ASSW2015 Conference Session Report
For ISAR-4 and ICARP III Sessions

Name of Session A1: Understanding the Arctic climate change and its global influences: Japan's contributions and suggestions for the future
Main organizer(s) Kumiko Takata, and Hiroyuki Enomoto
Short (1 or 2 Paragraph) Summary[1] The interdisciplinary and comprehensive studies on climate changes in the Arctic and its global influences are presented from all the related fields. The aim of this session is largely associated to the ISAR-4 priorities, and is related to the research activities of the GRENE Arctic Climate Change Research Project in Japan. More than 100 participants joined the two oral slots, exhibiting discussion among scientist from different fields. The number of posters, 24, was the largest one. In the 1st slot, changes and its mechanisms for sea-ice, ocean circulation, climate, atmospheric circulation, and ice-sheet were discussed on the basis of energy-water balances and cycles. In the second slot, changes and its mechanisms in the geochemical cycles, black carbon, and the marine and terrestrial ecosystems were shown by various measurements and models.
Main possible contributions to ISAR-4 and/or ICARP III[2] **in terms of the ISAR-4 and/or ICARP III priorities**[3] The aim of this session is to present and discuss the interdisciplinary and comprehensive studies on climate changes in the Arctic and its global influences, and is largely contributed to the ISAR-4 priorities. GRENE Arctic climate change research project investigated climate system and relation to various environments, and also suggested problems remained. These approaches are main focus of ISAR-4 and substantial flat of the establishing scientific trial for the coming decade, namely aims of ICARP III. Importance of changes in not only sea-ice distribution but also its volume was shown, and its relations with ocean/atmospheric circulation and its climate impacts were discussed. Besides, the mechanism of polar amplification was proposed. Results of changes in geochemical cycles and ecosystems were shown by various measurements and models, and future issues to understand its variations and mechanisms were discussed.

[1] Provide a short summary of the activity

[2] List a few key statements (findings, priorities, recommendations) that you would like to see reflected in the overarching ASSW2015 Conference Statement and ISAR-4/ICARP III Report

[3] ISAR-4 priorities:

- detect and understand recent changes in the Arctic, with a specific focus on processes affecting the global system
- facilitate scientific discussions and promote further national and international cooperation and collaboration, in particular between Arctic and non-Arctic countries

ICARP III priorities:

- identify Arctic science priorities for the next decade
- coordinate various Arctic research agendas
- inform policy makers, people who live in or near the Arctic and the global community
- build constructive relationships between producers and users of knowledge

ASSW2015 Conference Session Report
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Name of Session A2: Paleoclimatic perspective on Atctic changes and polar amplification
Main organizer(s) Kenji Kawamura, Ayako Abe-Ouchi, Masanobu Yamamoto
Short (1 or 2 Paragraph) Summary[1] The session began with introduction of the IASC-endorsed program "PAST Gateways" and the Japanese "long-term plan for Arctic paleoenvironmental research" (a national contribution to ICARP-III), followed by a series of scientific talks and posters on diverse topics of past Arctic atmosphere, ocean and cryosphere, covering various periods and utilizing various materials and methods (ice cores, marine and terrestrial sediments, geomorphology, historical documentation, ice sheet/climate models, etc). The periods discussed in the presentations are the last century, the last millennium, the Holocene, the last deglaciation, the last glacial and the last several glacial cycles. The session also demonstrated the importance of gathering scientists who are tackling the issues from different continents (Eurasia, North America) and oceans (Atlantic, Pacific) to discuss together towards full documentation and understanding of the past Arctic changes.
Main possible contributions to ISAR-4 and/or ICARP III[2] **in terms of the ISAR-4 and/or ICARP III priorities**[3] Since the Arctic climate has been dynamically changing, research focuses should be put on transitions between states and interactions between components. Paleoenvironmental reconstructions in the Arctic remain important, especially on Greenland and Arctic ice sheets, sea ice and related paleoclimatic parameters, with accurate dating. Multidisciplinary approaches are necessary, especially terrestrial/ocean/ice-core studies and data-model comparisons, towards better understanding of processes and interactions.

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ASSW2015 Conference Session Report
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Name of Session

A4: Geospace over and related to the Arctic region

Main organizer(s)

Yasunobu Ogawa (NIPR)

Short (1 or 2 Paragraph) Summary[1]

Many phenomena in the near-earth space environment (Geospace) significantly affect human activities and social infrastructures in the Arctic regions. The Geospace (A4) session and its side meeting were held as an international forum to discuss recent progress in this area and to advance the operation and development of essential research infrastructures. Fifteen oral talks were presented to an audience of about 40 scientists. Fourteen posters were presented in the associated poster session. An open side meeting was also held with 26 attendees, with short reports from each institution and short introductions to the poster papers. Most of the attendees continued fruitful discussions on recent progress and further collaborations in the following dinner party at a local restaurant. This was the first STP (Solar-Terrestrial Physics) session at ASSW/ISAR and it demonstrated how important such sessions are for furthering our understanding of the relationship between the Geospace and Arctic regions. Five young scientists received partial travel support by the ROSMIC/VarSITI of SCOSTEP under ICSU, and presented their papers in the session.

Selected topics from the session presentations included:

(1) High energy particles from space reaching the Arctic region along the earth's magnetic fields are being studied through various observation and modeling techniques. Outstanding results include an understanding of the significant changes of chemical species such as NOx to low altitudes and a qualitative and quantitative estimation of the hazard presented by cosmic ray radiation to the crews of aircraft flying over the arctic regions.

(2) Corresponding to the increase of greenhouse gasses such as CO_2, the atmosphere above stratosphere is significantly cooled. The cooling trend of the upper atmosphere in the last few decades were quantitatively reported by both IS radar observations and modeling, and the effect of CO_2 increase has been discussed.

Main possible contributions to ISAR-4 and/or ICARP III[2] in terms of the ISAR-4 and/or ICARP III priorities[3]

The Arctic geospace is now known to be coupled to the global atmosphere through atmospheric dynamical processes including circulation and waves. This session has contributed to understanding of the global and vertical atmospheric coupling processes, in relation to the recent changes in the Arctic. It should be emphasized that these geospace researches, such as ground-based/space-borne observations, theories and modeling, are mostly done by international cooperation and collaboration between Arctic and non-Arctic countries.

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ASSW2015 Conference Session Report
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Name of Session A5: The Climatic Threat from Arctic Offshore Methane
Main organizer(s) Peter Wadhams
Short (1 or 2 Paragraph) Summary[1] This session consisted of only four papers. The first, and keynote paper, by N. Shakhova at al., on "Decadal progress in quantitative estimate of methane fluxes from the East Siberian Arctic Shelf" could not be given because of the illness of N. Shakhova. P. Wadhams' talk which followed , on "Evolving ice and ocean conditions in the East Siberian and Laptev Seas relevant to methane emissions" was expanded somewhat to survey some of the material that would have been discussed by Shakhova. New work was described in three areas, all very interesting. Y-G Kim (Korea) talked on "Gas hydrate stability zone associated with subsea permafrost thawing in the Canadian Beaufort Sea inferred from marine heat flow measurements". This dealt with heat flow measerements done from the research ship "Araon" in 2013-14, with the promise that further work will be done in the East Siberian and Chukchi Seas throughout the 2016-20 period, which should be of great value in delineating available methane volumes and rates of release. D. Sasano (Japan) talked on "Relationship between CH4 and CO2 in the surface seawater in the western Arctic Ocean". This dealt with work done from MV "Mirai" in September-October 2012, in which the authors found that the partial pressure of dissolved methane was always supersaturated in the Barrow Canyon area, indicating a seabed source of methane emissions. H. Ma (Norway) talked on "Methanogenetic diversity and activity in the forehead of Austre Lovenbreen and Midre Lovenbreen Glaciers". These are two glaciers in Svalbard, and in the frontal area there is a rich geochemistry relating to under-ice processes and including methane release.

