



## Session Program POLAR2018

### Category

AA Astrophysics and Astronomy

### Session Number

AA-1

### Session Title

Astrophysics and Astronomy in the Polar Regions

### Session Description

The Polar Regions provide unique viewing locations for exploring the Universe. This session invites contributions from current and proposed astronomy and astrophysics research projects in the Arctic and Antarctic. The session will be a forum to learn about the science potential of these regions, and techniques for conducting research in extreme environments including ground-based and balloon-borne experiments. We encourage talks from early career scientists and nations who have recently joined SCAR and IASC as associate members, along with presentations from more established researchers to provide opportunities for mentoring and building collaborations to leverage the investment in scientific infrastructure in the Polar Regions. Talks involving polar research in Astronomy and Astrophysics are also encouraged.

**Keywords:** Astrophysics, Astronomy, Arctic, Antarctic

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**Category**

AC Atmosphere, Climate

**Session Number**

AC-1

**Session Title**

Polar and high altitude atmosphere: clouds, aerosols, climate and interactions

**Session Description**

Clouds and aerosols are critical and strongly interconnected components of the climate system in polar and high altitude regions. As these regions undergo rapid change, with warming temperatures, melting sea ice, surface albedo reduction, and shifts in large scale atmospheric dynamics, the formation and properties of clouds will change, further altering the energy balance and resulting in poorly quantified feedbacks on the climate system. Changes in aerosol formation and transport are likely to strongly influence cloud properties as aerosols constitute a unique intermediary, linking processes occurring at the earth's surface, as well as in the biosphere, the atmosphere, cryosphere and the hydrosphere.

In this session we invite contributions exploring processes related to clouds and aerosols, their variability, their links and their interactions with other aspects of the polar and high altitude environments. Topics may include, but are not limited to: air-sea-land exchanges of aerosols, biogeochemical processes related to aerosol formation, the influence of anthropogenic emissions on aerosol formation, as well as interactions between clouds, cloud phase, dynamic and thermodynamic processes at large and small scales, radiation, boundary layer turbulence, temperature, and humidity characteristics.

We welcome contributions that employ numerical models and satellite, ground-based, and field campaign observations.

**Keywords:** clouds, microphysics, precipitations, climate, radiative effect, aerosol interaction, Arctic, Antarctic

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**Category**

AC Atmosphere, Climate

**Session Number**

AC-2

**Session Title**

Polar meteorology, climatology and stratospheric processes

**Session Description**

Understanding the meteorology and climatology of Polar regions is essential for evaluating their role in the global climate system as well as in projecting future changes to the Polar environment resulting from anthropogenic forcing. The Polar middle atmosphere is also affected by human-induced phenomena, the stratospheric ozone depletion above all, whose effects extend globally and can influence tropospheric circulation and surface climate as well, therefore playing a key role in seasonal and sub-seasonal weather forecasts. Yet, our understanding of Polar lower and middle atmospheric processes and their linkages to a changing climate is limited also due to sparse observations and insufficient modeling efforts.

This session offers the possibility of reviewing what important knowledge the community is still lacking and which instruments/tools/studies could potentially fill these gaps. We invite contributions on all observational, modeling, and attribution aspects of Arctic and Antarctic meteorology, climatology, and stratospheric chemical and physical processes, including the connections with tropical climate variability and seasonal weather forecasting at high and middle latitudes.

**Keywords:** Polar, Meteorology, Stratosphere, and Climatology

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**Category**

AC Atmosphere, Climate

**Session Number**

AC-3

**Session Title**

High-Latitude Boundary Layers and Model Evaluation

**Session Description**

Given dramatic changes in the Polar Regions and a new focus on the Year of Polar Prediction (YOPP), this session addresses key physical and chemical processes, in oceanic and atmospheric boundary layers. The representation in models of these processes is needed to improve predictability of weather, sea ice, and of longer term variability and changes in the Polar Regions. Particularly challenging are the representation and assessment of clouds and surface exchange processes in next generation global and regional models. Of interest are the exchanges of heat, momentum, moisture and chemical constituents over increasingly complex ocean-ice-snow-land surfaces. Ongoing observations and field studies such as MOSAiC may provide advances in time for POLAR2018. Data analyses, model assessments, as well as studies of northern and southern high latitude surface processes and associated dynamical connections of Polar Regions to the mid-latitudes are welcome. A part of this session is also dedicated to polar climate model evaluation conducted at the SCAR-AntClim21 Workshop in October 2017. The main goal of the workshop is to provide a wide audience with hands-on experience with AntClim21 and broader Antarctic climate data products. The event will bring together senior scientists and early career researchers in areas of climate modeling, biology, atmospheric science, hydrology, and glaciology. Contributions from other studies conducting climate model evaluation are also welcome.

**Keywords:** Arctic, Antarctic, Boundary Layer, Weather and Climate Models, Observations and Assessments

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**Category**

AC Atmosphere, Climate

**Session Number**

AC-4

**Session Title**

The Polar Atmosphere and Geospace

**Session Description**

This session is addressed to the scientific communities who investigate the Antarctic and Arctic atmosphere and geospace by means of ground-based/space-borne observations including radio probes, theories and modeling. Participation is foreseen of scientists studying the neutral and/or the ionized part of the atmosphere, from the lower to further upper regions such as the magnetosphere. In the Arctic region, it becomes known that human lives and social structures are sensitively affected by the change of geospace disturbed by solar activities. Recent studies have indicated that the geospace in the Arctic and the Antarctic regions are not only linked by magnetic field lines but also by atmospheric dynamical processes including circulation and waves, which further affect the global atmosphere. Contributions from researchers and managers of Arctic-Antarctic operations that need to remove, or mitigate, the atmospheric contribution from their measurements (including search and rescue operators) are also encouraged. Possible topics include, but are not limited to, the study of Space, the Sun-Earth relations, and the impact of Space Weather on critical operations. Contributions from international collaborative researches/facilities are highly encouraged. The research based on the observations of the Earth from the space that exploits the radio spectrums (such as SAR imaging, satellite altimetry, weather satellites, etc.) are also welcome.

**Keywords:** Arctic-Antarctic neutral-ionized atmosphere, geospace, Space Weather, EO

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**Category**

AC Atmosphere, Climate

**Session Number**

AC-5

**Session Title**

Tropical-Polar Teleconnections and their Climate impacts

**Session Description**

In both Polar Regions, widespread and rapid changes are occurring in the atmosphere, ocean, and cryosphere. Future projections consistently exhibit continued and intensified polar transformations which can have cascading effects on the global climate. In the face of a rapidly changing global climate, it is becoming increasingly important to better understand the consequences of and the external and internal drivers behind observed and projected rapid polar changes. More specifically, it is becoming imperative to better understand the relevance of remote forcings, for example from the tropics, versus direct local forcings of observed and projected changes in the coupled polar ocean-atmosphere-cryosphere system.

This session aims to provide a setting to foster discussion on the tropics-pole teleconnection, in both the Northern and Southern Hemispheres, as well as how the Polar Regions feedback to lower latitudes. Contributions focusing on the tropical forcing of recent Arctic and Antarctic changes, teleconnections, and the underlying mechanisms are especially welcome. Studies of processes and patterns span topics such as the role of atmospheric jets, the Hadley and Ferrel cells, the Antarctic Dipole, the NAO, the Southern Annular Mode, the polar vortex, ENSO, Indian Ocean dipole, ITCZ, or MJO dynamics. Studies investigating the role of the Interdecadal Pacific Oscillation and Atlantic Multidecadal Oscillation in polar climate variability are also relevant to this session.

**Keywords:** Tropics, Midlatitudes, Teleconnections, Polar Atmosphere, Jet Stream, Rossby Waves, Weather Pattern, Stratosphere, Air-Sea Interaction

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**Category**

AC Atmosphere, Climate, CR Cryosphere, OS Ocean, Sea Ice

**Session Number**

AC-6

**Session Title**

Across the Southern Ocean: Atmospheric and ice mass changes

**Session Description**

Changes in the southern ocean and of the southern hemisphere westerlies have implications and impacts in Antarctica as well as north of the Antarctic convergence in particular on the cryosphere. In this session we welcome contributions on observed atmospheric and ice mass changes, studies on signals, causes and drivers of such changes and work that contributes to a better understanding of underlying processes and mechanisms. We aim at long-term climatic changes but also climatic variability and extreme events. Cross-disciplinary approaches e.g. between oceanography, atmospheric sciences and glaciology are particularly welcome as are studies on impacts and implications of the observed changes. Regionally, the sessions targets contributions that either cover one or more of the following regions: the Antarctic Peninsula, the Antarctic coast and the subantarctic territories, including Fuego-Patagonia.

**Keywords:** Antarctica, subantarctic territories, Fuego-Patagonia, cross-disciplinary

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**Category**

AC Atmosphere, Climate

**Session Number**

AC-7

**Session Title**

Seeing the Future: Predicting Variability and Change of the Polar Climate and Environment

**Session Description**

Observations make clear that numerous dramatic environmental changes are taking place in the Polar regions. Polar climate dynamics is crucial for the Earth's energy and water budget, as well as climate and environmental variability and change that have direct socio-economic impacts. Available dynamical and statistical models provide us with useful insight, but also with ample opportunities for improvement of polar climate prediction on intraseasonal to interannual and longer timescales. We encourage submissions that examine sources of polar climate, ice dynamics, and ecosystem predictability with models of different level of complexity, and link polar processes and predictions with mid- and low-latitude climate, and that identify potential ecosystem indicators useful to detect responses to climate change. What are the key gaps in knowledge, data, and capabilities needed to identify emerging threats? We look forward to presentations using observations, proxy data, theory and numerical models encompassing climate and ecosystem projections, reanalyses and forecast systems. This session also intend to promote interaction between the atmospheric, oceanic, cryospheric, terrestrial and ecosystem research and operational communities in both hemispheres.

