Theme 2: Oceans

2.1 Toward a Canadian Integrated Ocean Observing System: Current Status and Next Steps (Town Hall)

Canada requires a coordinated integrated ocean observing system to meet the national ocean information needs of government, academia, industry, and the public. Such a system will directly support our international ocean commitments, and permit Canada to play a global leadership role in multidisciplinary ocean science. An ocean observing system will help coordinate the collection of ocean data, be capable of adaptation in the face of changing needs and a changing environment, and will provide access to data currently not discoverable, especially the extensive holdings of the federal government.

Internationally, a growing number of countries and organizations worldwide have well-established ocean observing systems. Canada's positive global reputation has us well-positioned to sustain our engagement in international efforts (UNCLOS, ESPOO, CBD, OSPAR, MARPOL 73/78, GEOOS, GOOS, etc.). Nationally, the amount of information and data generated by Canada's existing ocean observing assets distributed across the country (provincial and federal ministries, research organizations, universities, Indigenous Nations, NGOs, etc.), is already considerable and provides a solid foundation for establishing regional associations within an overarching Canadian Integrated Ocean Observing System (CIOOS) to address Canada's national priorities. To this end, in 2016, Fisheries and Oceans Canada re-initiated a consultation process with stakeholder groups across the country to continue past discussions and move forward with the creation of CIOOS. In 2017, it commissioned three Investigative Evaluations (IEs) to make recommendations regarding the structure of a national observing system.

Such an initiative will not be successful without broad engagement with the many collectors and users of ocean-related data in Canada. The goal of this session is to provide an update on the process thus far, to share the results of the Investigative Evaluations, and – most importantly – to solicit input, feedback, and direction from ocean-related fields.

2.2 Acoustics in oceanography and marine sciences

Acoustic techniques are the primary means of long distance communication and remote sensing underwater. Consequently, acoustics is key to revealing the underwater world. The focus of this session is to highlight the contributions of underwater active and passive acoustics to all aspects of oceanography and marine sciences. Areas of interest include, but are not limited to: sonar and passive acoustics, bio-acoustics, passive acoustic monitoring, fisheries acoustics, geophysical applications, acoustic communication, defense applications, ambient and ocean noise, anthropogenic noise, long-range propagation, tomography, high-frequency scattering, imaging, and quantitative inversion.

2.3 Ocean Observing Programs and Coordinated Ocean Information Management

The session calls for presentations that high-light regional research collaborations between institutions, academia, and government, and cross-country initiatives utilizing diverse ocean observing platforms, as well as efforts to standardize and develop best practices in ocean modelling and data management. Programs that have both regional and national objectives, and integrate observations and modelling efforts are encouraged to present. Example initiatives and programs include ArcticNet, ONC, OTN, SLGO, and MEOPAR, as well as government lead initiatives such as CONCEPTS, OPP, and CIOOS.

2.4 Go with the flow: managing marine life in a dynamic ocean

Ocean currents and water masses influence the dispersal and ecological connectivity of marine populations across various scales from patch (e.g., turbulence) to ocean basin (e.g., global circulation). Integrating physical transport, dispersal and connectivity with management and planning activities is desirable both to quantify anthropogenic influences on biophysical processes and to optimize planning strategies. To facilitate knowledge exchange in this area of research, we invite abstracts from all disciplines on topics including, but not limited to: dispersal, transport and movement of species spanning microbial organisms to top predators, integrating biophysical transport into anthropogenic co-occurrence or decision making models, biophysical patchiness, particle tracking modeling, demographic/genetic connectivity, new tools and technologies. We invite studies employing a variety of approaches, for example field observations (e.g., moorings, drifters, tagging), bio-physical modelling (e.g., Lagrangian numerical studies), and management frameworks (marine spatial planning, decision support tools, etc).

2.5 Blueprint for Atlantic Ocean Observing (For Joint Town Hall with MEOPAR)

The oceans play a vital role in the global climate system and biosphere, providing crucial resources for humanity including water, food, energy and raw materials. The ocean is the seventh largest economy in the world, with goods and services from coastal and marine environments amounting to $2.5 trillion each year. Our growing use of the oceans, in particular expanding activity in the Arctic, poses challenges for the sustainable management and development of ocean resources. Informed decision making, at national, regional and global levels requires a sustainable, internationally-coordinated and comprehensive (seabed to space) ocean observing system to assess current trends and predict future scenarios.

The goal of the BluePrint team is to develop an advanced, international elaborated framework for the formation and operation of an integrated Atlantic Ocean Observing System that goes beyond the state-of–the-art and leaves a legacy of sustainability and enhanced coordination. The Blueprint will integrate existing ocean observing activities into a sustainable, efficient, and fit-for-purpose Integrated Atlantic Ocean Observing System. The observing system should be integrative, ambitious, multi-national, multi-sectoral and purposeful, but not prescriptive, and enhance new partnerships between science, service, private sector and civil society. The Blueprint team can deliver this framework but it is the decision makers across the Atlantic region who must deliver the implementation.