[1] Provide a short summary of the activity

Main possible contributions to ISAR-4 and/or ICARP III[2] in terms of the ISAR-4 and/or ICARP III priorities[3]

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ISAR-4

ASSW2015 Toyama Arctic Science Summit Week

ICARP III 3RD INTERNATIONAL CONFERENCE ON ARCTIC RESEARCH PLANNING

ASSW2015 Conference Session Report
For ISAR-4 and ICARP III Sessions

Name of Session

A6: Climate and ecosystem vulnerability in the terrestrial northern high-latitude

Main organizer(s)

Yoshihiro Iijima, Yongwon Kim, Tetsuya Hiyama, Yojiro Matsuura, and Kazuyoshi Saito

Short (1 or 2 Paragraph) Summary[1]

The A06 session had 20 oral (2 cancelled) and 16 poster presentations. About half of the presentations were contributed by Japanese participants and the other half by international participants. The session could effectively exchange brand-new results on broad range of terrestrial Arctic environmental issues along with four sub-session themes.

Main findings by each oral presentation are as follows:

A06-1: Terrestrial carbon source and evaluation: effectiveness airborne measurements in cooperate with machine learning analyses for regional scaling of turbulent methane fluxes in north slope Alaska (Serafimovich et al.). ICE-ARC Climate change impacts on Arctic and boreal terrestrial ecosystem to assess GPP and NEP output by C-cycle model (CESM) for 1982-2005 (Diel et al.). CAPEC Arctic Permafrost Environmental Change Monitoring since 2011 showed preliminary results on CO2 exchange rates & CH4 budget at Council, AK (Park et al.). Water table heterogeneities (sub-grid scale) affect the system hydrology, changing the water balance by stochastic generated polygon model in Tundra region (Aleina et al.).

A06-2: Supersite observation and iLEAPS: N fertilization and root cut experiment at boreal forest plot in central Siberia showed significantly increase in root respiration rather than microbial respiration (Morishita et al.). SOC accumulated by supply of lichen and moss litter at poor drainage, and local cryoturbation may be an importance of SOC in deeper soil at Inuvik site (Fujii et al.). Local/mesoscale atmospheric processes (topo-climatic wind system) significantly impact the surface energy balance at Alert & Eureka station of IASOA (Persson et al.). Permafrost landscape of central Yakutia , Yedoma ice region, in particular, has rapid response to recent climate changes and anthropogenic influence (Fedorov et al.). Storm activity along Siberian coastal region affected recent increase in rainfall and snow in eastern Siberia and enhanced permafrost warming and thawing (Iijima et al.).

A06-3: Changes in water and material cycling of permafrost ecosystems: The future warming may decay surface permafrost, resulting in drier soil lower tree NPP in boreal (larch) forest in eastern Siberia simulated by SEIB-DGVM (Sato et al.).

Osawa et al.: Biomass development estimation was developed and applied at pan-arctic boreal forests: different response in temperature was shown in NW Canada.

Macias-Faria & Forbes: Direct (cold-air advection) and indirect (atmospheric pattern change) effects of sea ice reduction on productivity at Circum-Arctic Tundra region.

Ichii et al.: Regional CO2 fluxes by site-obs. and remote sensing reproduced GPP and NEE in Siberia, compared with GOSAT and model inter-comparison (AsiaMIP) outputs.

A06-4: Intercomparison in modelling and datasets for the terrestrial Arctic: GTMIP stage 1 had started to assess model performance on physical & biogeochemical processes and the observation-based dataset are archived (Saito et al.). Process-based hydrological model

[1] Provide a short summary of the activity

applied in local watershed in central Siberia and showed importance of organic layer thickness and soil drainage conditions (Levedeva et al.). Shrub expansion in Alaska was simulated by SimShrub dispersal model and appears to have been driven by clonial reproduction or short-distance dispersal (Naito et al.). NIES TM simulation combining tower, aircraft and GOSAT output to assess XCO2 distribution and forest fire effect in west Russia can be captured by this methods (Belikov et al.). Climatic condition for intensive tundra fire associated with sea ice reduction at northern Alaska in 2007 was simulated by WRF (Alexeev et al.).

Main possible contributions to ISAR-4 and/or ICARP III[2] in terms of the ISAR-4 and/or ICARP III priorities[3]

The session could perform well-structured discussion on (1) atmospheric influence on terrestrial environmental changes, (2) permafrost and ecosystem changes in boreal and tundra regions, (3) in-situ and regional assessments on surface energy/water/carbon (both CO2 and CH4) balances, and (4) land-surface physical and biogeochemical modeling. These topics may have possible important inputs on ICARP III activity.

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ICARP III priorities:

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- coordinate various Arctic research agendas
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ASSW2015 Conference Session Report
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Name of Session B2: Current and Future Observing Strategies for Understanding the Evolving Arctic Climate and Ecological System
Main organizer(s) Gijs de Boer, Jacqueline Grebmeier, Are Olsen, Martin Raillard, Terry Callaghan, Leif Anderson
Short (1 or 2 Paragraph) Summary[1] This session included a series of presentations on observing activities and strategies in the Arctic region. These activities ranged from those currently in development (e.g. MOSAiC, ecosystem monitoring from ice-tethered platforms, Pacific Arctic Climate Ecosystem Observatory), established wide-ranging observing programs and networks (e.g. IASOA, InterAct, Global Cryosphere Watch, Distributed Biological Observatory, Pacific Arctic Group, Arctic Ocean Boundary Array), and some more localized efforts in specific locations (e.g. Svalbard Observing activities, SIZONET). In addition, there were presentations on observational efforts that required some integrated observing platforms (e.g. radiosonde impact on Arctic cyclone forecasting, tracking of water vapor isotopes over Alaska, international joint ship operations). In addition, we had two group discussions focused around Arctic observing. The main discussion was held as a panel discussion (panelists: Matthew Shupe, Larry Hinzman, Koji Shimada, Harald Loeng) on central challenges in Arctic observing. This discussion allowed each of the panelists to provide brief introductory remarks, which were followed by a wide-ranging discussion with broad participation. The content of this discussion is the basis for many of the ICARP III contributions discussed in the next section. In addition, as a result of some last minute openings in the agenda*, we also had a brief discussion on the apparent lack of contributions from observing efforts of the terrestrial biosphere. While several possible reasons were discussed, including a less cohesive community relative to those of the atmosphere and marine environment, it was also brought up that the small sample of efforts highlighted in this session may not be representative of the community as a whole. * Three presenters (B02-O05, B02-O17, B02-O18) were not present at the meeting
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ICARP III priorities:

- identify Arctic science priorities for the next decade
- coordinate various Arctic research agendas

Based mainly on the panel discussion, several ICARP III relevant topics were covered within this session.