**Keywords:** Arctic, Antarctic, climate prediction, Environmental change, cross-disciplinary

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**Category**

AC Atmosphere, Climate & OS Ocean, Sea Ice & CR Cryosphere

**Session Number**

AC-8

**Session Title**

Causes and Effects of Changing Polar Climate, Cryosphere and Hydrological Cycle

**Session Description**

The Arctic is warming two to three times faster than the global average. The annual minimum Arctic sea ice extent has declined by 50% and its thickness by 85% since the late 1970s. Decreased sea ice and warming are intensifying the Arctic hydrological cycle. In the Antarctic, sea ice has undergone a small net increase that masks large regional variability, whilst Antarctic Peninsula marine ice shelves continue to disintegrate. Such changes at the poles do not occur in isolation from the rest of the planet. There are vigorous two-way interactions between the polar and lower latitudes, including midlatitude drivers of Arctic temperature amplification and of the intensification of the atmospheric water cycle, and tropical drivers of Antarctic climate. Conversely, much attention has been focused recently on the potential impacts of rapid Arctic warming upon mid-latitude weather. This session will provide a venue to present progress and new ideas on the drivers of Arctic and Antarctic climate, cryospheric and hydrological change, and the global consequences of these changes. We encourage dialogue between meteorologists, oceanographers, hydrologists and cryospheric scientists, working with both observations and models, to address issues such as: the causes of polar amplification; role of the hydrological cycle in polar climate; interactions between polar and mid-latitude climate; cryospheric- and moisture-related climate feedbacks; evaluation of polar processes in climate models.

**Keywords:** Arctic, Antarctic, climate, cryosphere, hydrology, teleconnections, feedbacks

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**Category**

BE Biology, Ecology, Ecosystems, Biodiversity

**Session Number**

BE-1

**Session Title**

From boots to bytes: 'omics' tools for microbial diversity and biogeography

**Session Description**

This session invites comparative studies using high-throughput 'omics' techniques to resolve large-scale microbial diversity and biogeographic patterns across the three poles (Arctic, Antarctic and mountain regions). The session concentrates on the microbial and viral diversity, ideally comparing at least two geographic regions. All freshwater and terrestrial ecosystems are included, such as melt water ponds, streams, perennially ice-covered lakes and supraglacial ecosystems as well as soils, glacier forefields and other terrestrial and aquatic biotopes. 'Omics' techniques are encouraged, but more traditional methods can also be accepted and methodologies can be discussed.

The terrestrial habitats of the three poles have strikingly similar physical properties. The harsh conditions permit the survival of a limited selection of (micro) organisms. Yet, their diversity and biogeographic patterns are still unresolved. The aim of this session therefore is to go beyond descriptive and geographically limited studies and to encourage broad, comparative and process-oriented research towards large-scale biogeographic patterns, environment-diversity relationships, and ecological drivers of diversity patterns. This may also include studies on natural and anthropogenic dispersal pathways, ecological niches as well as present and future climatic-driven habitat and diversity change.

**Keywords:** Microbiology, biodiversity, biogeography, Antarctic, Arctic, mountain, high altitude, aquatic and terrestrial habitats, three poles, high throughput sequencing, metaproteomics, metatranscriptomics, metagenomics, chronosequences, microbiome

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**Category**

BE Biology, Ecology, Ecosystems, Biodiversity

**Session Number**

BE-2

**Session Title**

Phytoplankton, productivity and carbon export dynamics

**Session Description**

The biological fixation of carbon and its export to the deep in the Polar Regions strongly influence the global carbon cycle and the drawdown of atmospheric carbon dioxide (CO<sub>2</sub>). Within the Polar Regions, the Southern Ocean accounts for 40% of uptake of anthropogenic CO<sub>2</sub> uptake, but its productivity is impacted by the limitation of the trace metal iron. Complex biological interactions take place in response to low iron (Fe) bioavailability, modulating biodiversity and Fe chemistry. Next to primary productivity, the export of carbon from the surface to the deep ocean (biological carbon pump) regulates atmospheric CO<sub>2</sub> concentrations. The degree to which this carbon is exported to the ocean interior is strongly regulated by the interaction of many different processes including: mineral ballast effects, biogeochemical factors, and ecosystem structure. Zooplankton behavior may channel this carbon through a number of routes (vertical migration, faecal pellet production). In the Polar Regions, determination of whether the ocean is a sink or source of CO<sub>2</sub> is strongly dependent on the dynamics of particulate organic and inorganic carbon export. This session aims to:

1-Explores the multiple impacts that iron limitation impose on phytoplankton productivity, ecosystem functioning and biogeochemistry across the Southern Ocean.

2- Disentangle the main drivers controlling the magnitude and transfer efficiency of carbon to the mesopelagic and deep ocean in both Polar Regions.

**Keywords:** primary production, carbon export, iron limitation, biogeochemistry, phytoplankton, zooplankton

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**Category**

BE Biology, Ecology, Ecosystems, Biodiversity

**Session Number**

BE-3

**Session Title**

Polar perspectives on microbial evolution, adaptation, and ecological function

**Session Description**

Arctic and Antarctic microbes (Archaea, Bacteria, and single-celled Eukarya) are adapted at the molecular, cellular, and community levels to the unique conditions of the polar environment. These adaptations include tolerance to high salinity and low temperatures, oxidative stress, and to the dynamic range of these conditions. These adaptations and the capacity for evolution will determine how polar microbial communities respond to rapidly changing climatic conditions. Although environmental responses to climate change often differ between the Arctic and Antarctic, the physiological and ecological responses of marine microbes to a given set of conditions can be similar. Because polar microbial ecologists often focus on either the Arctic or the Antarctic there are limited opportunities for intellectual exchange between these communities. This session is designed to encourage cross-fertilization between regional specialists, and solicits abstracts on microbial adaptation, evolution, and ecological function in either the Arctic or Antarctic. Studies based on ecophysiology, microbial growth strategies, 'omics' techniques, and molecular and metabolic modeling are all welcome. We particularly encourage abstracts that link between environments, taxonomic domains, and methods, such as work linking molecular structures and mechanisms with physiological or ecophysiological effects.

**Keywords:** Antarctic, Arctic, bacteria, archaea, phytoplankton, algae, protist, microbe, bioinformatics, ecology

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**Category**

BE Biology, Ecology, Ecosystems, Biodiversity

**Session Number**

BE-4

**Session Title**

Climate change and ecosystems: physiology, biodiversity and ecological functions

**Session Description**

Global change will affect biodiversity and ecosystem functions in many ways and thereby alter the complex balance of biogeochemical and -physical cycles and climate feedbacks. The fast rates of climate change in polar and alpine systems may challenge organisms. Ecosystems may approach tipping points, where irreversible shifts in biodiversity and ecosystem functions could occur. The ability of ecosystems to cope with this change will depend both on physiological and behavioral plasticity of current populations and their evolutionary potential. In this session, we are interested in integrating latest results on the biodiversity of polar and alpine marine and terrestrial ecosystems and how they are structured, the functioning of ecosystems and the provisioning of ecosystem services under current and future conditions. We solicit contributions based on experiments, models, and observations, from gene to ecosystem level, integrated across temporal and spatial scales. Our goal is to highlight existing research, propose new avenues, identify knowledge gaps, and outline international research opportunities. Specific topics include:

- 1) Effects of multiple drivers on polar marine organisms (e.g. phyto-, zooplankton), assemblages and ecosystems (e.g. SCAR AnT-ERA, AntEco).
- 2) Biodiversity and ecosystem functioning of Arctic, Antarctic, and alpine tundra under past, current and future climate.
- 3) Arthropod ecology in tundra systems (related to NeAT, a network for tundra arthropods).

**Keywords:** Ecology, Ecosystem services, evolution, resilience, adaptation, plant traits, freshwater, marine, terrestrial

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**Category**

BE Biology, Ecology, Ecosystems, Biodiversity

**Session Number**

BE-5

**Session Title**

Productivity, Biodiversity & Ecosystem Shifts at Cryosphere-Ocean Boundaries

**Session Description**

The boundaries between the cryosphere and ocean are shifting as the climate warms in both the Arctic and Antarctic. This session will explore the possible responses of biological systems to changing ice cover, and expand our understanding on how climate warming is likely to further alter ecosystem processes across this boundary. High latitude productivity and associated ecosystem adjustments is a key organizing principle that could help bridge information and insights from across multiple disciplines. We invite contributions from studies investigating ecosystem consequences of cryosphere changes in glacially influenced systems such as fjords and adjacent coastal ecosystems, ice shelves and underlying ocean waters, as well as continental shelves impacted by retreating sea ice, including recent changes that are already apparent. Observational, experimental, and modeling studies leading to a mechanistic understanding of processes that are related to productivity and its influences on biodiversity and ecosystem structure are equally welcome. This session aims to bring together diverse perspectives on the future of Arctic and Antarctic productivity and impacts on ecological structure. The session will also seek to identify knowledge and/or data gaps, which might limit our collective ability to understand connectivity across polar systems.

**Keywords:** Productivity, Antarctic, Arctic, Ecosystems, Biodiversity, Fjords, Ecosystem Function, Climate Warming, Glaciers, Sea Ice

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**Category**

BE Biology, Ecology, Ecosystems, Biodiversity

**Session Number**

BE-6

**Session Title**

Ongoing change in terrestrial and freshwater ecosystems of Polar Regions

**Session Description**

Terrestrial and freshwater ecosystems of polar regions have been subject to substantial change or disturbance over the past several decades, particularly in the face of climate change. The drivers and responses to these changes are mixed, but may have unexplored similarities in Arctic and Antarctic systems, and may define how these regions respond to and amplify global warming. Polar regions are underlain by permafrost, which is warming and thawing at high rates, and which is critical to ecosystem structure and function as it limits to shallow depths the infiltration of rain and snowmelt. These shallow flow paths result in magnified physical, chemical, and biological connections among landscapes, streams, and lakes. The session will further address how these climate-induced changes in landscape-level processes affect the biological communities and biogeochemistry of lakes and rivers. The freshwater group of the Circumpolar Biodiversity Monitoring Plan (Arctic Council: Conservation of Arctic Flora and Fauna) has recently completed circumpolar assessments of the status and trends in freshwater flora and fauna as well as of their biogeochemical habitat of Arctic freshwaters. The evaluations, the most extensive assessment of freshwater monitoring data from the Arctic to date, include examination of data from both historical (paleolimnological data and records from 1800 to 1950) and contemporary time scales (post-1950), as well as traditional ecological knowledge of Arctic peoples.

**Keywords:** biodiversity, biogeochemistry, freshwater, terrestrial, land-water connectivity, ecosystem structure and function, ecosystem response to change

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**Category**

BE Biology, Ecology, Ecosystems, Biodiversity

**Session Number**

BE-7

**Session Title**

Up- and Down-scaling approaches in Polar Ecosystem Research

**Session Description**

A huge amount of single results on biological processes and ecologically relevant chemo-physical parameters have become available in the past decades. Overarching topical themes in ecosystem research demand results, which are representative for larger units of an assessment in terms of time, space and coverage of taxonomic, as well as functional, organism groups. Up-scaling research concepts, including modeling approaches, fitted sampling designs and analyses provide results, which fulfill these criteria. Notwithstanding, down-scaling approaches are needed to get better insights into the mechanisms of functioning of ecological systems including their drivers and provide a means to parameterize processes for models. This can be achieved through detailed analyses of comparative data and surveys as well as in situ experiments in areas identified by large-scaled surveys, e.g. hot and cold spots or representative scenarios in biological processes and biodiversity. We welcome contributions to ecosystem research in the Arctic or Antarctic (or both), which focus on biological processes and the use of different environmental parameters, illustrating of up-scaling or down-scaling approaches and how they help us understand the functioning of polar ecosystems.

