Plenary and Public Lecture Speakers Abstracts

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Plenary Speakers

David Grimes (Assistant Deputy Minister, Meteorological Services Canada, and President of the World Meteorological Organization)
"The Future of the Weather Enterprise with a Look Back over the Past"

The Government of Canada has been providing weather, water, climate and air quality services to Canadians, their governments, and public and private sector institutions for almost 150 years. Since its beginnings in 1871, Environment and Climate Change Canada's Meteorological Service provides high-quality and timely warnings and forecasts, services and information to reduce risks to health & safety and to help the public and private sector benefit from opportunities related to related to environmental changes. A strong research foundation and high performance computing capacity are essential to deliver on this unique federal mandate.

Today, in Canada and around the world, national meteorological and hydrological services provide more than basic weather, water and climate information; weather enterprises strive to provide information on the anticipated impacts of expected events in order to help citizens and other stakeholders to make informed decisions and adapt their behaviour. With growing public concerns about changes in weather and climate, demands are growing from the public for faster, more comprehensive information delivered in a wider range of ways, including social media. The weather enterprise is also being called upon to provide the essential science-based foundations to support the global agenda and societal needs in areas such as sustainable development, disaster risk reduction, and climate change, including the Paris Agreement and domestic action under the Pan Canadian Framework on Clean Growth and Climate Change.

This talk will take a look back at the history of the Meteorological Service of Canada, and the vast improvements in the science and technology of weather predictions and services over the past century. It will provide an overview of the future priorities of the weather enterprise, not only in Canada but around the world, from the current President of the World Meteorological Organization, considering the opportunities and challenges facing the weather enterprise such as Big Data, crowdsourcing, advances in modeling, and the growing engagement with partners in the private and academic sector.

Professor Howard Wheater
"Water Futures in Changing Cold Regions"

Canada is experiencing some of the world's most rapid rates of climate warming; with a water environment dominated by snow, ice and frozen soils, Canada is losing her cold. Climate and landscapes are changing, and historical patterns of water availability are no longer a reliable guide to the future. Adaptation to change requires new science to understand the changing earth system, new monitoring systems to warn of critical environmental change, new modelling tools that can represent non-stationary and tipping points, and more effective methods to translate new scientific knowledge into societal action. We report on two major Canadian research programs that aim to prepare Canada to meet these challenges. The Changing Cold Regions Network (2012-2018) focusses on monitoring and modelling environmental change in western Canada. Global Water Futures (2016-2023) aims to deliver transdisciplinary science, working with users to address the question 'How can we best forecast, prepare for and manage water futures in the face of rapid change and increasing water-related risks?'

Dr. Steven Goodman
"An Introduction to the GOES-R Satellite Series"

NOAA's Geostationary Operational Environmental Satellites (GOES) have been a mainstay of weather forecasts and environmental monitoring for the past 40+ years. The next generation of GOES satellites, known as the GOES-R Series, will usher in a new era in geostationary environmental satellites. It has been 22 years since the last major instrument advance with the GOES I-M series. The first satellite in the GOES-R series, now GOES-16, was launched in November 2016 and is producing stunning imagery and undergoing on-orbit post launch testing for approximately 12 months before being placed into operations replacing either the GOES-E or GOES-W satellite. The GOES-R satellites will continue to provide continuous imagery and atmospheric measurements of Earth's Western Hemisphere that will foster a host of improved and new environmental products and services. GOES-R's primary instrument, the Advanced Baseline Imager (ABI), will provide three times the spectral resolution and four times the spatial resolution while scanning the Earth nearly five times faster than the current GOES. GOES-R will also host a new instrument, the Geostationary Lightning Mapper (GLM) that is designed to continuously map in-cloud and cloud-to-ground lightning with 8 km spatial resolution over the Western Hemisphere. It will provide information to improve storm monitoring and warnings and contribute to improved aircraft safety and efficient flight route planning. GOES-R's space weather instruments will provide improved observations of the sun and space environment with more timely dissemination and early warning to a diverse user community. This presentation will provide an overview and status update of the GOES-R program and the activities leading to an operational GOES-R system. The new observations will provide dramatically improved weather, water, and space environmental services in the coming decades, enhancing public safety and providing economic benefits to the U.S.and our international partners.

Claire Martin
"OK Granny, listen up.."

Apparently Albert Einstein once said that "you really don't understand something unless you can explain it to your grandmother". This quote, though not referring to my Granny who obtained 5 bachelor degrees in her life, should be tattooed on the forehead of any professional meteorologist currently trying to communicate their work in the highly politicalized rabbit-warren world of alternative-facts strewn science.

At best it is a challenge; at worst it can be career-ending.
So how does a good scientist learn to become a good communicator? Furthermore what makes a good science story? And most importantly, why bother?

Simply put: for informed decision making we need great science communicators.
The good news is that there is a consummate thirst for our particular niche of scientific information. Arguably in fact, weather and climate are the most important science topics talked about today.

But, this then places a great deal of responsibility on the shoulders of those scientists who personally volunteer to help get their message out. Poorly devised communication, with unclear or a badly executed delivery can backfire on the subject matter, the scientist under the spotlight, and sometimes even the meteorological community as a whole.

Good science communication is an art.

The first hurdle is overcoming the very nature of the subject matter – it's complicated!

Learning to deliver the tricky nuanced details about the fluid-in-motion we call the atmosphere, is tough. But if it was easy, well, as they say, “everyone would do it”.
The biggest hurdle though, is in the delivery. And that’s where scientists can and (in my mind) should be given more training. An enthusiastic and willing scientist can be taught the tools to master any type of interview. Genuinely authentic scientists (read: nerdy) are widely recognized as credible, trustworthy promoters of our profession – something we desperately need in these times of cleverly concealed “fake news”.