In terms of Arctic priorities over the next decade, some central points of the discussion included:

- Interdisciplinary research efforts in order to understand interactions between different parts of the Arctic system
- Understanding the changing Arctic environment and building understanding of emerging features (i.e. spatial increase in first year ice zone)
- Development of autonomous observing platforms in order to increase efficiency with which grid-box scale variability can be obtained. In particular, it was noted that autonomous measurement of the atmosphere seems to be behind that of the ocean at the moment.
- Ensuring that collected datasets are used to their fullest extent by a variety of stakeholders

Coordination of Arctic research agendas also came up in the discussion. Specific points that were raised include:

- The need to avoid duplication of effort and target the most needed scientific areas
- Developing more permanent collaboration between groups and nations. Such collaboration should extend beyond the length of any individual effort or field campaign and would ideally continue on regardless of political headwinds.
- The global reach of the Arctic requires that Arctic and non-Arctic nations alike spend resources to understand this environment. How these efforts can most efficiently be blended and how non-Arctic nations can best gain access to the Arctic was a question that was raised. This takes interagency and international coordination. Given the current geopolitical interest, the point was raised that now may be a very good time to pursue such coordination.
- A final point that was raised is that the short-term funding model under which most scientists are operating is challenging for the development and maintenance of monitoring efforts.

Finally, in terms of informing stakeholders and building constructive relationships between producers and users of knowledge a few additional points were raised:

- It is not clear that all datasets and information are accessible to stakeholders outside of the international research community. What is meant by this is that the products of our observing efforts must not only be put in a data archive somewhere, but through some mechanisms it is necessary to ensure that the data is in a format that is relevant for the main users of the datasets

Additionally, it was brought up that the changing nature of the Arctic adds an element of complexity for defining stakeholder needs, since these needs are changing quickly as well. From a model improvement perspective, this dictates a need for early and frequent interaction between the modeling and observational communities to ensure efficient deployment of limited observational resources.

- inform policy makers, people who live in or near the Arctic and the global community
- build constructive relationships between producers and users of knowledge

ASSW2015 Conference Session Report
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Name of Session B3: Changing permafrost and its impacts on the physical, ecological, economic, and cultural earth system
Main organizer(s) Ylva Sjöberg, Hiroki Takakura, Mamoru Ishikawa
Short (1 or 2 Paragraph) Summary[1] The session covered a wide range of topics related to changing permafrost, including cultural, anthropological, engineering… The traditional and technological land use in permafrost and the impact of climate change were described, and the potentiality of interdisciplinary approach was discussed in the first block of the panel. The different influences in rural of Yakutia (East Siberia) and urban (Russian Arctic) are clearly shown by interdisciplinary approach. While the impact of the construction in urban area and the adaptation are relatively seen ubiquitously in the Russian Arctic, there are different types of impacts and measures in rural area according to vegetation and subsistence culture, which should be explored in further research. The second block contained presentation of ongoing international permafrost community initiatives (Permafrost Research Priorities, IPA projects, GTN-P) and concluded with a discussion panel on future challenges for permafrost research. There was good participation from the audience in the discussion and the topics included future leadership, the broadening of permafrost research and inclusion of new research groups/fields, innovative and new ideas and paths for permafrost research, and much more. The session also included several presentations of original research on various permafrost-related topics, most of which were presented in the third block and in the poster session.
Main possible contributions to ISAR-4 and/or ICARP III[2] in terms of the ISAR-4 and/or ICARP III priorities[3]

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Some future challenges for permafrost research were discussed during the session. Permafrost research is becoming more inter/trans-disciplinary as permafrost areas are changing and impacting other natural and social systems. Finding the best way of including new fields of research in existing initiatives, such as PRP, and monitoring activities, such as GTN-P is an important challenge for conducting efficient permafrost research.

ASSW2015 Conference Session Report
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Name of Session
B5: Remote Sensing of the Arctic System

Main organizer(s)
J. Cherry, K. Sugiura, M. Hori, W. Schoener

Short (1 or 2 Paragraph) Summary[1]

This session included papers on the latest results in the field of satellite, airborne, tower and upward-looking remote sensing of the atmosphere, ocean and terrestrial biology/phenology, snow and ice, and hydrology and permafrost. Presentations were made by participants from Japan, U.S., Russian, Norway, China, Korea, Germany, and other countries. Posters and talks included analysis of stand-alone remote sensing data, calibration and validation with *in situ* and other observations, comparison with model output, and assimilation of remote sensing data in modeling systems. Highlights also included use of new technology such as UAVs and low cost time-lapse camera systems. Other technologies such as satellite algorithms are continuing to evolve and mature through ongoing research.

Main possible contributions to ISAR-4 and/or ICARP III[2] in terms of the ISAR-4 and/or ICARP III priorities[3]

The topics of the sub-themes in the Remote Sensing program highlight areas where remote sensing research is particularly active for the Arctic: atmospheric science (including fire), biology and phenology, snow and ice, and hydrology and permafrost.
Several possible priorities emerge:

1. Cloud-aerosol interactions and cloud-energy balance feedbacks in the context of synoptic dynamics are likely changing due to changing aerosol loading and climate system feedbacks in the Arctic. One priority is to better estimate and calibrate cloud properties and energy parameters for the atmosphere and understand their interactions with the whole climate system.
2. Algorithms for detecting ecosystem responses to climate change and variability continue to evolve so that they are accurately representing change for Arctic

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ecosystems. Likewise, technology—hardware and software, particularly imaging—is evolving and a priority is to develop new quantitative methods of analyzing these data as appropriate, particularly comparison across various spatial scales.

3. Priorities for snow and sea ice research include continuing to refine algorithms for ice thickness, snow water equivalent and fractional coverage, lead detection, ice velocity, and characteristics based on regional and age-related differences. Continuity between satellite sensors over time is important to establish; improved validation datasets and multi-sensor/modeling systems will also be critical.
4. Interactions between snow, ice, and oceanic, atmospheric and terrestrial geochemistry are an emerging and important field of study because of impacts on the GHG, mercury, and ozone budgets.
5. For hydrology and permafrost, long-term change detection is possible between satellites and historical airborne imagery, but the challenge is the effort involved in processing the imagery; the community could benefit from datasets of pre-processed historical imagery.
6. The hydrology community has used remote sensing for diagnostic studies of characteristics and change on the land surface, but few efforts have used remote sensing to assimilate into or initialize prognostic models. This is an important area for future growth.
7. Synthetic Aperture Radar (SAR) is a particularly important technology for remote sensing of cold regions and the research community should support ongoing deployment of SAR missions, especially high resolution in time and space. Data should also be as accessible as possible, including in near-real time for flooding response.

Processes driving carbon balance, and whether high latitudes are sources or sinks, are still uncertain and more observations and longer time series are needed. Results using remote sensing suggest that the boreal forest is a carbon sink and the tundra is a carbon source, but climatic variables driving these processes may vary with time.

ISAR-4

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Name of Session

B6: A Pan-Arctic Challenge: Predicting the Future of Marine Biota and Ecosystem Connectivity Through Field Studies and Data Integration

Main organizer(s)

Dieter Piepenburg, Lee Cooper, Sung-Ho Kang

Short (1 or 2 Paragraph) Summary[1]

Arctic marine systems are experiencing environmental change, including regional warming and acidification, ice-shelf and sea-ice decline, and variable biological and ecosystem response in response to shifts in ocean and atmospheric forcing. These changes have significant impacts on marine biota on variable time and space scales, with distinct differences around the Arctic. Moreover, increasing human activities, such as exploration/exploitation of resources, ship traffic and mass tourism, add further pressures on polar ecosystems. Substantial effects on marine biota from sea surface to seafloor are expected, leading to shifts in all ecosystem functions and services (e.g., biodiversity, trophic interactions, carbon and nutrient cycling). To understand and predict the profound ecological consequences of these environmental changes – and ultimately mitigate them through ecosystem-based management – there is a need to monitor and describe the ecological status quo in terms of structural and functional properties not only on national (regional) but also international (pan-Arctic) scales, and to identify and analyze the relationships among environmental factors and ecological processes in time and space. To address this challenge, close international research cooperation is required to combine data and expertise in joint efforts to establish reliable, quality-controlled and geo-referenced information systems integrating a wide range of data on Arctic marine biota (e.g., plankton, benthos, fish, marine birds and mammals) with physical forcing aspects of the ocean-atmosphere system. Development of coupled models that link species distributions to organism energetics in the context of dynamic climate and oceanographic models would allow analysis and scenario building. Ultimately, success with these approaches will provide a more complete understanding of mechanisms connecting external drivers and ecological responses on regional and pan-Arctic scales.