**Keywords:** System understanding, small-large scale analyses, in situ experiments, biological processes, Terrestrial, Marine, Arctic, Antarctic

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**Category**

BE Biology, Ecology, Ecosystems, Biodiversity

**Session Number**

BE-8

**Session Title**

Polar wildlife - Ecology, health and disease

**Session Description**

Although the environments of the Arctic and Antarctic differ profoundly, these regions, and their species, share characteristics that make them vulnerable to anthropogenic change, climate change and invasion of non-native microorganisms. These threats have already altered the ecology, health, susceptibility to disease, and population structure of several Arctic and Antarctic wildlife species. This joint session will focus on sharing information on the threats that face wildlife health and persistence and how to monitor and to prevent future threats.

**Keywords:** Wildlife Health, Diseases of Polar Wildlife, environmental change, non-native microorganisms

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**Category**

BE Biology, Ecology, Ecosystems, Biodiversity

**Session Number**

BE-9

**Session Title**

Life distribution and responses to environmental changes in Polar ecosystems

**Session Description**

Polar environments are characterized by unique biodiversity, encompassing marine, terrestrial and freshwater ecosystems, and are the most vulnerable systems to environmental changes.

A full knowledge of life diversity, distribution, and variation in space and time is still needed.

Environmental changes are already affecting Polar regions, with impacts on the biotic and abiotic components of ecosystems, biological responses at ecological hierarchical levels (from genes to landscapes), over different spatial and temporal scales, being triggered by different physical, environmental and biological drivers, and different vulnerability across biogeographical regions, from Antarctica to the Arctic.

We encourage contributions addressing:

- a) Distribution and diversity of life through different ecological levels and environments (e.g. biodiversity hotspots, glacial refugia );
- b) Assessment of impacts and responses to present and/or past environmental changes (e.g. climatic, tectonic, oceanographic, anthropogenic), also through multidisciplinary approaches, long-term monitoring, manipulation experiments;
- c) How best benchmarking polar ecosystems across different environments.

A comprehensive understanding will allow effective planning to disentangle the effects of natural and human-derived global change on ecosystems, and a key challenge will be the development of syntheses allowing the assessment of environmental changes and biota responses at the scale of Polar Regions.

**Keywords:** Biodiversity; Environmental Change; Terrestrial, freshwater and marine ecosystems; spatial and temporal changes; multidisciplinary research; benchmarking

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**Category**

BE Biology, Ecology, Ecosystems, Biodiversity

**Session Number**

BE-10

**Session Title**

Polar fish: physiological adaptations and their responses to climate change

**Session Description**

The Southern Ocean is considered to be one of the world's most environmentally stable habitats, containing a high percentage of endemic fish species. The Arctic Ocean experiences greater influence through mixing with the surrounding oceans, but also supports a multitude of local, cold-adapted stenotherm fish species. Both Oceans are concomitantly altered by anthropogenic influences and climate change. Consequently, the fishes adapted to these polar environments are under continued pressure to respond through acclimation and/or adaptation to these changes.

This symposium aims to bring together all those interested in the evolutionary adaptation, population structure, physiology and ecology of polar fishes. It will provide a multidisciplinary platform for all working on the responses on polar fishes to climate change (e.g. ocean acidification, ocean warming, pollution, species invasion...). It will cover all aspects dealing with environmental adaptations or influences on polar fishes, from the chemical analytical, genomic, molecular, biochemical, metabolic and organismic approaches, and include all life stages of individuals as well as effects at the population level. Topics which focus on molecular and genetics aspects, or take an integrative approach to comparative physiology and ecology are highly welcome. We are looking forward to discussing anthropogenic influences on or adaptive responses of polar fish communities related to aspects of biodiversity and population structure.

**Keywords:** Fish, Arctic, Antarctic, evolution, physiology, adaptation, climate change

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**Category**

BE Biology, Ecology, Ecosystems, Biodiversity

**Session Number**

BE-11

**Session Title**

Using satellite imagery to study wildlife ecology in Polar Regions

**Session Description**

The last decade has brought about an enormous and rapidly growing interest in the use of satellite imagery to map polar wildlife. The relative simplicity of the Arctic and Antarctic landscapes, and the logistical difficulty of direct survey methods in remote polar areas, has contributed to the interest in mapping wildlife remotely. Furthermore, the varieties of satellite platforms (e.g., spatial resolution, spectral resolution, and spatial coverage of the image footprint) allow for much-needed data fusion techniques that elucidate not only enumeration and trends of animal populations but their relationship to other ecosystem processes. In this session, we will discuss recent technical advances in the use of satellite imagery to study the distribution and abundance of polar wildlife and how these advances have been applied to the ecology of polar vertebrates. Such advances include, but are not limited to, techniques for efficient manual interpretation, crowd-sourcing interpretation, computer vision for automated interpretation, as well as downstream methods for data validation, phenology corrections, and models to understand species-specific detection probability by satellite imagery. Given the methodological similarities in detecting wildlife in both Polar Regions but the different interpretations of ecological processes, it is our aim to bring together researchers with experiences in both regions to discuss and to provide insight about these advances in satellite technology.

**Keywords:** satellite imagery, wildlife, remote sensing, census, penguins, polar bears, seals, walrus, marine mammals, seabirds, wildlife survey techniques

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**Category**

BE Biology, Ecology, Ecosystems, Biodiversity

**Session Number**

BE-12

**Session Title**

Functional ecology of polar microbial communities in a changing world

**Session Description**

Cold terrestrial ecosystems play a key role in Earth's climate system. Melting glaciers and thawing of permafrost due to global warming not only promotes microbial carbon turnover with direct feedback on greenhouse gases but also has the potential to unlock unknown biodiversity and functional processes. This session will attract those interested in exploring how recent cutting edge genomic tools are being used to assess and resolve the role and resilience of microbial communities in polar and high-alpine ecosystems. This session invites microbiology and biogeochemistry experts who, through their unique understanding of the fast changing cryosphere and the factors that impact ecosystem and organism response, are attempting to predict how the system will respond to a warming world.

**Keywords:** polar systems, microbiology, function, ecology, ecosystem resilience

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**Category**

CR Cryosphere

**Session Number**

CR-1

**Session Title**

Permafrost: connecting measurements, monitoring, and modeling

**Session Description**

The quantification of permafrost and its changes over time is important and strongly reliant on model simulations. At the same time our understanding of permafrost systems is hampered by sparse data, environmental heterogeneity, and scale effects that make simulation and up-scaling difficult. We invite reports on individual studies and larger initiatives investigating permafrost and to enhance collaboration between the monitoring and modeling communities. Topics of special interest thereby include the systematic collection of observations into coherent datasets, the evaluation of model simulation results with observations, analyses of uncertainty across measurements, monitoring and modeling, and the visualization and communication of results and their uncertainties to diverse audiences.

**Keywords:** Permafrost, active layer, ground temperature, frozen ground, monitoring, modeling, ground ice, Arctic, Antarctic, Mountain

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**Category**

CR Cryosphere

**Session Number**

CR-2

**Session Title**

Permafrost landforms in the two Poles as possible Mars analogue

**Session Description**

The session focuses on permafrost landforms and related geomorphic and weathering processes on the two Poles. Permafrost landforms but also their geomorphic processes and in some cases the weathering processes can be considered the best analogue of Mars. The session wants to encourage the comparison between similar permafrost landforms in the two Poles and within the different climatic areas of each Pole (i.e. Maritime Antarctica and Continental Antarctica) and the possible comparison with the Martian analogue. The session wants also to include the comparison between the different weathering processes and rates in different permafrost environments in the two Poles (rock weathering and cryosoils) and their possible interactions with living organisms and ecosystems. Transdisciplinary contributions from geomorphology, physical geography, ecology of permafrost areas, soils, microclimate, hydrology, geophysics and remote sensing are expected. The session aims to contribute to questions from the SCAR Horizon Scan and ICARP III report emphasizing the significance of fast changing terrestrial environments.

**Keywords:** Permafrost, Geomorphology, Physical Processes, Permafrost Ecosystems, Weathering

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**Category**

CR Cryosphere

**Session Number**

CR-3

**Session Title**

Cryosphere-Hydrosphere interactions: The water cycle at the three Poles

**Session Description**

Seasonal snow, glaciers, ice caps, and permafrost play a key role in the dynamics of the Earth system both in the Polar regions and at high altitudes: Both the vegetation and the hydrological cycle are strongly controlled by, and interact with, seasonal snow; melt from glaciers and ice caps can be an important freshwater resource; and permafrost significantly affects landscape morphology and runoff processes.

In this session, we welcome contributions on the Polar and non-polar cryosphere, with a particular focus on local- and regional-scale interactions between the cryosphere and the hydrosphere. Topics to be addressed include but are not limited to (1) the quantification of past, present, and future contribution of snow- and ice melt to water resources, (2) the numerical representation of cryospheric components and processes in local- and regional-scale glacio-hydrological models, (3) the estimation of water reserves stored in glaciers, permafrost, and snow, (4) the quantification of both solid and liquid precipitation at high latitudes and high altitudes, and (5) the dynamics of the high-altitude and Polar water cycle.

The session does not have a particular geographical focus, but aims at providing a wide-ranging overview on recent developments in the understanding of hydrosphere-cryosphere interactions in Polar and mountainous environments.

**Keywords:** Polar and mountain cryosphere, glaciology, hydrology, snow and permafrost, modeling

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**Category**

CR Cryosphere

**Session Number**

CR-4

**Session Title**

Ice sheets, ice shelves & proximal processes in past, present & future climates

**Session Description**

Ice sheets terminating in marine environments and/or grounded below sea level are dynamic and sensitive portions of the cryosphere, especially vulnerable to change. They are also one of the largest uncertainties in understanding the fate of ice sheets under predicted atmospheric and oceanic warming. The exposed beds of palaeo-marine ice sheets offer a rich means of studying ice dynamics over large areas and long timescales, using the geological record to provide vital insight into the processes and feedbacks that regulate marine-based ice sheet retreat.

