the 11th International Conference on Permafrost that will be held in Potsdam, Germany in June, 2016.

Scientific Highlights:

- An international body of experts involved in permafrost research from the GTN-P EC and Data Management Group with the National Correspondents of GTN-P assessed the international monitoring quality of the Earth's permafrost areas by addressing the GTN-P data quality control and the spatial site-distribution on the planet.
- The workshop clearly defined (1) a specific plan of the first GTN-P bi-annual report on the thermal state and (2) the international monitoring quality of the Earth's permafrost areas as well as (3) the meaning and role of GTN-P.

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GTN-P Home Page:
http://gtnp.arcticportal.org/
Info Page for Workshop:
http://gtnp.arcticportal.org/index.php/8-news/115-news-gtnp-workshop

TWG:

Catalysts for Treeline Expansion under Global Change Workshop
(October 9-12, Perth, Scotland)

Predicting the distribution of future species under climate change is one of the greatest scientific challenges we currently face. Often, scientists try to address this challenge by looking at the direct links between climate and species distributions; however, the effects of non-climatic factors, such as disturbance and species interactions, can sometimes override climate effects. Recent studies have shown mixed responses of treeline ecosystems to global climate change. Along with treeline advance with warmer temperatures, treeline retractions or no response have also been detected. In the latter two cases, non-climatic factors or indirect climate effects (such as disturbance) likely outweigh the direct effects of climate change on tree species distributions. The main goal of this workshop is to collate common datasets and integrate current findings with the established scientific literature in order to address the question of disturbance as a catalyst of global change impacts in treeline ecosystems. This workshop will be held in October 9-12 in Perth, Scotland.

Scientific Highlights:

- Synthesize the current state of knowledge on disturbance as a catalyst for treeline ecosystem change
- Synthesize and summarize data collected through the Global Treeline Range Expansion Experiment (G-TREE).
- Identify the next research priorities and form a research framework for future initiatives in treeline ecosystem research

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TWG:

Permafrost Carbon Network
(December 14-16, San Francisco, USA)

The IPCC Working Group 1 Fifth Assessment Report highlighted the cryosphere as a major source of uncertainty in global climate projections. One of the most significant knowledge gaps related to cryosphere is the impact of thawing permafrost on the global carbon cycle. The magnitude and timing of the positive feedback between the warming climate and additional emission of greenhouse gases into the atmosphere from natural sources and particularly from thawing permafrost is unknown. The Permafrost Carbon Network framework organized a series of meetings and workshops that bring together scientists from the international permafrost science community to synthesize data on permafrost carbon.
This upcoming meeting will bring together network participants that have been leading syntheses in the last four years and continue to be engaged in new synthesis activities planned over the next couple of years. This workshop is also a key event in engaging new participants to start new synthesis activities that have been identified in previous meetings based on missing gaps and important research areas.
The new research areas focus around a) analysis of permafrost carbon feedback and permafrost physical representation in the context of CMIP6 activities, b) carbon pool estimates in Yedoma, c) radiocarbon dating and carbon cycling in permafrost, and d) methane hydrates in permafrost regions.
This meeting will take place during the American Geophysical Union Fall Meeting in December 14-18, in San Francisco.

Scientific Highlights:

- Discuss circumpolar datasets that link terrestrial ecosystems (boreal forest, tundra, peatlands) with the cryosphere.
- Advance model development by exploring possible benchmarking tools (e.g. planning of possible proposals) that can be provided by field and lab based scientists and finalizing model output from the Permafrost Carbon Model Intercomparison Project that estimates the permafrost carbon climate feedback for this century and beyond.

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Current and planned activities of TWG IASC Fellows:

Josefine Lenz co-organized the GTN-P workshop in Québec, 19-20 September 2015. She is also co-organizing the International Conference on Permafrost (ICOP) in June 2016 in Potsdam and a 2-day young researcher workshop prior to the conference; **http://icop2016.org/index.php/program/young-researcher-activities**, where other Fellows will also be actively involved.

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