This multidisciplinary and international session included contributions on emerging results from synthesis, field and modeling studies. These contributions demonstrated the importance of key ocean-atmosphere interactions, including sea-ice dynamics, physical and biogeochemical processes in the water column, and biological response throughout the marine food web. Data were presented on changes to external forcing that may promote marine species shifts or evidence of major ecosystem response and/or reorganizations, as well as reports on ongoing and/or planned international and trans-disciplinary collaboration in field activities and large-scale data integration. The session provided a state-of-the-art evaluation of environmental status and trends in a pan-Arctic framework, including the connectivity among physical forcing, biogeochemical cycling, biological response, and ecosystem modeling.

[1] Provide a short summary of the activity

Main possible contributions to ISAR-4 and/or ICARP III[2] in terms of the ISAR-4 and/or ICARP III priorities[3]

The session demonstrated the huge opportunities for international pan-Arctic field-studies and data-integration efforts in advancing our knowledge and understanding of key environmental processes influencing the distribution of marine species, communities and ecosystem dynamics in the changing Arctic. Presentations to the session included descriptions of observed changes in regional locations as well as across the Arctic and strategies for evaluating pan-Arctic research challenges. In addition, new techniques were presented for evaluating ocean acidification, genomic sequencing for characterizing phytoplankton communities and other forward-looking approaches that will contribute to better understanding of Arctic environmental changes.

At the end of the session, an open discussion identified a number of recommendations for high priority for marine Arctic research for the next ten years to come:

- Case studies that take advantage of targeted geographical areas for time-series monitoring. The Pacific Arctic Group (PAG) initiative, which includes the Distributed Biological Observatory (DBO), was seen as a model that could be expanded to other parts of the Arctic. Challenges remain, including the need for coordinated and consistent sampling and data-processing standardization/harmonization.
- Modeling activities that take advantage of archived data, including development of predictive scenarios
- International efforts for resolving technical aspects pertaining to publicly accessible pan-Arctic information systems
- Development of appropriate ecosystem-based management measures and identification of priority decision-making issues that are at the interface of science and environmental management
- Initiation of planning for a 'Synoptic Arctic Survey' that would be an "Arctic analogue" to the 'Joint Global Ocean Flux Study' (JGOFS)

Moreover, the session participants also pinpointed a number of complexities that remain to be resolved to foster the scientific progress, particularly pertaining to the coordination of contributions to the identified ICARP III priorities, including the research agendas of ‘non-Arctic-Council’ states.

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ASSW2015 Conference Session Report
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Name of Session B7:Atmosphere-Ocean-Ice interactions and aspects related to a seasonally ice free Arctic Ocean.
Main organizer(s) Bert Rudels, Günther Heinemann, Thomas Spengler
Short (1 or 2 Paragraph) Summary[1] **(first day, part 2), by Günther Heinemann** The session addressed the atmospheric boundary layer (ABL) and atmosphere-sea ice-ocean interactions. Experimental studies from recent field experiments were presented. Aircraft, ships and ocean gliders were used. In addition, results from CMIP5 models were shown for the development of sea ice in the Alaskan Arctic during the 21st century. **Summary**[2] **(second day)** The morning session addressed the Atlantic water circulation, its dynamics and its interactions between the boundary current and the basin interior, and how that is affected by the freshwater input, both as river runoff and net precipitation and by melting and freezing sea ice. Changes in the Atlantic circulation observed from tracer measurements and model work and likely related to changes in the atmospheric circulation pattern (AO+ and AO-) were presented. Different vertical mixing mechanisms in the deep basins and at the continental slope as well as on the shelves were discussed. The first afternoon session was devoted to freshwater, its sources and sinks, storage and redistribution in the different basins, and its phase changes between sea ice and liquid freshwater present in the water column. Indications of transition to a seasonal ice cover and its possible effects on the circulation and mixing were also discussed. The last afternoon session brought together presentations of the different forcing mechanisms driving the Arctic Ocean circulation, and how to describe and quantify the observed mixing and water mass transformations. Observations of the variability of the Atlantic inflow as well as of the seasonal variability of the exchanges through all the different passages and their effects on the heat and freshwater budgets were presented. Finally results of modelling efforts with a simplified box model as well as with a comprehensive climate model were shown.
Main possible contributions to ISAR-4 and/or ICARP III[3] **in terms of the ISAR-4 and/or ICARP III priorities**[4]

[1] Provide a short summary of the activity
[2] Provide a short summary of the activity
[3] List a few key statements (findings, priorities, recommendations) that you would like to see reflected in the overarching ASSW2015 Conference Statement and ISAR-4/ICARP III Report
[4] ISAR-4 priorities:

- detect and understand recent changes in the Arctic, with a specific focus on processes affecting the global system

(3) research questions for the next decade:
How can we better quantify air-sea-ocean interaction processes?
How can the representation of atmospheric boundary layer processes be improved in weather and climate models?
How will air-sea-ocean interaction processes change during climate change?

All of the presentations on the second day mainly addressed the question of research priorities (1) for the next decade, showing the urgent questions and the lack of definite answers. In many cases they also highlighted the need to coordinate different research agendas (2). Practically no time was devoted to (3) and (4)

- facilitate scientific discussions and promote further national and international cooperation and collaboration, in particular between Arctic and non-Arctic countries

ICARP III priorities:

- identify Arctic science priorities for the next decade
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- build constructive relationships between producers and users of knowledge

ASSW2015 Conference Session Report
For ISAR-4 and ICARP III Sessions

Name of Session B9: Arctic Governance, Sustainable Development of Local Communities and Non-Arctic State's Contribution
Main organizer(s) Shinichiro Tabata, Elena Conde, Rasmus Bertelsen
Short (1 or 2 Paragraph) Summary[1] Various issues concerning Arctic governance and international politics were discussed. Especially, the role of non-Arctic countries or observers to the Arctic Council, including China, Japan and EU countries, attracted great attention. The autonomy / self-governance of indigenous peoples was another topic of active discussion. In addition, natural resource development and its influence on indigenous peoples' lives was addressed, with particular emphasis on the importance of fiscal policies, taxes and subsidies.
Main possible contributions to ISAR-4 and/or ICARP III[2] **in terms of the ISAR-4 and/or ICARP III priorities**[3] Key contributions and suggestions arising from the ensuing discussion included: -The role of non-Arctic countries and observers in the Arctic Council should be enhanced and coordinated. We should pay more attention to the role of these countries in future research. -Cooperation among Asian countries in the Arctic should be pursued. Their policies should be cooperative rather than competitive. The possibility of an integrated approach towards the Arctic among these countries remains to be examined in greater detail. -We should devote more attention to human factors, including fiscal policies, taxes and subsidies, when we discuss natural resource development in the Arctic, especially in areas where indigenous people live. Among natural resources, the case of mineral resource development and its effect on local livelihood should become a central feature of future research. -Autonomy or self-governance of indigenous people should be an important focus of future research. The comparison of various indigenous peoples in the Arctic seems to be a promising direction.

