



CMOS **BULLETIN** *SCMO*

*Canadian Meteorological
and Oceanographic Society*

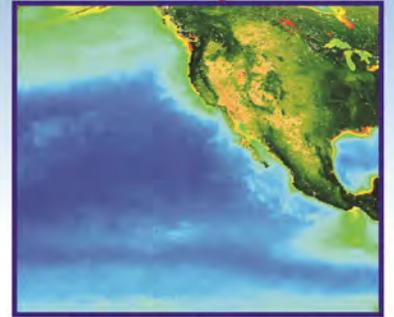
*La Société canadienne de
météorologie et d'océanographie*

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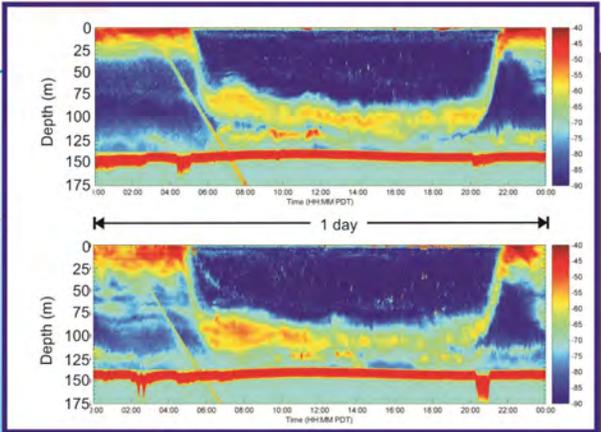
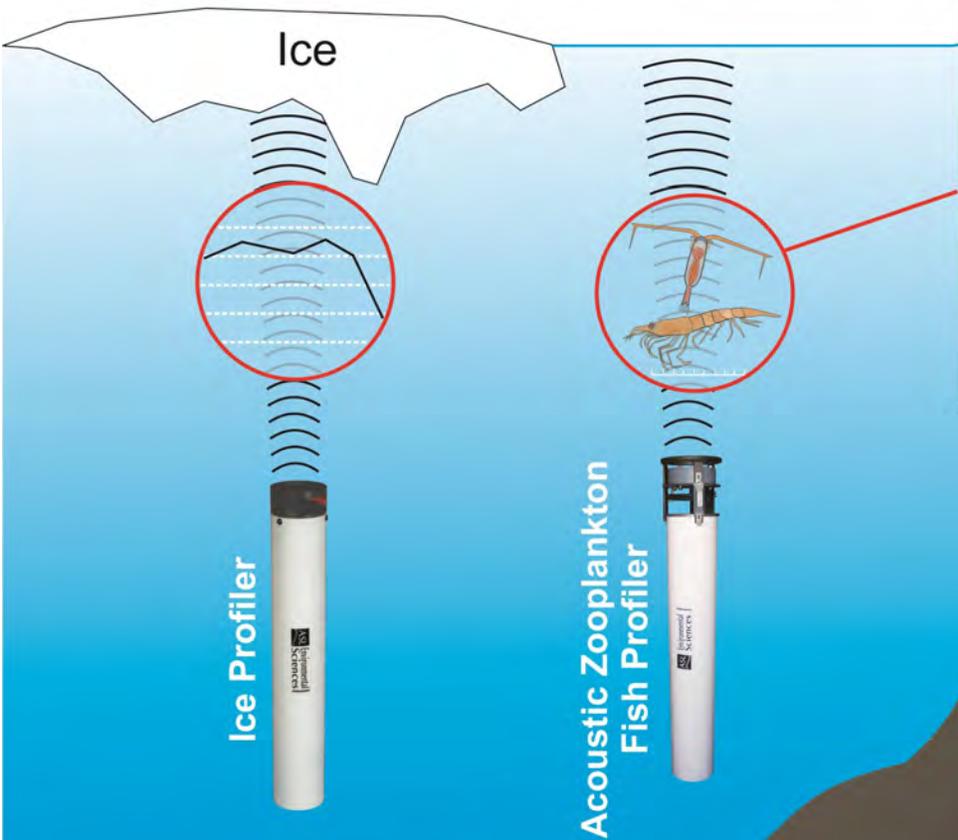


Photo: Patrick Duplessis

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Ocean colours are chlorophyll concentrations and land colours are NDVI



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CMOS Bulletin SCMO

"at the service of its members / au service de ses membres"

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CMOS exists for the advancement of meteorology and oceanography in Canada. Le but de la SCMO est de promouvoir l'avancement de la météorologie et l'océanographie au Canada.

Cover Page ◇ Page couverture

This issue's cover photo was taken by Patrick Duplessis, at a fog sampling "station" in Sambro, Nova Scotia, on a particularly foggy day. Patrick is a PhD student working on sampling and characterizing coastal fog with Rachel Chang's Atmospheric Processes and Composition Group at Dalhousie University. His work involves trying to more accurately predict when fog will form and dissipate, and how dense a particular event will be.

In the spring of this year, their research group worked in collaboration with Environment and Climate Change Canada to deploy their first fog field campaign. Between May and July, on-site instruments recorded meteorological and fog droplet data in real-time and a collector sampled fog water during every significant event for further analysis in the lab. The results of this project should help them to understand more about fog microphysics and how some atmospheric chemicals such as sulfate and nitrate affect fog formation. They are also hoping to tie their results in with historical data and climate models to try to explain why fog is on a decreasing trend in the Maritimes, and if it could increase again in the future. The 2016 fog season gave them several good events to work with.