2.6 Collaboration in development, evaluation and analysis of ocean circulation and biogeochemical models

Ocean circulation and biogeochemical models are widely used for both research and operational forecasting. However, there are challenges for small research groups to handle the increasing complexity of the model codes, evaluation with various observational datasets, and analysis of the increasing amount of model output data. In order to facilitate improvement of model quality and work efficiency, this session invites ocean modelling researchers from government, universities and industry who are interested in collaboration and sharing of expertise. Specific topics may include: 1) progress of model research and applications in various regions with different spatial resolutions; 2) new evaluation and analysis results that demonstrate the strength and weakness of the models; 3) improvements in model numerics and parameterization of sub-grid processes; 4) new analysis methods; 5) new forcing and evaluation datasets; 6) model inter-comparison; and 7) data presentation and visualization tools; etc. We hope contributions to this session will achieve a balance between scientific results and technical issues.

2.7 Development, performance, and implementation of oceanographic sensors and instrument platforms

New developments in scientific instrumentation often lead to advances in our understanding of nature; indeed our understanding of the ocean is limited to a large degree by our ability to observe it. Some examples of platforms and sensors in routine use today that have advanced oceanography include autonomous platforms such as gliders and Lagrangian profiling floats, cabled observatories, underway measurements on vessels of opportunity, oceanographic radar, ecogenomic sensors, and optical biogeochemical sensors. Autonomous platforms have become particularly important as oceanographic fleets are pared down by cost-cutting.

The intent of this session is to bring together those who have an interest in advancing oceanographic observations. We encourage presentations on new sensor and platform development, evaluation of sensor performance, quality assessment of long-term time series, and novel implementations of existing technology.

2.8 Ocean Acidification in Canadian Waters

As the oceans and lakes absorb a portion of the CO2 produced by fossil fuel burning, they become more acidic (lower pH), which adds an additional stress to aquatic ecosystems. This issue has been termed 'the other CO2 problem' in the climate change literature and has garnered increasing attention in the past decade in ocean studies. Prior to this period few data were collected and in many regions even a basic understanding of seasonal carbon cycles and baseline levels of pH remain unknown. Similarly, the impacts of this additional ecosystem stress and their societal and economic implications remain largely unknown. The session invites contributions from the two MEOPAR ocean acidification initiatives ICAP (Integrated Coastal Acidification Program) and COARp (Canadian Ocean Acidification Research Partnership), as well as from all other relevant studies and programs. We welcome abstracts investigating all aspects of this issue, including observational work, modelling, controlled laboratory manipulation experiments, vulnerability and risk assessments, and studies from the (wider) social science realm. Studies of direct relevance to acidification issues and/or biogeochemical cycles (e.g. changes in hydrological cycles or physical forcing) are also welcome.

2.9 Physical Oceanography

Advances in Physical Oceanography benefit from observational data, detailed modelling studies, and theory describing fundamental processes occurring over a large range of spatial and temporal scales. The range of length scales is vast and includes: micro- and fine-structure, sub-mesoscale, mesoscale, and basin-scale flows. In the subpolar regions the dynamics are intimately coupled to the dynamics of sea ice. We welcome contributions on these and other related topics and will work with the organizers of the Atmosphere, Ocean and Climate Dynamics session to ensure that there are no scheduling overlaps.

2.10 Coastal Oceanography and Inland Waters

This special session will focus on all aspects of observational and modelling studies of physical and biogeochemical processes in coastal waters, shelf seas, estuaries and inland waters. Topics include but are not limited to coastal physical oceanography, storm surges, tsunamis, estuarine dynamics, hydrology and hydrodynamics of large lakes, mixing and dispersion of materials. We also invite contributions related to both observational and modelling aspects of biogeochemistry in coastal and inland waters.

2.11 History of Canadian Oceanography

Canadian oceanographers and their organizations have made their mark on oceanography as we know it today. Presenters are invited to showcase historically groundbreaking or unique oceanograhic techniques, datasets, field trials, or research programs that contain significant "CanCon", as well as interesting stories and characters from the history of Canadian oceanography..

2.12 Operational Oceanography

Within Canada, and internationally, ocean forecasting is becoming more and more common, with weather predictions now including coupling to numerical ocean and sea ice models in their prediction suites. Recently, there has also been an expansion in the use of ocean forecast system output for critical at-sea operational decisions.