[1] Provide a short summary of the activity

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ASSW2015 Conference Session Report
For ISAR-4 and ICARP III Sessions

Name of Session

B10: Ice mass loss in Greenland and Arctic glaciers under the influence of changing atmosphere and the ocean

Main organizer(s)

Shin Sugiyama, Ursula Schauer, Teruo Aoki, Nozomu Takeuchi, Camilla S. Andresen

Short (1 or 2 Paragraph) Summary[1]

Oral sessions took place on 28 and 29 April in Room 203 with ~50 people in the audience. Six talks (15 minutes) were allocated to each of the four sessions entitled, "Dynamics of the Greenland ice sheet" (chaired by Shin Sugiyama), "Interaction of glaciers and the ocean" (Ursula Schauer), Arctic glaciers (Nozomu Takeuchi), and "Snow/ice impurities and surface energy balance" (Teruo Aoki). On 29 and 30 April, nine posters were presented and actively discussed at the foyer.

The talks and posters reported research results on the ice sheet, calving glaciers and ice caps in Greenland; glaciers in Svalbard and other Arctic regions; and the ocean nearby the ice sheet and glaciers. A number of presentations were made from recent Japanese activities in Greenland and Siberia. Several Polish researchers presented field data on ice-ocean interaction in Svalbard. Also presented are an international research project in the northeast Greenland lead by Germany, and the summary of GROCE (Greenland ice sheet and its interaction with the ocean) workshop held at AWI in December 2014.

Main possible contributions to ISAR-4 and/or ICARP III[2] in terms of the ISAR-4 and/or ICARP III priorities[3]

[1] Provide a short summary of the activity

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ASSW2015 Conference Session Report
For ISAR-4 and ICARP III Sessions

Name of Session

B11: Navigation and Fisheries in the Arctic: Prospects, Problems and International Policies

Main organizer(s)

A. Ohmura, H. Huntington, K. Hedges

Short (1 or 2 Paragraph) Summary[1]

The session B-11 was attended by 30-45 participants. The scope of the session is to encompass the developments in the Arctic, ranging from the climate changes to the societal impacts, specifically navigation and fisheries within the Arctic. The themes of the 13 presented papers covered the present situations of the climate change and sea ice conditions, navigational requirements in sea ice, navigational support, present fisheries conditions, detected and projected changes in fisheries in the Arctic seas, changes in fisheries industry, change in ecology, and thoughts as to how to cope and adapt to the changes in progress in the Arctic seas and their surroundings.

Especially new facts presented in this session are: the observed rate of the increase in infrared radiation in the Arctic (4 Wm^{-2}/decade), which is almost twice of the global mean increase rate (2.5 Wm^{-2}/decade); the potential menace by icebergs that are increasing in number; proposal for ice condition forecasts of various temporal length ranging from 3 months to an hour; necessity for standardizing the qualification of ice navigators; available communication safety techniques; migration of various species into the Arctic seas; newly available fishing possibilities in the marginal seas; and the prospects for an international agreement on fishing in the high-seas area of the central Arctic Ocean.

Main possible contributions to ISAR-4 and/or ICARP III[2] **in terms of the ISAR-4 and/or ICARP III priorities**[3]

The session evoked a considerable positive reaction among the participants, and wishes are expressed to encourage organizing a session with a similar them in the next ICARP/ISAR. An opinion was also expressed to narrow the sphere of the themes within a particular issue of the fisheries. Another opinion went that other activities, such as mining, gas/petroleum exploitation, and marine transport can be included under the impacts. These points can be discussed further in the future when the next ICARP/ISAR becomes keen to adopt these themes in the conference.

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ASSW2015 Conference Session Report
For ISAR-4 and ICARP III Sessions

Name of Session C1:Sharing Arctic Data, Observations and Knowledge: Understanding the Global System through International Exchange
Main organizer(s) Peter L. Pulsifer, D.R. Fraser Taylor, Julie Friddell
Short (1 or 2 Paragraph) Summary[1] This session focused on the opportunities and challenges related to the sharing of Arctic data, observations and knowledge. This diverse set of talks addressed many topics ranging from data sharing norms and value propositions, policy, methods and technology, interoperability, establishing appropriate levels of standardization, education and training, and the use of information technology in field work. A core theme throughout many of the talks was the need to promote international data sharing through an ethically open data model. The *IASC Statement of Principles and Practices for Arctic Data Management* was referenced as an important guiding document in this regard. The need to link metadata, data and data systems while providing researchers and other users with the tools and methods required to effectively access, navigate and use this integrated system is critical. Making progress will require a multi-pronged effort that must engage all actors (scientists, data managers, residents of the Arctic, funders, stakeholders, international programs and others). Leveraging, maintaining and expanding existing resources will be important so that new resources can be applied to filling important gaps identified by the broader community. Promoting the education and training of early career researchers is a particular priority area so that data management is considered an integral part of methodological training and education.
Main possible contributions to ISAR-4 and/or ICARP III[2] in terms of the ISAR-4 and/or ICARP III priorities[3] The topics and activities can contribute to all ICARP III priorities. Hey *et al*. (2009) and many others have revealed how 'data intensive science' can reveal new patterns and relationships not possible before the advent of networked and accessible, 'big' data,

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information and knowledge systems. Leveraging this scientific methodology will continue to support the achievement of Arctic science priorities. Linking data resources will contribute to coordinating and advancing national and international research agendas. Providing appropriate data access and visualization tools will support informing policy makers and people who live in or near the Arctic and the global community. Similarly, providing mediated and appropriately transformed data will provide a critical linkage between data producers (e.g. scientists, traditional knowledge holders) and users (e.g. policy makers, general public, students).

ASSW2015 Conference Session Report
For ISAR-4 and ICARP III Sessions

Name of Session C2: Arctic in Rapid Transition-future research directions from the perspective of early career scientists
Main organizer(s) Makoto Sampei, Alexey Pavlov, Monika Kedra
Short (1 or 2 Paragraph) Summary[1] The C2 session, held on last day of the ASSW 2015, consisted of morning and afternoon sessions. The session included 7 talks, 2 discussion sections and 6 posters. In total, 20-30 participants, including early-to-mid career scientists as well as senior researchers, attended both morning and afternoon sessions. During this session, both original research presentations as well as future research directions from research networks (e.g. ART, PYRN) were presented. Based on those presentations, we had constructive discussion on future research directions from the perspective of early career scientists including recommendations from senior scientists.
Main possible contributions to ISAR-4 and/or ICARP III[2] **in terms of the ISAR-4 and/or ICARP III priorities**[3] • It is necessary to establish the way how we can incorporate contributions of Early-to-mid career scientists' perspectives into future Arctic research planning (e.g. ICARP III or IV). • Call for a facilitation/development of schemes supporting projects led by mid-career researchers Need for interdisciplinary, cross-cutting research conducted in the Arctic.

[1] Provide a short summary of the activity

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ASSW2015 Conference Session Report
For ISAR-4 and ICARP III Sessions

Name of Session

C3: Emerging questions in Arctic Geoscience

Main organizer(s)

Victoria Pease

Short (1 or 2 Paragraph) Summary[1]

This session, a direct result of the IASC Geoscience Advisory Group recommendation for the better integration of Arctic geosciences within IASC, highlighted the *state-of-the-art* of the field(s) today and where it is going over the next 10 years. The diversity of sub-disciplines in the geosciences were represented (see possible contributions below) and generally mirror the diversty at the Working Group level.

Main possible contributions to ISAR-4 and/or ICARP III[2] **in terms of the ISAR-4 and/or ICARP III priorities**[3]

Contributions to future ICARP III activities address science prorities for the next decade:

Archeology.