Over the past two decades, ice shelves have thinned considerably along the Amundsen coast in West Antarctica, and partly destabilized in the Antarctic Peninsula. Destabilization of ice shelves is manifested by basal thinning through inflow of warm ocean waters, by hydrofracturing of surface melt water driven by regionally warming winds, by ice cliff failure at the ice shelf front, or by a combination of these three processes.

Here we invite contributions that aim to give insight in past, present and future ice shelf changes and their drivers across all of the atmosphere, ice, ocean, and terrestrial subglacial disciplines. Studies presenting observations, from palaeo or sub-recent in situ or remote sensing data, and models, both theoretical and numerical, are encouraged to apply, especially those that combine observations and models.

**Keywords:** Antarctic, geology, cross-disciplinary, Arctic, atmosphere, ocean, paleoclimate, ice, subglacial, glaciology, observations, remote sensing, modeling, theory, ice shelves, marine ice sheets, proxies

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**Category**

CR Cryosphere & GG Geology, Geophysics, Solid Earth & OS Ocean, Sea Ice

**Session Number**

CR-5

**Session Title**

Interactions between ice mass balance, the solid Earth, and sea-level changes

**Session Description**

This session explores improvements in our understanding and quantification of past, present and future ice sheet and sea-level changes, by focusing on ice sheet evolution and glacial isostatic adjustment. We invite contributions that relate to observations of global and regional sea-level changes, ice sheet mass changes and/or deformation of the solid Earth, as well as modeling of ice sheet dynamics, surface mass balance, basal hydrology, and glacial isostatic adjustment (GIA), in both the Arctic and Antarctic. Potential themes to be explored include: advances in ice sheet mass change observations; advances in long-term continental-scale modeling of ice sheets and in modeling the contribution of ice sheets to sea-level rise; new processes included in ice sheet models, such as cliff failure, hydro-fracturing, basal hydrology and other subglacial processes; advances in GIA modeling, including three-dimensional Earth models, and ranging from the Pleistocene to recent; and advances in sea-level change observations, including land-based and satellite methods. The goal of this session is to gain a perspective on glacier and ice sheet mass balance changes on a variety of time scales, and to review recent advances in the understanding of interactions of glaciers and ice sheets with oceans and the solid Earth.

**Keywords:** Ice mass balance, Glacial Isostatic Adjustment, Sea-level change

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**Category**

CR Cryosphere

**Session Number**

CR-6

**Session Title**

Glaciers and Ice Sheets: from the Mountains to the Poles

**Session Description**

Understanding glacial processes is key to assessing the sensitivity of glaciers and ice sheets to changing climate. One basis for our understanding of these processes is the regional to global assessment to provide a comprehensive characterization of land ice. Glacier and ice sheet changes are monitored on different spatio-temporal scales, from seasonal mass balance studies at selected glaciers, over multi-decadal repeat inventories over entire mountain ranges to geophysical measurements over entire ice sheets. Mathematical and numerical models form the other important basis to our understanding of glacial processes. Combining observations and models allows us to forecast the future evolution of glaciers and ice caps.

Bringing together studies from polar and mountain regions, this session includes presentations on both in-situ and remotely-sensed observations, as well as on numerical modeling of glaciers and ice sheets.

**Keywords:** glaciers, ice sheets, in-situ, remote sensing, numerical modeling

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**Category**

CR Cryosphere

**Session Number**

CR-7

**Session Title**

Snow and firn: an open measurement and modeling challenge

**Session Description**

Snow and firn are considered a major uncertainty in the knowledge of the global water and energy budgets. Both are critical components of the Earth ecosystem, very sensitive to climate change and the cause of numerous climate feedbacks. Continuous monitoring of snow and firn using remote sensing or ground-based techniques is challenging due to rapid variations in the proportion of the three contributing components ice, water and air, and the respective changes in energy budgets. The interaction of snow and firn with electromagnetic waves, underlying the retrieval for most remote sensing data, requires a detailed characterization ranging from microstructure to topographic scales. The modeling of snow and firn is often hampered by the lack of accurate treatment of some key physical processes such as water percolation, vapor transport, and snow metamorphism, and by uncertainties on the phase and occurrence of precipitation.

We invite contributions in modeling/observational experiments and instrumental developments that advance the understanding of snow and firn. We welcome studies that focus on key physical processes in snow and firn such as, but not limited to, radiative transfer, heat transport, gas and liquid flow, compaction, snow metamorphism, and interactions with vegetation. We also invite presentations about the application of observations and/or modeling to estimate snow surface energy budget, snow mass budget, and changes in snow cover and snowfall.

**Keywords:** seasonal and perennial snow, firn, in situ, remote sensing, observations, modeling, instrumental development, snow microstructure, water percolation, vapor transport, heat transport, radiative transfer, snow metamorphism, snow surface energy budget, snow mass budget, snow cover changes, snowfall

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**Category**

CR Cryosphere

**Session Number**

CR-8

**Session Title**

Latest highlights from high altitude and polar ice cores

**Session Description**

Current progress in ice core science has pushed our understanding of past changes in climate, atmospheric composition and the related biogeochemical cycles substantially forward. This comprises:

- (i) new high-precision methods to provide more robust and quantitative paleo-information from ice cores,
- (ii) process studies improving our understanding of ice core proxy information,
- (iii) latest high-resolution records that provide a more detailed picture of climatic and atmospheric changes in the past as well as
- (iv) new high altitude and polar ice core projects that open new windows into past changes both spatially and temporally.

Moreover, ice core science has gained largely by the combination of ice core information with climate models and other climate archives. Here we invite contributions to any of these fields that present significant advancements in our knowledge of paleoclimatic changes from ice cores or improving the understanding of ice core information.

**Keywords:** ice cores, polar, high altitude, biogeochemical cycles, gases, aerosol, isotopes

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**Category**

EN Environment

**Session Number**

EN-1

**Session Title**

Environmental and community challenges in rapidly changing polar coastal zones

**Session Description**

Polar coastal zone is characterized by a complex interplay between among marine, terrestrial, and atmospheric phenomena. It is also probably the most dynamic component of the polar landscape where rapid changes affect human habitation and activities. For instance, majority of Arctic communities are located in coastal settings and depend on the state of coastal system. Climate change also brings natural resources into focus of governments, and industry. Management of exploration and potential exploitation of natural resources is a main challenge within the next decades. Present-day polar coasts are exposed to a range of hazards associated with warming of climate. Therefore, further development of Polar Regions is strongly dependent on our understanding of coastal responses to rapid environmental changes.

We encourage submission of contributions highlighting aspects of polar (Arctic and Antarctic) coastal zone changes, environmental exploration and exploitation of coastal resources and its potential environmental impact from all disciplines, including geomorphology, marine geology, economy and social sciences.

Our objective will be to raise and discuss various aspects of coastal change and its impact on the resilience of the polar environment and society.

**Keywords:** coastal change, environmental hazards, human impact, natural resources, Arctic, Antarctic

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**Category**

EN Environment

**Session Number**

EN-2

**Session Title**

Contamination in Polar and High Altitude Environments

**Session Description**

Polar and high altitude ecosystems are exposed to contaminants from local sources (i.e. fishing, tourism, sewage, research activities), as well as from distant sources through long range transport (by air mass, marine currents, rivers, and organisms as biovectors).

Contaminants can affect the entire ecosystem across different trophic levels but are also transferred to and along food webs (i.e. bioaccumulation and biomagnification). It is therefore important to understand sources and levels of contaminants in all matrices, and processes occurring at interfaces. Climatic factors may also influence the characteristics and distribution of contaminants in the abiotic environment as well as their movement between different ecosystem compartments.

This session welcomes a broad range of contributions featuring research focused on the study of inorganic and organic contaminants at the Polar and high altitude environment that aim to:

- Identify main drivers regulating the distribution, magnitude, transport, transformation, bioaccumulation of contaminants, including, but not limited to: legacy and emerging persistent organic pollutants (POPs), plastic debris, mercury and other trace metals
- Estimate the impact of the contaminants across the ecosystem (Atmosphere, Oceans, Cryosphere and Terrestrial Ecosystems as well as human exposure)
- Evaluate the effects of climate change on contaminant transport and fate
- Discuss remediation, policy change and mitigation options and solutions

**Keywords:** : Arctic; Antarctic; High altitudes ecosystems; Human impact; exposure; bioaccumulation; toxicity; Inorganic contaminants; Persistent organic pollutants (POPs); legacy and emerging contaminants; plastic contaminants; Global Change; Long range transport; Ecotoxicology; cross-disciplinary

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**Category**

EN Environment

**Session Number**

EN-3

**Session Title**

Geological heritage and geo-conservation in the Polar Regions

**Session Description**

Geological heritage may be described as geological, geomorphological or paleontological features possessing aesthetic, intrinsic or scientific and educational value, and that may provide unparalleled illustration into geological processes and insight into the formation or evolution of the Earth. While recognition of sites of biological or ecological significance (e.g. breeding site of rare or endangered species) and/or cultural significance is readily and widely acknowledged by the polar community, there has been considerably less attention given to recognition of, and the development of protection measures to manage, intrinsically valuable natural non-living features in the polar regions, in spite of numerous excellent examples of features worthy of note. Nevertheless, the global impetus is growing for the need for proactive intervention, protection and management of sites of intrinsic geoscientific value. In this session, we invite earth scientists, policy experts and national conservation administrators to provide examples and case studies illustrating geological heritage from the Polar Regions, useful management and administration tools and strategies for protection and preservation of these features for future generations.

**Keywords:** Environmental protection, Antarctic Treaty System, Vulnerability, Geology, Landforms, Paleontology

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**Category**

EN Environment

**Session Number**

EN-4

**Session Title**

Conservation in the Polar Regions: Challenges, Strategies and Collaborations

**Session Description**

Conservation is important for both biodiversity and human well-being and understanding risks to ecosystems is fundamental to well-informed ecosystem management. Both polar regions are currently exposed to a variety of environmental threats, ranging from over-harvesting of living resources to pollution and from the spread of alien species to the broad overarching impacts of climate change. Even where the two polar regions differ, for example with regard to the intensity and governance of human activities, advances in polar scientific research have highlighted the need to promote protection initiatives for the conservation of particularly vulnerable species, habitats, ecosystems and/or regions both in Antarctica and in the Arctic.

The aim of this session is to highlight different approaches to environmental protection and conservation in polar environments and to facilitate discussion on the current state of affairs, and how further improvements might be made to the environmental stewardship of both regions.