This session invites abstracts on all aspects that contribute to the advancement of operational oceanography. This covers work related to re-creating descriptions of historical ocean conditions as well for short-to-seasonal timescale forecasting. Abstracts on all aspects of operational oceanography from research to products are welcome. These could include: increases in ocean model performance, ocean model forecast/hindcast evaluation, innovative techniques for model visualisation and product discovery, end uses of ocean forecast/hindcast systems, novel approaches for ocean observing as well as forecasting and evaluation of biogeochemistry variables.

2.13 General Session - Oceans

This session will include contributions related to oceans that do not fit into any of the other sessions.

Theme 3: Atmosphere

3.1 Surface-atmosphere exchange in terrestrial environments

Interactions between the Earth's surface and the atmosphere determine the properties of the planetary boundary layer by transfer of mass and energy. These surface-atmosphere interactions connect to mechanisms which are known to drive climate change. Natural and anthropogenic emissions of long-lived greenhouse gases (e.g., carbon dioxide, methane, and nitrous oxide) and more reactive species (e.g., volatile organic compounds, nitric oxide, and ammonia) play a crucial role in these mechanisms and have direct impacts on global warming and public health. The deposition of trace gases on leaf or soil surfaces causes perturbation to vulnerable ecosystems (e.g., deposition of nitrogen species), and may lead to a loss of agricultural yields (e.g., deposition of ozone). Under a changing climate, biogeochemical cycles are projected to change in most environments possibly leading to significant changes in land use and human behavior. The aim of this session is to discuss transport processes and mechanisms at the interface of the terrestrial surfaces and the atmospheric boundary layer which affect these biogeochemical cycles. This includes flux measurements on ecosystem scale of reactive and non-reactive traces gases using micrometeorological approaches such as eddy covariance, relaxed eddy accumulation or gradient techniques. Studies that investigate transport mechanisms in the lower part of the boundary layer and model studies on surface-atmosphere exchange are invited. The session is intended to focus on, but not limited to, exchange above natural, agricultural and urban environments.

3.2 GOES-R related activities at Environment and Climate Change Canada

GOES-R is the program name for the series of next generation geostationary weather satellites developed by the National Oceanic and Atmospheric Administration (NOAA) in collaboration with the National Aeronautics and Space Administration (NASA). GOES-16 was launched in November 2016 and assumed the operational GOES-East position in January 2018. GOES-S will launch in March 2018.

The ABI (Advanced Baseline Imager) is the primary instrument on GOES-R. ABI has 16 channels offering increased spatial and temporal resolution. ABI provides a suite of new products for severe weather forecasting, fire and smoke monitoring, and volcanic ash advisories etc. The GLM (Geostationary Lightning Mapper) instrument is a first of its kind to be on a geostationary satellite. The GLM has the potential to improve severe storm warnings and short range forecasts of heavy rainfall and flash flooding, including weather events that could affect aviation safety.

This session will focus on sharing user experiences using the new capabilities of the GOES-16 satellite, as well as future plans to exploit its observations. Topics of particular interest include: (i) GOES-16 products and access in Canada (ii) Case studies, applications and training (iii) Geostationary Lightning Mapper validation and applications.

3.3 Atmospheric Boundary Layer Composition and Processes

This session aims to bring together researchers working to increase our understanding of Atmospheric Boundary Layer (ABL) meteorology, especially including aerosol and trace gas composition. Topics of broad interest to this session include field measurements (from any platform) and/or numerical simulations of ABL:

1) Trace gas and aerosol physical, chemical and optical properties,
2) Trace gas and aerosol emission, production, loss and deposition processes,
3) Physical processes controlling the ABL itself.

We welcome submissions related to daytime and nocturnal ABL structure and variations in land, coastal and marine environments, possibly but not necessarily including aspects of chemical tracer (gas or aerosol) evolution. We also strongly encourage submissions related to atmospheric surface and mixed layer composition with, e.g., an air quality and/or emission/deposition focus, and subject to ABL variations and ventilation.

3.4 The Canadian Climate and Atmosphere Research (CCAR) Program

The Canadian Climate and Atmosphere Program (CCAR) was initiated by NSERC in 2012 and funded seven networks each for a five year period. The aim of the $35M program was to: "...generate knowledge of the physical, chemical and biogeochemical processes related to the climate and atmospheric system and enable application of this knowledge toward understanding and predicting weather and climate..." In 2016 NSERC held a review of the program that found "...that the scale and scope of the research conducted would not have been possible without CCAR funds and the use of a network approach. This approach had a number of important benefits including: facilitating collaborations, enabling knowledge dissemination, transfer and use, as well as training a large number of highly qualified personnel."