- Circum-Artic integration between archeological research and the environmental and geosciences - to better integrate how past human populations were adapting to longer-term climate change cycles over the last few millennia.

Geology.

- Integrated field programs - to correlate circum-Arctic orogens and fold belts, and understand their timing and formational mechanisms.
- Amerasia Basin drilling – to obtain basement samples in order to link submarine and on-shore geology.

Geophysics.

- Seismic monitoring – to correlate the effects of global warming and the melting of the Greenland ice sheet with glacial-retreat related earthquakes.
- Ocean drilling - to date multi-channel seismics (MCS) profiles and sample for paleoceanography.
- More MCS - to establish relations between seafloor features as well as their internal

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structure.

- Obtain refraction data - to study the basement and deformational fabrics preserved there.
- Acquire dredging samples - to sample locations where basement is exposed beneath the sedimentary cover.

ASSW2015 Conference Session Report
For ISAR-4 and ICARP III Sessions

Name of Session C4 : Co-design, co-production, co-communication – how to frame concerted research for sustainable development in times of change
Main organizer(s) Jörn Schmidt, Peter Skjöld, Grete Hovelsrud, Scot Nickels
Short (1 or 2 Paragraph) Summary[1] The session encompassed 6 presentations, which covered a wide range of different topics. We heard that there was not much progress of science plan 11 from ICARP-II on how Arctic science could best respond to the needs of Arctic peoples (Southcott). However the momentum is still there and needs to be fed by concrete actions. One possible way forward could be the establishment of a working group on traditional knowledge within the framework of IASSA and other scientific organizations (puju). The difficulty in setting up a framework for communication between science and local communities and the uptake of gained knowledge in local actions was showcased in an example of Kolguev islands, Russia (Pristupa). The difficulties experienced here could also be related to different perceptions of the environment and its changes. This was shown in an example of analysing the perception of environmental change from different stakeholder groups in Northern Norway (Dannevig). These differences also relate to differences in perceived need for action. In any case action sometimes need leadership and thus the question arises, whether leadership skills are luck or can be trained (Lisowski). The latter can be done as shown, but how to communicate information and knowledge in a way that it is easily accessible? One way to do this could be through the help of games, which could facilitate implicit learning, but also the communication with user groups and the wider public (Schmidt). In Summary, the session showed that there is still a way to go for good governance of co-producing knowledge, but that the will is there, tools available and lessons already learned.
Main possible contributions to ISAR-4 and/or ICARP III[2] in terms of the ISAR-4 and/or ICARP III priorities[3]

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- The session showed that there is a need for more guidance on how to engage on a specific topic with local communities despite the presence of many ethical guidelines (e.g. http://www.naho.ca/inuit/research-and-ethics/guidelines/) .
- This relates specifically on how to incorporate traditional knowledge and scientific knowledge in a two-way approach to develop both in a way that local communities can benefit in times of change.
- Along these, there is also the need to inform decision makers and the wider public also outside the Arctic on issues related to Arctic communities to enhance the visibility of these issues.
- A dedicated working group on Traditional Knowledge Systems should be established under IASC or IASSA
- Communication is key and means of enhancing this, both between disciplines and between science and local communities is needed
- Games can be tools to convey science to the communities and reach out to the general public to inform about Arctic issues

ASSW2015 Conference Session Report
For ISAR-4 and ICARP III Sessions

Name of Session C5:Advances in Transdisciplinary Arctic Research: Progress on Building Collaborative Agendas for Research Supporting Solutions for Sustainability
Main organizer(s) Carolina Cavazos Guerra, Gail Fondahl, Maribeth S. Murray
Short (1 or 2 Paragraph) Summary[1] This two-part session aimed to assess our progress in building collaborative agendas in research across and for diverse communities. During the first part, papers with a focus on research addressing socio-ecological processes and on the exchange of knowledge among researchers and practitioners were presented. Emphasis was given to novel ways to execute and disseminate research capitalizing on the different strengths, knowledge systems and interests of engaged partners. During the second part of the session, a moderated panel of experts, including an indigenous scholar and an indigenous political leader offered observations on ways to move collaborative research agendas and strategies forward in the Arctic.
Main possible contributions to ISAR-4 and/or ICARP III[2] **in terms of the ISAR-4 and/or ICARP III priorities**[3] - Arctic ecosystems are strongly affected to warming climate: climate/vegetation, socio-cultural systems, economy and land allocation are all affected. This will affect indigenous culture and traditional activities (such as reindeer herding). Hence, co-operation among diverse stakeholders is necessary in order to sustain the environment and to harmonize ecological and socio-economic requirements. - We need to co-design research approaches, within which questions are co-defined, the findings co-produced, and recommendations co-implemented. - It is important to open dialogue and engage local people for collaboration/feedback early in the process to achieve sustainability, resilience, adaptation among interested parties, and to obtain a win-win result. - Desirable and reasonable social and ecological management is a socio-political process, not a scientific decision. However, implementation is most effective when

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local administrative/coordination bodies are engaged.

- Learn from the past and from other world regions as the past and other regions may offer possible lessons on how to engage and build creative solutions and new opportunities for sustainable development in the Arctic (knowledge sharing/transfer).
- Increasing community sustainability will require compiling more data related to social conditions, to tackle factors such as housing and food security. Data needs to include information on market systems, environmental change, intergenerational well-being, and governance.
- Take into account the voices and ideas from Early Career Researchers (ECR's) in Arctic research. In order to overcome challenges to fulfilling their career goals (e.g. finding funding, available positions) and to keep their motivation for Arctic research include more training opportunities, and foster networking opportunities to create future collaborations including in international research communities. An additional key element is to inform ECRs about a greater diversity in future career opportunities.

ASSW2015 Conference Session Report
For ISAR-4 and ICARP III Sessions

Name of Session

C6: Understanding Sustainability in the Arctic: From Patchwork to Framework

Main organizer(s)

Andrey N. Petrov, Gail Fondahl and Peter Schweitzer

Short (1 or 2 Paragraph) Summary[1]

Session's rationale: Sustainability science seeks to understand the character of interactions among society and nature. The science of sustainability is developing along three interconnected pathways: scientific discussion of what sustainability (including sustainable development) means; political discussion of the agenda for sustainable development, from local to global scales; and promoting social learning of actual nature-society interactions in order to guide humanity towards sustainability. Still emergent, sustainability science is necessarily inter- and transdisciplinary and problem-based, focused on governance of and interactions among systems of resources and humans. Because ecological and social systems are constantly transforming, sustainability science addresses the dynamics of ever-evolving socio-ecological systems. Despite advancement of Arctic research in recent years, our understanding of the complex structures, functions and interactions within or among socio-ecological systems across this region is still incomplete and we lack synthesis attempts.

Session's activities: C6 group of sessions at ASSW 2015 had the following two thematic components: The first session reported on the IASC-sponsored workshop on synthesizing the knowledge about sustainability in the Arctic and presented and discussed the ICARP III draft White Paper „Arctic Sustainability Research: Agenda 2014" outlining critical research issues in sustainability science for the next text years to come (Petrov, Fondahl and Schweitzer). The session also incorporated a formal discussant (Graybill) and then an open forum to discuss the paper. Two additional presentations (by Loukacheva and Vlasova) followed the discussion, describing different aspects of research planning and sustainability in the Arctic context. The White paper will be revised based on feedback received and finalized for publishing in the next few months.