So, listen up grandmothers, and grandfathers, and indeed everyone else – let’s start embracing good science communication.

Dr. Katja Fennel
“Biogeochemical Trends and Their Ecosystem Impacts in Atlantic Canada”

In the ocean, coastal ecosystems are the most vulnerable to the combined stressors of warming, deoxygenation, acidification, eutrophication and fishing while being the most relevant for human activities. The representation of coastal oceans in global climate models is difficult, making projections of future coastal trends and their ecosystem impacts challenging. These regions also have large air-sea fluxes of carbon dioxide, making them an important but poorly quantified component of the global carbon cycle. Regional model applications that are nested within large-scale or global models are necessary for detailed studies of coastal regions. We present results from such a regional biogeochemical model for the continental shelves and adjacent deep ocean of Atlantic Canada. The model is an implementation of the Regional Ocean Modeling System (ROMS) and includes a lower trophic level ecosystem model with explicit representation of dissolved oxygen and inorganic carbon. The region is at the confluence of the Gulf Stream and Labrador Current making it highly dynamic, a challenge for analysis and prediction, and prone to large changes. Historically a rich fishing ground, coastal ecosystems in Atlantic Canada have undergone dramatic changes including the collapse of several economically important fish stocks and the listing of many species as threatened or endangered. It is unclear whether the region is a net source or sink of atmospheric carbon dioxide with estimates of the size and direction of the net air-sea flux of carbon dioxide remaining controversial. We will discuss simulated patterns of primary production, inorganic carbon fluxes and oxygen trends in the context of circulation features and shelf residence times for the present ocean state and present future projections.

Professor Christian Haas
"Canada – The Last Ice Area?"

Observations and model predictions suggest that the Arctic will become free of sea ice during summer within the next 30 to 100 years. These changes will have huge climatic, ecologic, and socio-economic consequences. It is also expected that the Canadian Arctic will be the last region where sea ice will survive before disappearing completely. The region could become a last refuge for Arctic animals like Polar Bears. Supporting observations include satellite data of ice concentration, ice age, and ice thickness. I will summarize this evidence and complement it with results from airborne and snowmobile ice thickness surveys from various regions in the Canadian Arctic carried out in the past ten years. These provide more insights into thickness changes and regional and local variability than satellite observations can do. Results confirm that the thickest sea ice of the Arctic still resides in Canada, and that multiyear ice may not have thinned as strongly as first-year ice. This implies that ice conditions in the Beaufort Sea and Northwest Passage still have to be considered hazardous where the ice survives summer melt. Our measurements also show the ubiquitous occurrence of local thin ice in narrow straits or over shoals where ocean heat flux can be increased. With warmer conditions, these thin ice regions may become open polynyas throughout the winter, changing local weather and contributing to more rapid ice disintegration during spring. While the presented results support the notion of Canada as the Last Ice Area, they also imply that future ice conditions may not be the same as presently, changing its importance for local climate, ecosystem, and northern residents.

Professor René Laprise
"Regional climate downscaling: Achievements, challenges and prospects"

Since the pioneering work initiated at the National Center for Atmospheric Research (NCAR) three decades ago, dynamical downscaling with limited-area models has become increasingly used to achieve unprecedented high-resolution climate simulations and projections over regions of interest.

A recent World Climate Research Programme (WCRP) major project, the Coordinated Regional Downscaling Experiment (CORDEX), provides a common framework to assess and compare regional climate models (RCM) simulations over 14 continental-scale domains. CORDEX provides datasets to stakeholders for climate vulnerability, impact and adaptation studies, and will eventually contribute regional-scale projections ensembles that could be used in the Assessment Reports of the Intergovernmental Panel on Climate Change (IPCC), as the Coupled Model Intercomparison Project (CMIP) does at global scale.

The presentation will give an overview of the added value afforded by high-resolution regional climate model (RCM) hindcast simulations driven by reanalyses for various regional and local climate processes. Some examples of the inherent limitations of dynamical downscaling will also be illustrated when ocean surface and atmospheric lateral boundary conditions driving datasets are imperfect. Finally prospects offered by on-going RCM developments such as convection-permitting resolution, coupling ocean-atmosphere, climate-vegetation, climate-aerosols, and others, will be discussed.

Diane Saxe
"Facing Climate Change"

Dianne Saxe, the Environmental Commissioner of Ontario, will explain her role and introduce her report to the Ontario Legislature, Facing Climate Change. The presentation will focus on why the Commissioner considers climate change to be the most important and most urgent problem facing humanity, and how much it is already affecting Canada.

Public Lecture

Dr. Francis Zwiers
"Changing weather extremes – why it isn't an "alternative fact"

Stories about extreme weather and climate events around the world often make media front-page headlines, alongside the recent upswing in "alternative fact", or fake, news. These stories about extremes draw our attention because of their immediacy and the devastating impacts, which often include deaths and up to billions of dollars in damage.

Two Canadian examples include the Fort McMurray wildfire (2016, >$3.6B in insured losses) or the Calgary floods (2013, $6.7B USD in total losses). In the aftermath of such devastation, media ask whether such extreme events are now more frequent or intense than in the past, whether they are caused by human influence on the climate and if they represent a harbinger of the future.

In most cases, climate science does find that human influence played a role, consistent with the overwhelming body of evidence indicating a human contribution to the observed changes in average climatic conditions over the past century.

Nevertheless, at a localized level, the effects of climate change can be hard to detect, leading to possible discrepancies between our own personal experience of climate change and the findings of climate science. In this new era of "alternative facts", it would be a fallacy to rely solely on personal experience, reject the findings of the climate science community and consequently fail to prepare for the climatic changes ahead.

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