As the CCAR program draws to a conclusion, this session will highlight the contributions of the networks to climate and atmospheric research in Canada and consider the next steps needed to capitalise on this investment. Papers are invited on CCAR networks and their contribution to Canadian and international research, policy and economic development as well as suggestions for future activities.

3.5 Fog or Low Visibility

Fog or low visibility has many significant impacts. Aviation at airports, road transportation, fishing, servicing of offshore oil and gas platforms, commercial shipping, and recreational boating are all affected. Surveillance activities, search and rescue activities, and military operations are also impacted by low visibility and ceiling conditions. Our forecasts of low visibility due to fog, blowing and falling snow, smoke and haze are generally poor, although newer techniques are emerging. Our physical understanding of how low visibility events occur is rather rudimentary. Satellite or remote sensing techniques to detect and nowcast low visibility periods appear to be viable yet more research is required. Techniques to verify visibility forecasts need to be established, especially for rare events. In order to be useful for certain clients, aviation for example, forecasts have to be quantitative and not

simply indicators of fog/no fog. This presents some additional challenges because visibility in liquid fog depends on knowing/forecasting droplet concentrations, sizes and cloud liquid water content, or some surrogates of those parameters. Visibility also changes if snow or rain is falling and if ice particles are present suspended in the air. This session will present papers highlighting the progress being made on these problems, including a better understanding of fog or low visibility, new climatologies, climate trends, improving our monitoring and verification capability, discussion of new forecasting techniques, and some new projects which are addressing these issues.

3.6 Air Quality: Modeling and Monitoring of Cumulative effects

This session invites contributions on air quality studies using modeling and/or monitoring approaches with focuses on cumulative air pollution and its impact on ecosystem and human health, such as topics on (i) atmospheric pollutants emissions sources, transport, transformation and sinks and related environmental impacts, (ii) atmospheric deposition of major pollutants to various ecosystems and its impacts and effects indicators, (iii) spatial and temporal distributions as well as long-term trends of atmospheric pollutants and their implications on pollution control policies, and (iv) short- or long-term cumulative effects of single or multiple pollutants on human, animal and ecosystem health.

3.7 Convection and Cloud Physics

The predictability of climate and weather forecast models is mainly determined by the accuracy with which they parameterize subgridscale processes. We invite observational and modelling studies related to cloud and convective processes, their relationship with climate and rainfall variability, and aerosol-cloud interactions.

3.8 General Session - Atmosphere

This session will include contributions related to the atmosphere that do not fit into any of the other sessions.

Theme 4: Cryosphere

4.1 High Latitude Systems and Climate Change

This session focuses on climate impacts on high latitude systems and northern and southern polar regions at both regional (e.g., Bering Sea, Beaufort Sea, Barents Sea, Labrador Sea) and broader spatial scales (e.g., Arctic Ocean and the Southern Ocean). We seek papers that evaluate climate impacts at time scales ranging from seasonal, decadal, to multi-decadal. Included topics might be: (a) Seasonal time scales, for example, estimates of September ice conditions and links to preceding winter and early spring atmosphere or ocean conditions; (b) The impacts of climate change on high latitude and Arctic or Southern Ocean storms and their impacts and feedbacks on the upper ocean; (c) The role of inertial gravity waves, mesoscale and sub-mesoscale eddies and related processes on mixed layer depths, vertical mixing, and on the ice edge etc; (d) Estimates of climate and climate change on longer time scales, up to the next several decades, e.g. following IPCC scenarios; and (e) Climate impacts on high latitude ecosystems and ecosystem services (i.e. fisheries).

4.2 Advancements in the in situ measurement of solid precipitation

In situ measurements of solid precipitation (snowfall and snow on the ground) are influenced strongly by the specific configuration of instruments and environmental conditions at a given location, presenting challenges for environmental monitoring and risk assessment programs. These challenges pertain not only to the physical installation and configuration of instruments, but also to the standardization and homogenization of measurement data. The World Meteorological Organization (WMO) Solid Precipitation Inter-Comparison Experiment (SPICE) has sought to address these challenges through the assessment and intercomparison of instruments for the measurement of solid precipitation and snow on the ground in different climate regimes. Concurrently, research and operational programs have continued to address regional and national issues related to measuring snowfall and snow on the ground. This session will present results and recommendations pertinent to the advancement of in situ measurements of solid precipitation, including the current status of adjustment functions to mitigate the influence of wind-induced undercatch on measurements from automated precipitation gauges.

4.3 General Session - Cryosphere

This session will include contributions related to the cryosphere that do not fit into any of the other sessions.

Theme 5: Hydrology

5.1 General Session - Hydrology

This session will include contributions related to hydrology that do not fit into any of the other sessions.

Theme 6: Weather

6.1 General Session - Weather

This session will include contributions related to weather that do not fit into any of the other sessions.