The second session included individual single-authored and multi-authored papers. Walker presented another white paper dealing with comparative research on Arctic infrastructure. Graybill and Zaika emphasized the key role of urban places and spaces in the Arctic and proposed ways of integrating urban research in Arctic sustainability science agenda. Filippova focused on Indigenous settlements facing challenges to their sustainable livelihoods because of climate change in Yakutia (Russia).

Main possible contributions to ISAR-4 and/or ICARP III[2] in terms of the ISAR-4 and/or ICARP III priorities[3]

[1] Provide a short summary of the activity

Priority 1: Identify Arctic science priorities for the next decade:

1. Presentation and discussion of the ICARP III White Paper on Arctic Sustainability Science *("Arctic Sustainability Research: Agenda 2015"*). The paper was introduced by key authors (Petrov, Fondahl and Schweitzer), evaluated by a formal discussant (Graybill) and discussed on the open forum (30 minutes). Revisions to the draft paper will incorporate the feedback received at the ASSW, as well as other reviews; it will be submitted or publication in2015. The ASSW 2015 statement includes wording that emphasizes the importance of sustainability and sustainable development of Arctic communities that directly stems from this C6 contribution.

2. Presentation of the white paper on Arctic infrastructure *"Rapid Arctic Transitions due to Infrastructure and Climate (RATIC)*" (Walker). The ASSW 2015 statement highlights the necessity to study Arctic infrastructure, which stems from this C6 contribution.

3. Other papers suggested research agenda topics and science planning

Priority 2: Coordinate various Arctic research agendas:

1. Working papers were prepared by international interdisciplinary groups. The ICARP III White Paper on Arctic Sustainability Science includes recommendations on coordinating international Arctic research agendas

2. Vlasova reported on science coordination efforts and future priorities in the International Geographic Union Cold Regions Environments Commission

3. Sessions incorporated multiple voices from: various Arctic jurisdictions (USA, Canada, Russia) and non-Arctic states (European Union); indigenous presenters; representatives of different disciplines (human geography, anthropology, permafrost science, law, and urban ecology).

Priority 3: Inform policy makers, people who live in or near the Arctic and the global community:

1. session participants included Arctic residents and indigenous scholars, as well as representatives of non-Arctic states.

2. The ICARP III White Paper on Arctic Sustainability Science will be available to policymakers and local residents via website

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ASSW2015 Conference Session Report
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Name of Session

C7: The Arctic System: changes and effects with emphasis on freshwater ecosystems

Main organizer(s)

Alexander M. Milner, Jón S. Ólafsson and Warwick F. Vincent

Short (1 or 2 Paragraph) Summary[1]

Our session contained 16 oral papers and seven posters covering freshwater environments in the Arctic including lakes, ponds, wetlands and rivers from physicochemical processes, nutrient fluxes and biotic communities. The session was a contribution in conjunction with the Freshwater Synthesis network project within ICARP III, and it highlighted the role of Arctic freshwater systems as important integrators of atmospheric and terrestrial processes, and as conduits to the near-shore marine environments under a changing climate.

A highlight of the session was the role of early career scientists, five of whose travel to the meeting was supported by IASC and who presented their research either orally or as a poster. These scientists directed the discussion by suggesting key research priorities for input and discussion by session participants under following four themes: Physicochemical properties of freshwater environments, Freshwater resources, Ecology and conservation, and Northern communities. This input will be used to craft and refine the prorities which will be circulated to the Arctic freshwater community for input and prioritization and used to inform a paper to be submitted to the new journal *Arctic Science* before December 2015.

Main possible contributions to ISAR-4 and/or ICARP III[2] **in terms of the ISAR-4 and/or ICARP III priorities**[3]

- The number of contributions to the session indicated that freshwater should be highlighted as a separate science priority and not be included under the Terrestrial Ecosystem as it has been in the last two ICARPs.

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- 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.
- An improved understanding of the seasonal dynamics of northern freshwater ecosystems, especially their under-ice limnology during winter.
- Insights into nutrient fluxes from terrestrial areas to the marine ecosystems including DOC and contaminants.
- A better understanding of uncertainty in freshwater systems and the role of extreme events under a changing climate.
- Experimental approaches to address process understanding to be undertaken at a series of circumpolar Arctic sites potentially using the INTERACT field station network.
- Accurate predictions of future changes in freshwater quantity and quality for water resource managers in northern communities and also effects on infrastructure and hydrohazards.
- Assemble databases of freshwater biodiversity and associated environmental information covering large geographical areas throughout the Arctic that can be mined by interested parties and stakeholders in cooperation with the CAFF – CBMP freshwater group.
- Promote active participation of Early Career Researchers in international meetings beyond attendance with the aim of creating knowledge–based interest among future generations.

ISAR-4

ASSW2015 Toyama Arctic Science Summit Week

ICARP III 3RD INTERNATIONAL CONFERENCE ON ARCTIC RESEARCH PLANNING

ASSW2015 Conference Session Report
For ISAR-4 and ICARP III Sessions

Name of Session

C8: Circumpolar Arctic Coastal Communities Observatory Network (CACCON)

Main organizer(s)

Donald Forbes, Paul Overduin, Joan Nymand Larsen

Short (1 or 2 Paragraph) Summary[1]

This session launched CACCON with initial regional and community hubs in Russia (Chukotka), USA (Alaska), Canada (Nunavut & Nunatsiavut), Denmark (South Greenland), and Norway (Finnmark). The session involved a panel on the rationale and philosophy of CACCON, physical and social science foundations, early-career perspectives, and pilot hubs in Chukotka and Nunatsiavut. The room was packed and a lively discussion ensued.

CACCON is a pan-Arctic network of community-engaged, multi-faceted and integrative knowledge incubators and hubs and has been nominated as the Arctic Engagement Network for Future Earth Coasts. It addresses a gap identified in the *State of the Arctic Coast 2010* report (www.arcticcoasts.org). CACCON observatories will facilitate trans-disciplinary research agendas with co-design and co-production of knowledge through local and regional stakeholders, building capacity through sharing insights between stakeholder peers across the circumpolar world to identify information needs and transformational insights. The starting point will be existing coastal observational datasets or monitoring programs in the biophysical and social sciences, as well as existing community-based monitoring programs and compilations of local and traditional knowledge. Through a collaborative process involving end users, status and sustainability indicators will be developed that are relevant for local, regional, and larger-scale decision-making. These indicators will then define a core set of future community-based observations, providing a basis for policy development and planning, to be supplemented by efforts supporting locally-identified priority issues.

Main contributions to ICARP III

- Arctic science priorities:
  - co-designed, transdisciplinary research for sustainable solutions
  - integrative analyses of sustainability challenges in Arctic coastal communities
  - actionable, proactive, adaptation policies for Arctic coastal communities
  - identifying and learning from 'bright spots' (or 'dark spots') of sustainability
- Sharing insights among existing community-based research and resilience programs
- Responding to community-based agendas and building resilience by growing local and regional knowledge-co-production and dissemination capacity
- Arctic Regional Engagement Network for Future Earth Coasts and IASC WGs