Key areas of interest will include:

- The designation of terrestrial and marine protected areas,
- Biosecurity and the impacts of alien and non-native species,
- Spill prevention and other pollutants limitation programs,
- The application and utility of the IUCN Red-listing of Ecosystems in Polar Regions,
- Cross disciplinary communication and international conservation collaborations, and
- Use of different approaches to stimulate public engagement

**Keywords:** conservation, ecosystem management, environmental protection, cross-disciplinary, pressures, stewardship, Antarctic Treaty, Arctic council, communication

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**Category**

EN Environment

**Session Number**

EN-5

**Session Title**

Big data, small data, your data. What does good data management mean to you?

**Session Description**

The rise of big data is challenging the data handling systems of scientists and data managers in the polar research communities. It is also increasing the focus on ideas about who owns data and how it should best be shared.

While polar data managers have made great strides in archiving and sharing observation and derived data over the past quarter century, the velocity, variety and volume of data created by polar scientists pose new challenges for data sharing infrastructure. For modelers, decisions must be made about exactly what to archive. Meanwhile, the new generation of Virtual Research and Cloud Computing environments introduces new kinds of data infrastructure.

In addition to the technical challenges of managing big data, this session will investigate the human side of data management. It will cover experiences in working with data owners and users to ease their experience of data sharing. We encourage presentations on the tensions around sharing data, including concerns related to research competitiveness, ownership, privacy, returning Indigenous Knowledge to communities, and motivations for both sharing and protecting data.

Contributions are invited from those scientists, practitioners, and others with complex data management needs and those planning new developments in data management infrastructure. We welcome presentations from all disciplines, including social sciences, Indigenous Knowledge, physical and biological sciences.

**Keywords:** data management, big data, ownership, sharing, infrastructure

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**Category**

EN Environment & BE Biology, Ecology, Ecosystems, Biodiversity & GG Geology, Geophysics, Solid Earth

**Session Number**

EN-6

**Session Title**

Reconstructing past environmental change in the Polar Regions

**Session Description**

This session aims to stimulate multidisciplinary discussion and facilitate an integrated understanding of the physical, ecological, and climatic consequences of past environmental changes in terrestrial Polar ecosystems. The Polar Regions respond quickly to environmental changes and these responses are preserved in, for example, lake sediments, periglacial deposits, annual growth rings, ground ice, fluvial/alluvial and coastal deposits. Such proxy records provide important natural archives of past environmental changes within the most rapidly warming biome on Earth. Multidisciplinary palaeostudies that provide analogues of recent and future perturbations in Polar environments, and that help identify boundary conditions to ice / land / ocean / atmosphere feedbacks that influence regional and global climate are welcomed, as are long-term monitoring studies, short-term experiments and complementary palaeoecological studies implementing monitoring data that address the effects of environmental change on Polar ecosystems. Another key aim of this session is to bring together the scientific community using Polar terrestrial records of past environmental change to formulate a series of outstanding research questions and develop new collaborations. These could be based around, for example: (i) past changes in climate and relative sea level; (ii) changes in food-web structure, including nutrient deposition and land-use changes; (iii) colonization by non-native species.

**Keywords:** Arctic, Antarctic, climate variability, natural records, biodiversity

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**Category**

EN Environment & OS Ocean, Sea Ice & GG Geophysics, Geology, Solid Earth & CR Cryosphere

**Session Number**

EN-7

**Session Title**

Biogeochemical cycling in the Polar Regions: Terrestrial and Ocean interactions

**Session Description**

Climate warming-induced changes in high latitude polar regions, surrounding oceans, and high altitude third pole regions, have the potential to significantly influence the future of Earth's biogeochemical cycles. Landscape evolution through permafrost thawing, glacial retreat and cryogenic weathering processes may have a cascading effect on the terrestrial biogeochemistry and hydrological cycle. Changing freshwater fluxes may alter mineral, elemental, nutrient and carbon fluxes into the ocean, affecting their productivity and cycling globally through overturning circulation. Understanding and quantifying the impact of such inputs are critical to our understanding of how the polar oceans respond to these changes, and on the efficiency of the global ocean as a net atmospheric carbon sink. This session looks to explore and integrate advances in understanding of changing biogeochemical cycling both between and in the terrestrial cryosphere and polar oceans. We invite researchers from diverse backgrounds (geochemical, terrestrial, cryospheric, and marine) to present information on short- and long-term studies of biogeochemical cycling of inorganic and organic elemental species, isotopes and nutrients; new observational, experimental and simulation approaches to quantify changing fluxes and ecological responses. We encourage submissions from geographically diverse polar locations, i.e. pan-Arctic, Antarctic, Southern Ocean and third Polar Regions.

**Keywords:** biogeochemistry, cryosphere, terrestrial, ocean,

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**Category**

GG Geology, Geophysics, Solid Earth

**Session Number**

GG-1

**Session Title**

Magmatic, tectonic, and geodynamic investigations of the Polar Regions

**Session Description**

In recent years, geophysical and geological studies of the Arctic and Antarctic have uncovered exciting details of the crustal and lithospheric structure, the processes of geologic evolution, and the interplay between geodynamics, volcanism, and ice sheet development in the Polar Regions. This session aims to provide an interdisciplinary forum where results from new polar geoscience research will be shared. Contributions are encouraged from a wide range of disciplines, including but not limited to active and passive seismic studies, aerogeophysical investigations, MT, volcanism and volcano-related palaeoenvironmental studies, sedimentary geology, structural geology, and magmatism. By highlighting key investigations and tectonic regions of interest, this session will help seed new cross-disciplinary initiatives and promote the development of future international collaborations for Arctic and Antarctic geoscience. This session is sponsored by AntVolc, the SCAR expert group for Antarctic volcanism.

**Keywords:** Geophysics, Volcanology, Geology, Geodynamics, Arctic, Antarctic

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**Category**

GG Geology, Geophysics, Solid Earth & CR Cryosphere

**Session Number**

GG-2

**Session Title**

Arctic and Antarctic past ice sheet dynamics and paleoclimate evolution

**Session Description**

The Greenland Ice Sheet and marine-based parts of the Antarctic Ice Sheet have the potential to provide a major contribution to sea-level rise over the next centuries. Improved understanding of underlying processes, thresholds, rates and magnitudes of previous ice sheet retreats is essential to improve predictions of future sea-level rise and guide effective mitigation plans. In this regard, times when global temperatures and atmospheric CO<sub>2</sub> levels were higher than today are of particular interest. More recent warm intervals and times of glacial retreat, such as MIS 3 and the last glacial termination, also provide particular opportunities because of the spatial data coverage that is achievable. This session aims to bring together results of studies on past ice sheets across transects extending from the ice sheet interior to the deep sea, in both the Arctic and Antarctica and based on data-data (sedimentological and ice core archives) and data-model integration and intercomparison.

The session is highly interdisciplinary and welcomes contributions from fields including glaciology, ice sheet modeling, sedimentology, paleolimnology, and marine geology and geophysics, as well as climate and atmospheric sciences. We solicit presentations on linkages between continental, ice-proximal and far-field marine records and models. We aim to learn about polar linkages and teleconnections, and reconciling differences between local versus regional and global records.

**Keywords:** past ice-sheet dynamics, paleoclimate, paleoceanography

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**Category**

ME Medicine

**Session Number**

ME-1

**Session Title**

Human Adaptation to High Altitude

**Session Description**

Living at and travelling to high altitude including Antarctica is a physiological challenge. While lowlanders have to acclimatize to reduced oxygen supply (and cold) by increasing red blood cell production, highlanders living in different regions of the world have developed various adaptive mechanisms to cope with these harsh conditions. The physiological response to hypoxia requires the availability of iron for numerous processes including oxygen sensing and erythropoiesis. Moreover, hyperventilation may induce depletion of bicarbonates reserve and development of chronic alkalosis potentially impairing tissue regeneration. Exposure to hypoxia may also persistently reduce the level of peripheral blood endothelial progenitor cells and impair endothelium function ultimately leading to increased risk for cardiovascular diseases. We expect the participants to present cutting edge data on the crosstalk of oxygen and iron metabolism, the acclimatization processes of lowlanders to high altitude (in rest or during exercise) as well as the genetic adaptation in Tibetans, Andeans and other populations living at high altitude.

**Keywords:** high altitude, acclimatization, adaptation, erythropoiesis, iron, endothelial cells, respiration

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**Category**

ME Medicine

**Session Number**

ME-2

**Session Title**

Human science from the extreme poles

**Session Description**

Antarctica and the Arctic are natural laboratories to investigate psycho-physiological adaptation to the extremes. This session will cover all applied research supporting health and well-being from deployed personnel or indigenous population living at high latitudes and the recently rising specific effects of chronic hypobaric hypoxia experienced by personnel deployed on high altitude stations. It will also cover research results about how to recruit, select, train and support the staff above the polar circles, either from individual or group psychological perspectives, or from organizational and management perspectives. An aim of the session is to present current projects' results as examples of how Antarctic and Arctic research is delivering important knowledge for the benefit of human space flight and exploration class missions to outer space, as well as to link the "poles" of field research and fundamental research in this environment to the benefit of overwintering and space crews.

**Keywords:** Antarctic bases personnel, high altitude medicine, extreme medicine, long-duration spaceflight, telehealth, medical evacuation, psychology, physiology, adaptation, metabolism, immunity, stress

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**Category**

OC Outreach and Communications

**Session Number**

OC-1

**Session Title**

Innovation, partnership and impact in polar science communication

**Session Description**

The goal of science communication is to educate and motivate audiences to learn more about science, its methods, and its broad impacts across the human enterprise. With the increased attention on rapid changes in the Polar Regions and their impact on global climates, higher priority on education and effective science communication is needed within our polar community.

Today, scientists and host institutions are more accountable for communicating research results to funding agencies, policy makers and the general public via formal and popular media. Science educators need more effective methods for communication, to reach beyond the research community and communicate polar science to all audiences.

The session seeks expert science communicators from many backgrounds (scientists, educators, journalists, artists) who have implemented successful communication methodologies and projects for a variety of audiences. We seek new and innovative techniques using modern digital technology, creative arts (e.g., art, film, music, dance, etc.), social media and other approaches. We encourage presentations that share experiences and evaluate instrumentation and techniques (theoretical and practical) for enhancing education and science communication. The session will promote collaborative efforts in education research, outreach and training to facilitate developing similar activities and programs for polar science information exchange and dissemination.