Theme 7: Climate

7.1 Climate Variability and Predictability

This session invites contributions that deal with climate variability and predictions on subseasonal, seasonal, interannual and decadal-interdecadal time scales. Contributions are solicited on topics including studies of the Madden-Julian Oscillation (MJO) and tropical waves, El Nino/Southern Oscillation (ENSO), atmospheric circulation patterns, tropical-extratropical interaction and teleconnections, and impacts of these processes on predictability and predictions. Equally welcome are contributions on extended- and long-range weather forecasts, and predictions of climate variability on various time scales, including ensemble and initialization techniques, model development, forecast skill assessment, downscaling and calibration, and end-user value and applications. Results from diagnostic, modelling, model inter-comparison, and theoretical approaches are all welcome.

7.2 Processes and Impacts of climate change in the Arctic realm: from past to future

The Arctic Realm is rapidly changing at a pace exceeding the average rate of the ongoing global warming. Particularly sensitive to this change is the cryosphere, including both Arctic sea ice, glaciers and the Greenland Ice Cap. Melting of ice has large impact on the radiative energy budget and sea level. At the same time, the meltwater discharge may affect oceanic circulation. Many of these processes and feedbacks operate on time scales too long for instrumental observations and the sensitivities and natural variation in key Earth System Components in the Arctic can be best studied on natural experiments from the geological past. In this session, we invite contributions from a range of disciplines and across time scales, including observational data, proxy data, model simulations and forecasts. The common denominator of these studies will be their focus on a better understanding of the involved processes and their impacts.

7.3 Earth System Models: Assessing Earth’s State and Fate from Regional to Planetary Scales

Earth System Models provide our principal means to simulate Earth System processes and to predict the evolution of the planet. Each generation of Earth System Models, including components that simulate the atmosphere, oceans, land, vegetation, ice, and snow, has provided new insights into physical and biogeochemical processes, predictions from seasonal to decadal scales, and projections of the future of the planet under greenhouse warming and other sources of radiative and compositional driving. These models can be statistically and dynamically downscaled to investigate socio-economic impacts of climate variability and change and provide regional-scale projections. This session encourages contributions dealing with the many facets of Earth System Models, including the latest developments under the Coupled Model Intercomparison Project Phases 5 and 6, assessment of model performance in comparison to Earth observations from ground-based and space-based measurements, prediction of climate on seasonal to centennial timescales, regional climate modelling, climate change detection and attribution, process understanding and subgrid scale parameterization development, and climate change impacts assessment on regional scales.

7.4 Science for Canadian Climate Services

Climate services balance user requests with available science. This session will profile data products and tools with a focus on multi-model scenarios and historical climate data records to inform climate resilience and adaptation decisions of intermediate to high complexity. This session will provide an overview of the Canadian Centre for Climate Services' approach and status, coupled with presentations highlighting innovative climate information, products and tools addressing slow onset climate change and climate extremes.

7.5 Regional Climate Analysis and Projections; Analyses et projections du climat régional

Identifying large-scale drivers and local/regional feedback processes leading to extreme and high-impact weather events responsible for atmospheric hazards is required to reduce the risks of associated damages. Regional climate analyses and projections play a key role in the understanding of the past and future changes in precipitation and the water cycle. With increasing computing power, it is now possible to undertake unprecedented very high-resolution climate simulations, and to study in-depth the complex processes responsible for the occurrence of weather and climate extremes. Comparing these simulations with observations allows addressing various scientific issues related to climate variability and feedback mechanisms at various temporal and spatial scales, both for surface conditions (ex. soil moisture, snow cover, land and ocean surface temperature anomalies) and for preconditioning large-scale atmospheric features. Given the need to better understand these critical issues, this session focuses on topics related, but not limited to:

1. Regional climate analysis and projections;
2. Value added by large ensembles and very high-resolution, including convection-permitting, climate simulations;
3. Interactions between climate and land/ocean surface anomalies;
4. Analysis of storm tracks, frequency, intensity and energetics;
5. Climate risks and their regional-scale characteristics;
6. Weather and climate-related fine-scale processes.

7.6 General Session - Climate

This session will include contributions related to climate that do not fit into any of the other sessions.

Theme 8: Risks and Impacts

8.1 Weather, shipping and subsistence activities in Arctic regions

Weather in the North is a fundamental consideration intersecting all aspects of life for all groups living or working there. From the marine shipping sector to the local hunters, they depend on good weather conditions to conduct their activities. Accurate forecasting is highly relevant to them. However, it is a challenge for operational forecasting services to address the full range of possible requirements presented by their clients, and likewise, there are limits to the solutions that can be provided through technology alone. A proper assessment of local weather situations can only be possible through

proper engagement with those who live or operate on the ground. Many aspects of research in the North are also essentially untenable if there is not at least local input, or preferably, active project direction from local partners. In many cases, the inclusion of local input is not only beneficial, it is essential to project success.