ASSW2015 Conference Session Report
For ISAR-4 and ICARP III Sessions

Name of Session C10: Consulting Arctic communities on research planning
Main organizer(s) Chris Southcott, University of the Arctic
Short (1 or 2 Paragraph) Summary[1] The session, chaired by Kirsi Latola of the University of Oulu, was comprised of four presentations on consulting Arctic communities on research planning. The first presenter, Julie Bull, an Indigenous researcher from Labrador, Canada, discussed both the difficulties and the importance of including Indigenous communities in research planning. She discussed the approvals regime that currently exists in Canada and noted that while the consultation process is often fraught with problems, a continued effort at consulting and collaborating with Indigenous peoples is essential for research in the Arctic. Chris Southcott presented the initial results of the University of the Arctic Community Consultation in Research Planning project. This project, which grew out of Science Plan 11 of ICARP II, discussed different methods that could be used to involve Arctic communities in planning research priorities. He presented the data from the project's pilot questionnaire survey which showed that IASC's main research areas were all considered important by the regions studied but that preference was given to social, health, and economic considerations along with natural resources. Southcott was followed by Sharon Edmunds-Potvin representing the Inuit Circumpolar Council. Her presentation noted the importance of the Inuit in the Arctic and the need and usefulness of greater involvement of Inuit in Arctic research. She noted that the involvement of the Canadian Inuit in the ArcticNet project could be used as a model for effective Indigenous involvement in research. A similar theme was stressed the next presenter, Larisa Abriutina of the Russian Association of Indigenous Peoples of the North. She noted that, while the Indigenous communities in the Russian north did not what to control research, it was extremely important that they be involved. In this regard she noted RAIPON's involvement in research with AMAP and the SLiCA project as models of successful cooperation. She also discussed the importance of researchers sharing results with communities once the research was completed.
Main possible contributions to ISAR-4 and/or ICARP III[2] **in terms of the ISAR-4 and/or ICARP III priorities**[3]

[1] Provide a short summary of the activity

[2] List a few key statements (findings, priorities, recommendations) that you would like to see reflected in the overarching ASSW2015 Conference Statement and ISAR-4/ICARP III Report

[3] ISAR-4 priorities:

- detect and understand recent changes in the Arctic, with a specific focus on processes affecting the global system
- facilitate scientific discussions and promote further national and international cooperation and collaboration, in particular between Arctic and non-Arctic countries

The session stressed the importance of involving Arctic peoples, especially Indigenous communities, in deciding research priorities. In addition, once priorities have been established, there is a need for these communities to be actively involved in the research projects. Once projects are completed, researchers need to share the results of their research with the people living in the Arctic.

Finding out how to involve Arctic communities in the deciding of priorities, the undertaking of research, as well as the sharing of knowledge, is not an easy task. It should be a research priority for the next ten years. Various Indigenous organization in the Arctic do have best case examples that they would like to see followed by other projects. Realizing that establishing partnerships with communities is not an easy task, one of the research priorities for ICARP III should be to find out how best to involve Arctic peoples in determining priorities, organizing and conducting research projects, and sharing the results of these projects with communities.

- Arctic communities, and especially Indigenous peoples, need to be involved in deciding research priorities
- Once priorities have been established, there is a need for these communities to be actively involved in the research projects
- Once projects are completed, researchers need to share the results of their research with the people living in the Arctic
- Finding out how to best involve Arctic communities in the deciding of priorities, the undertaking of research, as well as the sharing of knowledge, should be a research priority for the next ten years
- Indigenous organizations have best case examples that can be used to guide this research

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ICARP III priorities:

- identify Arctic science priorities for the next decade
- coordinate various Arctic research agendas
- inform policy makers, people who live in or near the Arctic and the global community
- build constructive relationships between producers and users of knowledge

ASSW2015 Conference Session Report
For ISAR-4 and ICARP III Sessions

Name of Session

C11 : Early Exploration and Exploitation and their Impact Today on Local Arctic Societies

Main organizer(s)

Peter Sköld, Umeå University, Sweden

Short (1 or 2 Paragraph) Summary[1]

Industrial heritage sites in the Arctic tell us much about the development of industries from the 16th century onwards but also about the ecological and geopolitics consequences. They give information about the driving forces of the industries, the industrial technology, the structure of the settlements, the control over the resources and the impact on the local environments. The effect of environmental change to the Arctic indigenous is comprehensive, which involves economy, culture, education, health, diet and many other aspects. Inuit of northern Canada are extensively affected when it comes to traditional economy, tourism opportunities and the increasing activities of extractive industries.

The Arctic past has explanatory potential for the present as an area for a diachronical understanding of the graduality between contact, confrontation, resistance and co-optation of native communities in Arctic Russia. In people's memory the borders between these concepts and time periods are more fluent than we often assume judging from historical evidence. We need to be aware of the various threats to cultural heritage around the Arctic and to find ways to encourage good management and to develop methods that ensure that we do not lose too much of our history and long-term understanding of the region. It is important to explore the realities of preserving, protecting and conveying the meaning of Arctic heritage sites in the face of increasing impacts.

Main possible contributions to ISAR-4 and/or ICARP III[2] **in terms of the ISAR-4 and/or ICARP III priorities**[3]

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[1] Provide a short summary of the activity

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[3] ISAR-4 priorities:

- detect and understand recent changes in the Arctic, with a specific focus on processes affecting the global system
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ICARP III priorities:

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- Arctic research within the humanities is important for a holistic and long-term understanding of the development, in the past and in the future.
- It is important to explore the realities of preserving, protecting and conveying the meaning of Arctic heritage sites in the face of increasing impacts.
- Industrial heritage sites give information about the driving forces of the industries, the industrial technology, the structure of the settlements, the control over the resources and the impact on the local environments.
- There is a great need to improve methods and theories aiming for trans-disciplinary research initiatives in the Arctic.

ASSW2015 Conference Session Report
For ISAR-4 and ICARP III Sessions

Name of Session C-Joint Session C4, C5, C10, C11
Main organizer(s) Jörn Schmidt, Peter Skjöld, Grete Hovelsrud, Scot Nickels, Chris Southcott, Carolina Cavazos-Guerra, Gail Fondahl, Maribeth Murray Participants: Malgorzata Smieszek, Rudy Riedlsperger, Sharon Edmunds-Potvin, Carl-Christian Olsen
Short (1 or 2 Paragraph) Summary[1] This joint session was meant to provide additional discussion on the topic of: • How can we identify the main challenges in Arctic communities where research and science can assist finding solutions? • What kinds of information do Arctic communities need to address these challenges and how should these information be conveyed? • Are current funding models sufficiently flexible to enable the appropriate partnerships between people in Arctic communities and the scientific research community The session provided short summaries of the original sessions to provide the background and than continued with statements from three panellists, Rudy Riedlsperger, Sharon Edmunds-Potvin and Carl-Christian Olsen on the above topics based on their personal background. The main findings of this session are formulated below as possible contributions to ICARP III. A long version of the minutes are available.
Main possible contributions to ISAR-4 and/or ICARP III[2] **in terms of the ISAR-4 and/or ICARP III priorities**[3] • While advances have been made in working towards true collaboration between communities and scientists, work needs to continue to ensure equitable relations in research. Research needed by communities to address key challenges (as defined by the communities) should receive priority attention, and communities should have

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ICARP III priorities:
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the opportunity to be involved in research at all stages. Best practices in community-scientist collaborations should be shared, and lessons distilled, with the understanding that communities differ, and each community-research partnership will have its own unique nature and requirements.

- Research funding organizations need to enable community participation in research. This includes providing initial funding for relationship (and trust-) building, and funding for sharing the results of research in ways most useful to the community, including in the local language where appropriate.
- Large differences exist among Arctic communities and places; we need to examine and understand more thoroughly the myriad ways in which social, environmental and economic challenges manifest themselves differently among different Arctic communities.
- Research being done to specifically tackle issues of indigenous communities includes often development aspects and thus funding should be coordinated between research funding and development funding agencies.
- Participation of indigenous people in conferences is highly welcome. However, it is necessary to accommodate for potential language barriers. Thus facilitation of translation should be envisaged where possible. For the Arctic, often English-Russian translation could already be sufficient.