**Keywords:** Science communication, Arctic, Antarctic, Polar science, Education, Outreach

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**Category**

OC Outreach and Communications

**Session Number**

OC-2

**Session Title**

Polar Research and Citizen Science: Exploring New Platforms and Opportunities

**Session Description**

Citizen science (engaging volunteer participants in activities like community-based monitoring and field data collection) has proved to be an indispensable means of combining scientific research with education and public outreach. Citizen science can “push the envelope” of what scientists can achieve with limited funding, personnel, and access, provides a powerful tool for increasing scientific literacy and active citizenship, and is a mechanism for meeting specific conservation objectives. This session aims to bring together entities that have been or are currently engaged in citizen science programs in the Polar Regions, those who may have an idea for starting such a program, and those who represent possible groups of citizen science leaders or participants (e.g., educators, polar tour operators, directors of non-profit membership organizations). The session will start with short presentations about past and existing programs targeting polar citizen science, or that could be adapted to this theme. Afterwards, session leaders will convene breakout groups organized by program platform to share ideas, methods, challenges, and potential collaborations. Session leaders particularly wish to include participants representing community-based monitoring programs begun during IPY 2007-2008 and IAATO/AECO member tour operators who are currently involved with citizen science efforts, to foster a better understanding of the success and challenges these programs have experienced.

**Keywords:** polar, citizen science, IPY, tourism, research, conservation, education, cross-disciplinary

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**Category**

OC Outreach and Communications

**Session Number**

OC-3

**Session Title**

The role of museums in promoting polar heritage and advancing polar science

**Session Description**

Museums have a long history of exploring and documenting polar biological and geological diversity and human history, and they play an important role in sharing polar knowledge and heritage with the public. Collections housed in museums and other institutions hold the record of life on the planet, including millions of specimens from the Arctic and Antarctica, yet museums have been largely on the periphery of polar science. The need for permanent specimen and tissue repositories, and a global inventory of these repositories, is a priority, given the value of these collections to polar science. There is great value and interest in the stories of people who live and work in Polar Regions, and museums are able to share this human history in compelling ways. Museums also communicate polar research and exploration to the public, and provide digital access to their specimens. This session focuses on all aspects of polar research, collections and engagement at museum and related institutions, including museum-led polar research, knowledge gaps in the polar collection record, progress in digitizing polar collections, documentation and conservation strategies of polar collections, museum outreach and engagement related to polar issues, and discussion of ways museums can better work together and with the broader research community in a 21st century global context to advance polar research and collections, and engage, inspire and educate citizens about polar regions and issues.

**Keywords:** museums, collections, repositories, outreach, engagement, specimens, Arctic, Antarctic, cross-disciplinary, biodiversity

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**Category**

OC Outreach and Communications

**Session Number**

OC-4

**Session Title**

Art meets Science: That Which Cannot Be Transmitted

**Session Description**

This session is a hybrid between art and science; exhibition and lecture. It considers how the translation of field research shapes contemporary discourse of the Polar Regions in areas ranging from climate change, mineral extraction to fictional landscapes.

In 2014 a group of artists from around the globe sailed in a tall ship up the west coast of Svalbard reaching 79°52 N, 011°48 E. Themes of temporality, impermanence and the Anthropocene were explored and transposed using photography, video, installation and sculpture. The artists witnessed the same landscape, yet, as they filtered the experience through their individual thematic concerns and aesthetic sensibilities with different media, a series of translations occurred.

The interdisciplinary session aims to connect artists and scientists working with Polar concerns. What is the collaborative potential between art and science to raise awareness and understanding of these regions in relation to climate change?

We are interested in discussing the following topics:

- Process of making art in response to scientific issues
  
- How the language of visual arts can be used as a bridge between an objective scientific response and a subjective emotional response, to engage a wider audience in considering the realities of our rapidly changing world.
  
- How do artists explore that which cannot be transmitted and create meaning in what is lost?
  
- How do artists and scientists deal with the limits of visualization methods?

**Keywords:** Arctic, Antarctic, art, education, cross-disciplinary

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**Category**

OS Ocean, Sea Ice

**Session Number**

OS-1

**Session Title**

The acoustic environment of the polar oceans: exploring polar soundscapes

**Session Description**

The underwater acoustic environment is created by the superposition of sounds from a multitude of sources of natural biotic and abiotic as well as anthropogenic origin. For aquatic life, marine mammals in particular, their perceived soundscape directly impacts their ability to hunt, communicate and possibly navigate these waters. However, for much of the world oceans, and for polar seas in particular, little is known about the diversity of contributions and the diel and seasonal patterns as well as long-term trends of the acoustic environment. This lack of knowledge hampers our ability to predict how anthropogenic change will impact on populations to which these waters form an essential habitat. The impact of anthropogenic activities on the acoustic environment may be direct, by adding noise, or indirect through global climate change, affecting acoustic propagation conditions and habitat usage. To outline the range of polar acoustic environments and the nature of their main contributors, this session aims at bringing together studies addressing these issues through in-situ recordings, methodological advances and numerical modeling.

**Keywords:** Soundscape, acoustic environment, marine mammals, anthropogenic impact, underwater sound, noise

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**Category**

OS Ocean, Sea Ice

**Session Number**

OS-2

**Session Title**

Interdisciplinary research on sea-ice biogeochemistry and associated ecosystems

**Session Description**

The rapid change of sea-ice habitats in both Polar Oceans will significantly impact the ecosystems and biogeochemical processes within sea ice and at its interfaces. The Arctic is transforming rapidly from thick multi-year ice to first-year ice, becoming more similar to the Antarctic icescape. The strategies evolved by the Antarctic organisms to cope with the annual wax and wane of sea ice might thus provide inference for the Arctic case.

We aim to bring together researchers working in both Polar Regions to stimulate knowledge exchange and work towards comparison of changing dynamics and impacts on ecosystem functions and services in both Arctic and Antarctic sea-ice ecosystems, joining interdisciplinary sea-ice research from three different angles:

- 1) New approaches to investigate the multi-scale variability of sea-ice habitats using sampling platforms, such as ROVs, AUVs, aircraft, and ice-moored observatories;
- 2) Biodiversity and biogeochemistry of sea-ice habitats, their relationships with environmental variability and ecosystem functions; and
- 3) Numerical models as tools to understand past and present dynamics, and predicting future changes in ice-associated ecosystems.

This session calls for contributions on experimental, observational, and modeling studies focused on sea-ice biogeochemical atmosphere-sea ice-ocean interactions, biota and processes, also as part of the BEPSII (Biogeochemical Exchange Processes at Sea-Ice Interfaces) Clic/IASC/SCAR/SOLAS WG.

**Keywords:** Sea-ice ecology, sea-ice biology, sea-ice ecosystem, sea-ice biogeochemistry, cross-disciplinary, Arctic, Antarctic, experimental work, ecosystem models, new technologies, climate change.

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**Category**

OS Ocean, Sea Ice

**Session Number**

OS-3

**Session Title**

Sea ice extent, properties, volume & ice shelves: modern and paleo records

**Session Description**

Antarctic and Arctic coastal and sea ice zones are undergoing rapid and prolonged changes. Portions of some Antarctic Peninsula ice shelves have collapsed and extensive bottom melting has been documented in other Antarctic ice shelves. Although submarine, air- and space-borne sensors provide a fairly accurate account of Arctic sea-ice volume trends, similar observations in the Antarctic are less common and more difficult to interpret. As a result we have much less understanding of sea ice volume despite its sensitive response to climate variability. In order to fully understand the significance of all the contemporary changes, it is also necessary to examine them within the context of past sea ice changes over longer timeframes from geological records using a range of proxy methods. In this session, we invite papers that focus on current and past Arctic and Antarctic sea ice trends, sea ice properties and processes, the current status of ice shelves and their interactions with sea ice, sea-ice volume measurement, monitoring, and prediction, together with the mechanisms that control them. In all cases, studies that offer interdisciplinary approaches (e.g. field measurements/proxy methods combined with modeling) are particularly welcome.

**Keywords:** Sea ice, Arctic, Antarctic, cross-disciplinary

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**Category**

OS Ocean, Sea Ice

**Session Number**

OS-4

**Session Title**

Sea ice modeling and prediction

**Session Description**

We solicit contributions on the past, present and future evolution of Arctic and Antarctic sea ice, based on model simulations, on observations, or on a combination of both. These include studies that make use of new data that have recently become available for sea-ice research through the CMIP6 suite of model simulations, through large ensemble simulations, and through new observational data sets and algorithms. We also specifically invite contributions that examine the relationship of sea ice and iceberg model simulations and operational products such as ice charts.

In addition to the analysis of the evolution of sea ice over the 20th and 21st century, we invite submissions that provide an in-depth analysis of the relationship between individual models, individual observational data sets and between models and observational data, including products from operational ice services. The time scales of these studies may range from a few days for direct navigational use to centuries for understanding long-term climate evolution. In addition, studies examining the role of internal variability for the comparison of sea ice simulations with observations and with other model simulations and for sea ice projections are also encouraged.

Regarding new observational records, we in particular invite studies that use satellite data for ice detection and classification (ice class, thickness, drift, stage of development, etc.) and for manual and automated production of ice charts.

**Keywords:** Arctic, Antarctic, sea ice, iceberg, modeling, data

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**Category**

OS Ocean, Sea Ice

**Session Number**

OS-5

**Session Title**

The role of snow on sea ice for sea-ice parameter retrieval and variability

**Session Description**

Snow on sea ice and its properties are important for sea ice mass balance, net surface radiation balance of sea ice and for various ocean-sea ice-atmosphere interactions. Snow on sea ice influences retrieval of sea ice parameters from remote sensing observations. Variability in snow properties causes noise in sea-ice concentration products and leads to erroneous sea-ice type discrimination. For sea-ice thickness retrieval accurate snow depth is among the most needed parameters.

Despite its relevance less emphasis has been put on derivation of snow parameters and their quality assessment. These parameters include, but are not limited to, snow depth, snow grain size, snow density, snow wetness, snow salinity, presence of ice lenses, presence of flooding and its impact on sea-ice surface topography.

How well do we know snow on sea ice? How well do we understand the role snow on sea ice has for the observed variability in sea-ice cover and thickness in both Polar Regions? Do you feel able to contribute to answering these questions? Then please consider submitting an abstract to our session. We invite studies dealing with in situ observations, satellite data retrieval, modeling and combinations thereof of snow parameters on sea ice. We also invite studies on methods for quantifying the influence of (unknown) snow properties on the satellite retrieval of sea-ice parameters and on reducing the noise and improving the accuracy of retrieved sea-ice parameters due to snow properties.