This session encourages contribution from research efforts that have engaged and are working with end-users in the marine shipping and other sectors including local communities as partners, and who achieved more than they could have on their own. Operational groups are particularly welcome. There has been a lot of discussion concerning various aspects of safety for those going out on the land. It is of interest to forecast groups to gain a better understanding of the types of issues faced, so that weather, sea ice and marine state forecasting can be better tailored to the need.

8.2 Integrated approaches of climate change impacts on marine fisheries

Climate change impacts on marine fisheries take place across multiple scales affecting processes that shape the physical nature of marine environments, biological production and community structure, and the interactions between human and natural systems. Climate change is expected to affect multiple physical stressors, which will alter biological production and distribution of exploited species and thus their availability to human society. Biophysical drivers such as ocean warming, deoxygenation, and acidification, will reshape biogeochemical cycling with downstream effects on food web structure and flow. Effects of biophysical drivers also affect physiological processes including metabolism, homeostasis, and ion regulation, ultimately affecting life history strategies and population dynamics. With changes to biological production of exploited species, the dependence of human societies on marine resources will shift, as will patterns of economic production and social welfare. Integrating direct and indirect effects on marine fisheries production progresses our understanding of the multiple interactions and the factors drive changes, providing insight to risks and impacts on biological, social, and economic systems.

This session invites contributions from researchers contributing to and exploring integrative methods to assess climate change impacts on marine fisheries. This includes both observation and prediction research that focuses on risks to physical (e.g. sea-ice dynamics, biogeochemical cycling), ecological (e.g. physiological constraints, species distribution and range shifts, food web structure), social (e.g. food security, First Nations), and economic (e.g. revenues, income) dimensions of climate change impacts on fisheries. This session encourages studies that are interdisciplinary, as well as studies that have relevance to Canadian fisheries and communities.

8.3 Risks and impacts relating to the insurance industry

This session will bring together projects and outreaches sponsored by the insurance industry. Severe winds, large hail, flooding all have significant impacts on personal property, therefore the insurance industry.

8.4 Risk Communication at the Local Level: Towards Meaningful Community Collaborations on Environmental Hazards (Town Hall)

Research on science and risk communication has consistently emphasized the importance of collaboration between impacted communities ('publics') and accredited expert groups (whether government agencies, academia, industry, or NGOs), in order to foster trust and ensure community needs are being accounted for. Although meaningful community collaboration can be difficult to achieve, it potentially avoids problems of one-way expert-to-public communication, which assumes risk is effectively mitigated by increasing public attention to expert knowledge. This 'information deficit' communication model privileges accredited expert perceptions of what constitutes relevant, timely, and accessible communication against local expertise and contexts. Communities can differ considerably from experts in their interpretation of these characteristics, beginning with how risks are defined and prioritized. While many agencies have no direct experience of a specific hazard or impacted activities, community knowledge is always a factor when receiving outside information. For example, 'timely' monitoring of hazards by accredited experts may be poorly received by communities that prioritize prevention, especially when hazards are understood by communities to be long-term and ongoing (e.g. the "event" of methyl mercury contamination as a consequence of hydro-electric development against a long-term trend of extraction and encroachment). Finally, efforts to improve 'accessibility' often focus on delivering streamlined, simple messaging around nuanced problems; this can become an issue when communities are accustomed to navigating complexity, and are aware that higher level information exists but is not disseminated. These disconnections are less likely to occur if communities and risk-related agencies actively collaborate on research and risk communication/management planning. These concerns, and ways forward, will be addressed in a panel discussion, with input from social/natural scientists and environmental managers, sharing lessons drawn from their recent collaborations on plastic pollution, sea ice stability, Muskrat Falls flooding and contamination, and wildfire management.

8.5 General Session - Risk and Impacts

This session will include contributions related to risks and impacts that do not fit into any of the other sessions.

Theme 9: Interdisciplinary

9.1 Big Data and Artificial Intelligence in Meteorological, Oceanographic, and Environmental Applications

The past five to six years have seen rapid advances in the field of artificial intelligence coupled with Big Data. Data and Predictive Analytics using machine learning algorithms such as Deep learning trained on vast amounts of data are now beginning to fulfill the promises of AI and are rapidly being applied to many fields with numerous improvements and new developments now possible. Advances in the science and operational sides of meteorology and in oceanography are therefore expected. Following the very successful session on AI and Big Data last year at the 51st CMOS in Toronto, this session will continue to showcase applications in meteorology and also include oceanographic and environmental recent developments.