**Keywords:** Antarctic, Arctic, sea ice, snow cover, snow depth, snow properties, flooding, snow metamorphism, snow-sea ice-interaction, methods, observations, modeling, remote sensing

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**Category**

OS Ocean, Sea Ice

**Session Number**

OS-6

**Session Title**

Polar Ocean Dynamics

**Session Description**

Understanding the polar ocean circulation and its interaction with the cryosphere and biogeochemical processes is critical to improve our knowledge of heat, freshwater, energy and carbon budgets, as well as sea level rise and ocean productivity. The Arctic and the Southern Oceans are affected by large scale annular modes of atmospheric variability, have large ice-covered regions, are bordered by ice-sheets and support strong boundary current systems. Dynamically, these flow regimes experience a small Rossby deformation radius, regions of extreme vertical stratification, strong interactions with bathymetry, and eddy variability that influences both mean and transient properties of the large-scale circulation. Despite these similarities, important differences in the behavior of the two regions have been observed, including sea ice trends from recent decades of opposite signs. Differences in ocean stratification, mixed layer processes, bathymetric geometry, and surface forcing have been suggested as possible causes for the distinct natures of the two regions.

In this session, we invite contributions on all physical oceanographic aspects of the Arctic or the Southern Ocean (or ideally both), based on observations, numerical models or theory. Contributions that explore how the ocean impacts the wider polar system, including air-sea exchange, sea ice, ice shelf evolution, biogeochemical cycling and other broad features of the high-latitude climate system, are especially welcome.

**Keywords:** Arctic, Southern Ocean, Physical oceanography, circulation, dynamics

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**Category**

OS Ocean, Sea Ice & AC Atmosphere, Climate & CR Cryosphere

**Session Number**

OS-7

**Session Title**

Atmosphere-Ice-Ocean interactions in the Polar Regions

**Session Description**

The Arctic and Antarctic climate system is strongly affected by atmosphere-ice-ocean (AIO) interactions and feedbacks between snow, ice, ocean, and the atmosphere, such as snow physics processes, polynya formation, sea ice production, and bottom water formation. AIO interactions are also triggered by synoptic weather phenomena such as cold air outbreaks, katabatic winds, and polar lows. The representation of these physical, chemical, and biogeochemical processes and interactions at different spatial and temporal scales, however, remains a major challenge for current weather and climate models.

This session combines research foci on atmospheric and ocean boundary layers, sea ice, and snow-cover processes as well as on global change related to the Arctic and Antarctic. We invite contributions related to the coupling between atmosphere, ice, and ocean, including the influence of sea ice floe-size distribution, sub-mesoscale ocean/sea ice dynamics and thermodynamics, and interactions between the Polar Regions and the global circulation. In addition, the session focuses on processes and parameterizations related to physical, chemical, and biogeochemical exchange and transport, where we also invite contributions addressing observational challenges. Further focus is on snow cover modeling as well as snow ablation and accumulation. Contributions are welcome dealing with theoretical and observational studies, including remote sensing, as well as studies using numerical models.

**Keywords:** atmosphere, cryosphere, ocean

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**Category**

OS Ocean, Sea Ice & EN Environment & BE Biology, Ecology, Ecosystems, Biodiversity

**Session Number**

OS-8

**Session Title**

Unifying perspectives: conceptualizing pan-Arctic and pan-Antarctic ecosystems

**Session Description**

Many nations are elaborating major research programs aimed at advancing our understanding of polar oceans. These are circular and cannot be understood by research carried out exclusively in specific sectors. In times of climate change the necessity of unifying, conceptual models is particularly compelling for the Arctic Ocean system that is transformed with breath-taking rapidity. A cascade of effects of Arctic change affects the rest of the world, in particular on the Northern Hemisphere. A prerequisite to understand environmental change and to manage the imminent pressures derived from the forecasted increase in industry operations in the Arctic are unifying ecosystem models that address the entire Arctic Ocean. The risk is that research programs will suffer from a lack of focus and their outcomes, while possibly scientifically relevant and sound for specific sector, may fall short of providing the high level understanding required for entire systems. The challenge to adopt a similar strategy for the Antarctic in the advent of possible industrial activity in future is apparent. The goal of the session is to promote shared, high-level paradigm synthesizing our understanding of the key processes and elements governing the response of the Arctic and Antarctic ecosystems in relation to current pressures and changes. In the Arctic the work has already started, but we aim at following up process for both Polar Regions

**Keywords:** Arctic, Antarctic, marine ecology, unifying perspectives

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**Category**

SH Social Sciences and Humanities

**Session Number**

SH-1

**Session Title**

Environmental Protection, Resource Rights and Evolving Geopolitics in Antarctica

**Session Description**

Global pressure over the Antarctic environment and its natural resources will increase over the coming decades due to three factors: climate change, the global dwindling of natural resources, and the fact that Article IV of the Antarctic Treaty leaves the question of sovereignty in Antarctica unresolved. Thus, the global community and the ATS regime specifically have an interest in developing tools to ensure continued protection of the natural environment as well as the regime itself. It is critical to develop projections regarding soft and hard manifestations of territorial pressures and international power plays on the ATS, and how these are likely to build over the next decades. We are also at a unique point in history to influence the ethical dimensions of the decisions that may govern claims on, and uses of, the Antarctic: What is a fair division of natural resources? Does any nation or group of nations have a privileged claim? Is stronger environmental protection desirable and how should it feature in future decisions?

In this session we invite contributions that are placed within the theoretical framework of international law and international management regimes, as well as normative viewpoints on territorial claims, claims over natural resources and environmental protection. Historical or comparative analyses on these issues, and discussions based on the Arctic experience are also welcome.

**Keywords:** Antarctica, environmental protection, international law, Antarctic Treaty System, resource rights, geopolitics, sovereignty, territorial claims, regimes, Arctic

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**Category**

SH Social Sciences and Humanities

**Session Number**

SH-2

**Session Title**

Indigenous Governance and Knowledge: Intersection of people, policy & priorities

**Session Description**

Indigenous epistemologies, laws and governance structures have long underpinned the ways in which humans have related to the Arctic environment. While science and governance models are taking precedence, Indigenous Peoples (IPs) are reasserting their right to self-determination and using collaborative, participatory and co-production approaches that utilize Indigenous Knowledge (IK), traditional values and perspectives as well as scientific knowledge and practice. IK provides essential information to understand the changes occurring in the Arctic from a physical, biological and social perspective. The holistic approach that Indigenous communities take to understanding the environment, which they are part of, provides crucially needed information and governance models. Increasingly, researchers and policy-makers are exploring meaningful ways to engage and include IK and management schemes in the science and governance paradigm, while concurrently Indigenous communities are demanding more self-determination and information sovereignty while working to retain control of their knowledge and confronting issues of ethical management and sharing. This session connects IPs, researchers, students, policy makers and those working at the intersection of people, priorities and policy to discuss principle-based approaches for building and maintaining relationships with Arctic IPs, including Indigenous Governance Models and the ethics and sovereignty connected to managing and sharing IK.

**Keywords:** Indigenous Knowledge; governance; ethics; information sovereignty

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**Category**

SH Social Sciences and Humanities

**Session Number**

SH-3

**Session Title**

Historical perspectives on Arctic and Antarctic connections

**Session Description**

The Arctic and Antarctica may be at opposite ends of the earth, but they share many historical connections, and knowledge gained in the North often influenced later exploits in the South. While 16th-century explorers and their backers searched for the North-West or the North-East Passages, seeking a shortcut between Europe and Asia, the southern continent remained unknown, and was even imagined by some as a place promising wealth and glory. Commerce became an important driver in both regions; whaling and sealing flourished in the Arctic before taking off in the Antarctic, and in some cases individuals and firms operated in both Polar Regions. Explorers turned from North to South, making use of their Arctic experiences in the Antarctic context, while Indigenous individuals from the North also accompanied many expeditions in order to provide polar expertise. Organizations such as the Scott Polar Research Institute, the Arctic and Antarctic Research Institute of the USSR, the Norwegian Polar Institute, and the German Alfred Wegener Institute linked both Polar Regions within a common framework for both research and logistical planning, while government departments increasingly established desks with responsibilities in both Polar Regions. Research techniques developed in Antarctica have also been put to use in northern areas, reversing the original direction of exchange. The session welcomes papers from all disciplines.

**Keywords:** History, Polar Regions, knowledge transfer, politics, research organization, humanities, social sciences

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**Category**

SH Social Sciences and Humanities

**Session Number**

SH-4

**Session Title**

Polar Heritage: Politics, policy, practice

**Session Description**

This session explores the processes through which heritage production is used to create collective memories of Polar Regions – from politics to policy and practice. Competing actors have enrolled historic sites as anchor points for selected narratives about the past that serve present purposes, or simply as objects that can be managed as an exercise of sovereignty. In this session we would like to engage with a wide range of different issues relating to Polar Historic Sites and Monuments (HSMs) specifically and polar heritage more generally. Topics could include exploring the politics of memory at intersection of environmental change, geopolitics, international relations (especially cultural diplomacy) and heritage in the polar regions; tensions between the material culture created through human activity and the containment of accumulation of material legacies of human presence in Antarctica; better understanding HSMs through archaeological, historical and site research; multi-disciplinary research on HSMs (for example working with environmental scientists to gauge human impacts); lacunae in polar heritage policy as well as issues related to heritage practice, for example maintaining an in situ physical presence while engaging the non-polar world with the significance of polar heritage and the role of polar museums in heritage dynamics.

**Keywords:** heritage; Historic Sites and Monuments; environmental change; cultural diplomacy; geopolitics; collective memory; heritage policy; polar museums

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**Category**

SH Social Sciences and Humanities

**Session Number**

SH-5

**Session Title**

Current and future change, sustainability and resilience in the Polar Regions

**Session Description**

The Polar Regions are undergoing rapid environmental, socio-cultural and economic transformation. Monitoring current change and anticipating future developments are becoming more important than ever. Assessing the sustainability and resilience of integrated socio-ecological systems involves a better understanding of the complex interactions between social and ecological domains and facilitates the creation of resilient systems whilst increasing knowledge capacities of polar communities and their ability to shape change. A number of initiatives are currently underway to assess sustainability and resilience in the Polar Regions taking into consideration the impacts of biophysical and social drivers of change. This session aims at exploring how polar communities and stakeholders deal with the combined challenges from climate change, political, economic and resource pressures, changes to the global order and new socio-cultural realities and what the future might hold for the Polar Regions. We recognize the opportunities presented by integrated interdisciplinary approaches developed within the biophysical, social, humanities and arts scholarship and invite researchers with an interest in socio-ecological systems, the interaction of society and place, or in exploring the futures in a methodological or even speculative manner to contribute to this session. Papers surveying changing (inter-)disciplinary perspectives on one or both Polar Regions over time are also welcome.