We solicit submission of papers on decision-making applications in the domain of oceanography, meteorology, hydrology, air and water quality, health, energy, transport, smart cities, etc. Presentations of strategy enabling data exploration and valorization such as these are of great interest: novel browser-based solutions for the mapping, visualization and analysis of Environmental

Predictions and Data, immersive technology and tools on browser-based data rendering, Big Data transmission, spatiotemporal data indexing and representation, analysis methodology of Big Data, reducing Big Data to meaningful information for applications, pattern recognition, machine learning, data gridding and data mining techniques in general. Any presentation or demonstration of Big Data and AI techniques that would engage in discussion with the participants is particularly welcome.

9.2 Integrated Predictions for Best Responses

The complex and changing nature of the marine and coastal environments along Canada's east, west and Arctic coasts present significant challenges. The Vancouver Declaration on Clean Growth and Climate Change of March 2016 states "Canada's northern and coastal regions are particularly vulnerable and disproportionately affected by the impacts of climate change." For communities to respond effectively to these challenges, decision makers must have access to the best available information regarding future changes and how they will interact with other social drivers and determinants of change, including health and sustainability. This Session would focus on the hazardous environmental events: any or combination of intense winds, heavy precipitation, fog, storm surges and sea level rise, sea ice and icebergs, riverine flooding, air pollution, water pollution and in certain places earthquakes and tsunamis, including those which could result due to distant earthquakes. The Session would bring together natural scientists – weather, climate, ocean, geology – with social scientists – socio-economics, cultural, communicators - to discuss how integrating and communicating information based on the best natural and social science information, can led to the best community responses. The session would also include discussions on the international policy – Paris Agreement, Sustainable Development Goals and Sendai Framework for Action on Disaster Risk Reduction and corresponding Canadian policy regimes and how they can be used to support the science and implement the integrated predictions for best responses.

9.3 Atmosphere Related Research in Canadian Universities - Education, Training, Communication and Outreach (Town Hall)

The Atmosphere Related Research in Canadian Universities (ARRCU) Working Group is an ad hoc group of Canadian university faculty who undertake research in weather, climate, and air quality under the general framework of atmosphere-related research (ARR). ARR considers the whole atmosphere, from the surface to space, and its interaction with land-surface, hydrologic, ocean, cryosphere, and space systems. Work in this area connects atmospheric and related sciences to many other areas of environmental and social science.

We have initiated a strategic planning process in Canadian ARR across the university, government, and industrial sectors. We seek to help configure academic ARR to most benefit Canada in a time of rapid environmental and socio-economic change. We believe that this process will benefit ARR activities within and outside the wide range of University departments and disciplines where ARR takes place.

This discussion focus on the role of Education, Training, Communication and Outreach, with the aim to produce a white paper on this topic.

9.4 Coupled Environmental Prediction

As numerical weather prediction systems become further refined, the interactions across the Air-Ice-Ocean interface are becoming increasingly important. This is giving rise to the development of a new generation of fully-integrated environmental prediction systems composed of atmosphere, ice, ocean, and wave modeling and analysis systems. Such systems are in increasing demand as the utility of marine information products (e.g. for emergency response) becomes more widely recognized. This session welcomes contributions on coupled environmental prediction on timescales from hours to seasons, covering the range of coupled processes and interactions at play on regional and global spatial scales, and their application in analysis and forecasting systems. This session is co-sponsored by the Global Ocean Data Assimilation Experiment (GODAE) Ocean View (GOV) Coupled Prediction Task Team (CP-TT).

9.5 Changing Arctic: Science and Policy Studies

This interdisciplinary session will present scientific papers describing emerging results on the rapidly changing Arctic and northern environment. The physical environment of the Arctic, particularly the Western Arctic within Canada and in Baffin Bay, has changed dramatically over the past 35 years and in particular over the past 15 years. The underlying causes of these changes, in particular in terms of the cryosphere, oceanography, hydrology and meteorology, are being addressed through observational and modeling research. Papers will be presented on the changing Arctic conditions as to their profound effects on larger scale weather, oceanographic and hydrological patterns as well as on the ecosystem, the indigenous peoples of the Arctic, and commercial activities including shipping, The changes extend well beyond the Arctic and papers will be solicited to address the large scale implications which extend beyond the Arctic. The importance of Arctic research and its consequences in looking ahead is very timely and pertinent to informing the public and contributing to public policy issues in this strategically important part of Canada. Scientific papers will be solicited from a wide range of sectors including academia, government research agencies, the private sector, environmental non-governmental, community and First Nations. Papers are sought from research and science activities that is nearing completion, updates on research that is underway and the plans for research and science activities that is planned and just getting underway. This session will seek papers in the following areas: (i) Arctic Meteorology and Climate; (ii) Arctic Oceanography; (iii) the Cryosphere including sea ice, glaciers, terrestrial and marine snowfall and snow accumulation; (iv) interdisciplinary papers on Arctic Ecosystems and (v) policy papers on the Human Dimension of the Changing Arctic.