**Keywords:** Polar Regions, Arctic, Antarctic, Futures, sustainability, monitoring, socio-ecological systems, resilience, climate change, resources

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**Category**

SH Social Sciences and Humanities & OC Outreach and Communications & SY Observation Systems

**Session Number**

SH-6

**Session Title**

Connecting Polar Research across Boundaries

**Session Description**

Polar research spans numerous disciplinary, institutional, national, and sector boundaries. Working effectively across these many boundaries requires effective communication, coordination, and collaboration. This interactive session will explore examples of what is being done, and what more could be done, to bridge boundaries in order to advance polar research, support human activities in a sustainable way while respecting local and traditional culture and livelihoods, and inform sound decision-making. The following topics are expected to be covered:

Stakeholder collaborations (including among science, society, public, funding agencies, and indigenous people)

Organizational collaborations, including international infrastructural collaborations

Bridging Arctic and Antarctic Polar science, technology and engineering

Bridging between STEM with social sciences

Other boundaries which can be bridged to advance inquiry, discovery, and the application of knowledge to support human activities and sound decision-making.

**Keywords:** Connecting, interdisciplinary, international, societal, collaboration, cooperation, communication, coordination, infrastructure

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**Category**

SH Social Sciences and Humanities

**Session Number**

SH-7

**Session Title**

Science, Policy, and Politics at the Poles

**Session Description**

While both Polar Regions are important fields for the development of the scientific knowledge, they also serve as unique platforms for the various interactions between science, policy, and politics. This session takes the polar regions as a distinct "area", using an area studies approach to explore core governance issues and engage in deep policy analysis. Area studies is a multidisciplinary methodology common in the social sciences and humanities which is used to answer complex and inter-connected questions related to a particular geographic region or society. Our session proposal invites papers from Arctic and Antarctic social scientists and humanities specialists aimed at addressing key policy issues at the poles such as: how polar science moves to policy; polar science diplomacy; the role of advisory bodies and regional organizations (i.e. AFoPs, SCAR, IASC, IACS); comparative Arctic and Antarctic foreign policies; polar legal matters; polar development and under-development; indigeneity and the poles; how politicized narratives of history and culture inform present day geopolitics; and the geoeconomics of the poles.

**Keywords:** Arctic, Antarctic, area studies, science diplomacy, geopolitics, public policy

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**Category**

SH Social Sciences and Humanities & AC Atmosphere, Climate

**Session Number**

SH-8

**Session Title**

Data science for polar environments – discovery, rescue, and mining

**Session Description**

This session brings together two communities who recover and interpret historic information, the users of environmental data and the community applying new data mining methodologies to that data. While observational data near the poles are still sparse, the quantity of data from historical records, satellite observations, reanalyses and climate models is growing constantly. To improve our understanding of the complete climate system, it will be critical to take full advantage of the recent data available and to link it to historical reference data.

Contributions on improving understanding and modeling of the Polar climate system through data rescue, data mining and machine learning methods are welcome. Studies that develop and implement new data-mining methods for climate diagnosis in the atmosphere, ocean or cryosphere are encouraged, but submissions that integrate information from multiple components of the climate system are particularly welcome. Historic records are vital for a better understanding of changes in Polar environment such as climate, landscape, flora and fauna. Recent advances in image and data processing, digitizing, and crowd sourcing allow placing this information in a better spatio-temporal context. Abstracts from historians, humanities and GIS researchers dealing with the recovery, visualization, and interpretation of information from indigenous narratives, log-books, maps and diaries are welcome.

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**Category**

SH Social Sciences and Humanities

**Session Number**

SH-9

**Session Title**

Polar research in the humanities and social sciences: approaches and challenges

**Session Description**

The polar regions are dynamic systems that face increasing challenges resulting from the interactions between climate change, increasing and diversifying levels of human activities, and economic and political pressures. Understanding and addressing these challenges requires contributions from humanities scholars and social scientists, which are well placed to contextualize and conceptualize the multifaceted dimensions of human engagement with the Polar Regions.

Even within the humanities and social sciences, research approaches and methods vary greatly, with some common themes (e.g. on text and document analysis, meta-analysis) but often different practices. Connected by a common interest in human interactions with the Polar Regions, humanities and social scientists have much to gain from sharing insights about their research methods, as well as the challenges they face and opportunities they seize. This session enables scholars to do that.

Similarly, natural scientists with an interest in socio-ecological systems or the interplay between people and places are invited to contribute to this session. We invite abstracts that address aspects related to polar research methods and their limitations, novel approaches and paradigms, challenges faced when undertaking research in the polar regions, the analysis and management of textual, historiographical, qualitative and quantitative data, as well as changing disciplinary perspectives on the polar regions over time.

**Keywords:** Arctic, Antarctic, social sciences, humanities, cross-disciplinary, methods

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**Category**

SY Observation Systems

**Session Number**

SY-1

**Session Title**

Earth Observation: Solutions for data collection, compilation and dissemination

**Session Description**

Remote and in situ observations of the Polar and cryospheric regions continue to produce vast quantities of multi-disciplinary data on the terrestrial, marine, geological, biological, cryospheric and atmospheric systems. Coordination, cooperation and efficient dissemination are integral to optimize data impact.

This cross-disciplinary session presents the range of regional and global data being acquired and compiled, including remote earth observation and in situ data, the compilation and processing of existing geospatial data, and the collation and conversion of legacy datasets in to modern geospatial compilations. We will explore how datasets are best compiled, stored and distributed, and best practices for cross-disciplinary dissemination. We will highlight a good practice example: The Global Cryosphere Watch (GCW). This multi-disciplinary project of the World Meteorological Organization and its partners will establish a sustained, global, robust, end-to-end cryosphere observing and monitoring system, covering all components of the cryosphere.

We invite contributions from all fields of data collection, compilation and distribution, particularly highlighting gaps in our current knowledge to point to priority areas for future research. With respect to the cryosphere (in particular to GCW), contributions meeting the challenges of data consistency and data dissemination, data distribution through portals and providing an integrated cryosphere-observing network are invited.

**Keywords:** Cross-disciplinary, Antarctic, Arctic, cryosphere, data collection, earth observation, databases, data dissemination

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**Category**

TE Technology, Engineering

**Session Number**

TE-1

**Session Title**

Observing with autonomous vehicles in Polar Regions

**Session Description**

Reliability of Arctic and Antarctic forecasting tools have been shown to be of variable quality. This is in part due to a lack of understanding of physical processes involved, which results from a lack of observations in those regions. Autonomous systems operating at various scales provide unprecedented perspectives on the atmosphere, cryosphere, oceans and biosphere. Their ability to bridge in situ station observations and satellite-based remote sensing helps inform questions related to spatial variability, vertical structure of atmosphere and ocean, and helps obtain information in otherwise difficult- or impossible-to-reach environments. Ultimately, this helps us to better understand and predict polar weather and climate.

We invite contributions from various communities involved with conducting autonomous high latitude observations, including scientists, engineers, policy makers, and commercial interests. Specific topics of interest include:

- Scientific results from autonomous platforms
- Technological improvements and capabilities that aid operations in the harsh polar environment.
- International collaborations, asset and data sharing, and regulatory solutions to accessing the Polar Regions.
- Integration of platforms into polar observing systems
- Outstanding opportunities for autonomous systems to address scientific questions.

Abstracts regarding unmanned aircraft systems (UAS), autonomous underwater vehicles (AUV), and other robotic platforms are welcome.

**Keywords:** cross-disciplinary, unmanned, autonomous, Arctic, Antarctic, observing

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**Category**

TE Technology, Engineering

**Session Number**

TE-2

**Session Title**

Advancing Polar Engineering and Sustainable Infrastructure Development

**Session Description**

Technological insights that not only improve polar research but also better the lives of polar communities in a sustainable manner are of great importance and are in high demand. Unique engineering and policy approaches are required in these arenas, and this session therefore seeks a broad spectrum of submissions.

On the technical side, submissions addressing the design, testing, and utilization of polar field techniques, equipment, facilities, vehicles, and instruments for research and use by polar communities are invited. Themes to be investigated include: cold regions construction engineering; low-temperature materials development; alternative energy systems; innovations in ice coring and drilling technology in cold regions; ice and permafrost engineering; and polar transport.

Yet technological advances and inflow cannot generate sustainable development nor facilitate research unless it is accompanied by prudent policy and enhanced local capabilities. Submissions are therefore also invited that explore the following: deficiencies in polar communities in terms of specific technologies, infrastructure, and complementary human capital (e.g., in the areas of healthcare, education, transportation, energy, sewage treatment, Internet connectivity); successful and unsuccessful introductions of technology and infrastructure in polar communities; proposals for meeting the technological and infrastructural needs of polar communities in a sustainable fashion.

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**Category**

TE Technology, Engineering & CR Cryosphere

**Session Number**

TE-3

**Session Title**

Remote sensing of polar regions

**Session Description**

Our understanding of the rate and physical processes controlling change in Earth's ice covered regions has been revolutionized in the last 2 decades by remotely sensed observations. Earth Observation satellites have improved the spatial and temporal sampling of cryospheric regions, and historical datasets now provide an invaluable long term record of change. New satellite missions (e.g. SMOS, Sentinel, CryoSat, TerraSAR-X, WorldView, GRACE, Cosmo-SkyMed) have employed innovative sensors, imaging modes, and high latitude orbits to measure the cryosphere. It is increasingly clear that improvements in our ability to exploit satellite measurements of the cryosphere will only be achieved through coordinated progress in the measurement of surface state variables, enhanced modeling capabilities coupled with the development of new remote sensing concepts. Some of these new developments have included the use of new satellite platforms and methods to improve geospatial measurements, e.g., remotely sensed data for snow monitoring, glaciological and mass balance studies, ice sheet flow and geodynamics over short temporal scales, understanding the marine cryosphere and interactions with the ocean and atmosphere. This session aims to highlight recent scientific results in all aspects of remote sensing of the cryosphere, over land and sea ice. Presentations should address interpretation of cryospheric data from satellite, airborne or in situ instruments.

**Keywords:** Remote sensing, modeling, cryosphere, Polar Regions

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