9.6 Satellite Remote Sensing: Vital Information on the Health of the Planet

Space-based observations provide a unique global perspective on the Earth's atmosphere and surface, including the oceans, land, vegetation, ice, and snow. Current and planned satellite missions from Canada, and international agencies in US, Europe and Japan have provided and will provide a wealth of new information about the Earth system and that can be used to investigate a wide range of environmental and scientific questions. This session encourages contributions dealing with the many facets of space-based remote sensing, including new measurement technologies and techniques, both passive and active; retrieval algorithms; validation of satellite products; assimilation of data into numerical models; scientific results and discoveries and operational utilization and development.

9.7 Research and operational activities supporting the Year of Polar Prediction

The Year of Polar Prediction (YOPP) will run from mid-2017 to mid-2019 as the core phase of the ten year (2013-2022) Polar Prediction Project (PPP), an initiative of the WMO‘s World Weather Research Programme (WWRP). The evidence of rapid changes in the Arctic following the International Polar Year (IPY) have motivated the WWRP-PPP to look beyond weather and focus on wider environmental factors such as the ocean, sea ice and the climate. The PPP’s mission is to enable a significant improvement in weather, climate and environmental prediction capabilities for the Polar Regions and beyond, by coordinating a period of intensive observation, modelling, verification, user-engagement and educational activities. To this end several Special Observing Periods (SOPs) have been scheduled (beginning February 2018) at both Poles during YOPP when the international monitoring and environmental modeling communities will concentrate their efforts to evaluate the impact of enhanced observations on environmental forecasts at the poles as well as globally, and to engage users to explore how this information can be of greater value.

This is particularly timely for Canada with close to a third of its land mass north of the Arctic Circle. The fast warming of the region allowing for economical exploitation of natural resources, the recent opening of new shipping routes, the increase in tourism, have all contributed to widespread socio-economic needs in the Arctic. At the same time the fast changes in climate are creating new challenges for First Nations as their traditional environmental references are also changing. YOPP presents an opportunity for Canada to leverage its assets and numerical modelling capabilities in the Arctic with the international community to accelerate the development of reliable and relevant environmental monitoring and prediction systems to better serve the needs of the North.
This session welcomes contributions outlining operational and research activities supporting Canadian and international contributions to YOPP and PPP. The main themes considered are observations, numerical modelling and verification, and user engagement to aid service delivery.

9.8 Numerical Methods and Model Development

This session focuses on recent advances in computational physics, scientific computing, and software engineering related to the development of numerical models for the atmosphere, ocean, land surface, and cryosphere. These techniques are at the heart of every numerical model, and advancements in these fields apply across the physical sciences of CMOS' mandate. A session on newly-developed and newly-applied methods encourages rapid dissemination of these ideas to the broader community. In addition to classical topics in computational mathematics and physics, we encourage submissions on GPU computing, data visualization, and development methodologies for high-performance computing systems.

9.9 Atmosphere, Ocean, and Climate Dynamics

This session combines submissions on that document studies of the dynamics of the atmosphere, oceans and/or climate system. The scope of the session is deliberately broad in order to include research that spans a broad range of spatial and temporal scales. Studies of the dynamics of mesoscale processes that act on hourly timescales are as welcome in this session as those that

document the evolution of planetary-scale structures in a changing climate. Such investigations may include diagnoses and theoretical studies of forecast, climate, and process models, or studies based on reanalysis and other observational datasets; however, any topic that is relevant to atmosphere, ocean, or climate dynamics will fit well into this session.

9.10 Societal Applications: Transforming Weather, Marine and Climate Communication through Policy, Research and Practice

This session welcomes papers from anyone with an interest in the intersections of society with weather and climate, fisheries and oceans, especially those papers including original research in social and behavioural sciences as well as public policy.

For example, we are interested in soliciting papers on the following topics:

- Translating predictive science into public decision-making
- Effectively communicating weather, climate and marine risk and uncertainty for enhanced preparedness
- Interpretation and responses to weather, climate, and ecological risk: implications of perception and sense-making on needs and uses for information
- The impacts of extreme weather and climate events on human and marine environments: lessons learned
- ‘Expert’ engagement and the incorporation of different knowledge systems for building weather, climate and marine resilience
- Weather, climate, and marine forecast and warning: Bridging boundaries through inter-disciplinarity, collaboration and partnerships

9.11 General Session - Interdisciplinary

This session will include contributions related to interdisciplinary research that do not fit into any of the other sessions.