Patrick Duplessis a pris la photo de couverture de ce numéro à une « station » d'échantillonnage du brouillard à Sambro (Nouvelle-Écosse), par un jour particulièrement brumeux. Patrick est un étudiant au doctorat. Il travaille sur l'échantillonnage et la caractérisation du brouillard côtier au sein du groupe des « processus et de la composition atmosphériques » de Rachel Chang, à l'Université Dalhousie. Il cherche à prévoir avec une plus grande certitude le moment de formation et de dissipation du brouillard, ainsi que la densité de celui-ci pour un événement donné.

Au printemps de cette année, le groupe a travaillé en collaboration avec Environnement et Changement climatique Canada pour mettre en œuvre sa première campagne de mesure du brouillard. Entre mai et juillet, des instruments *in situ* ont enregistré des données météorologiques et relatives aux gouttelettes de brouillard, en temps réel. Un capteur a échantillonné l'eau du brouillard de tous les cas importants pour analyse ultérieure en laboratoire. Les résultats de cette campagne devraient permettre au groupe de mieux comprendre la microphysique du brouillard et la façon dont certaines substances chimiques atmosphériques, comme les sulfates et les nitrates, affectent la formation de ce phénomène. Les membres du groupe souhaitent aussi faire le lien entre leurs résultats, les données historiques et les modèles de climat, afin d'expliquer la diminution du brouillard dans les Maritimes et si cette tendance se renversera dans le futur. La saison de brouillard 2016 leur a fourni plusieurs cas pertinents à étudier.



Patrick is pictured here (far left), with Rachel Chang (second from left), and other members of the research team, at the installation of the tower with meteorological instruments at Sambro.

Patrick apparaît sur la gauche avec Rachel (2^e à partir de la gauche) et d'autres membres de l'équipe de recherche, au site de la tour d'instruments météorologiques de Sambro.

Words from the President



Friends and Colleagues

Before I start I want to make an important public announcement to the CMOS Membership that merits attention. Next year the Canadian Meteorological and Oceanographic Society will celebrate its 51st Congress. The congress will be held from 4 June to 8 June, 2017 at the Downtown Hilton in Toronto. It was a mere 50 years ago that the Canadian Meteorological Society came into being on January 1, 1967, and the first Congress under the name of the new Society was held at Carleton University in June of that year.

WE NEED VOLUNTEERS TO HELP WITH THE FESTIVITIES. The Local Arrangements Committee (LAC) Chair is Ron Bianchi and the Celebrations Coordinator is our own Past President Martha Anderson. If you want to assist, we need your help. Please contact Ron or Martha (details below).

The 2016 summer is coming to an end and the autumn period is rolling in, seemingly with little change. Ottawa, the city that I live in, has experienced its driest and warmest summer in its history. The Earth's climate is changing, temperatures are rising, snow and rainfall patterns seem to be shifting, and more extreme climate events – like heavy rainstorms and record high temperatures - are already happening. As an indication that our world is changing even more, the 280-metre long Crystal Serenity Cruise Ship arrived in Cambridge Bay on Aug 29th as it crossed the Northwest Passage. I chuckled the other day when I heard a report that some passengers are thinking of suing the cruise line because they are not seeing any arctic ice or icebergs. Go figure! I guess the irony of the crossing was lost on some of the passengers. While climate change is a passionate career pursuit to many scientists of our Society, for others climate change means more tourism to remote regions once thought unreachable.

I have attended the past ten Congresses, and while the themes of each congress comments on the climate trend of the day, the overarching theme has remained the same for our society. We continue to ponder the same issue: our climate world is changing; what will the future hold for us? Which brings me to our Society, the only organisation in this country that brings together the best minds in meteorology and oceanography under one umbrella. Where we share our challenges, our findings and our prognosis of the future –and will this prognosis mean that Cambridge Bay will be lined with gift shops to support 2-4 cruise ship visits per day in an ice-free Arctic summer. While our scientists look for micro-turbulent changes in the ocean water column to assess indication of climate variability, the biggest indicator of all may be whether passengers aboard the future Mega Arctic Cruise Ship – “The Arctic Serenity” – continue to complain that they are not seeing any arctic ice.

Finally, as parting words, in 2009 when my friend Bill Crawford was CMOS President, he reminded its membership that the Bulletin was arriving in their mailboxes at about the same time as the request for renewal of CMOS membership. As then, I urge you to renew your membership. As well, why not recruit some of your colleagues into CMOS, or make your fellow students aware that student membership is also free. Membership forms are on-line, along with a listing of all our classes of membership.

Welcome to the new season of CMOS.

Fair winds and a following Sea,

M.L. Taillefer, President

50th ANNIVERSARY CONTACTS

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Allocution du président



Amis et collègues

Avant tout, je souhaite procéder à une annonce importante qui mérite l'attention de tous les membres. L'an prochain, la Société canadienne de météorologie et d'océanographie organisera son 51^e congrès. Ce congrès se tiendra du 4 au 8 juin 2017 à l'hôtel Hilton (Downtown) de Toronto. Il y a déjà 50 ans qu'a été fondée la Société de météorologie du Canada (SMC), le 1^{er} janvier 1967. Le premier congrès sous l'appellation de la nouvelle société a eu lieu à l'université Carleton, en juin de la même année.

VOLONTAIRES DEMANDÉS POUR LA PRÉPARATION DES FESTIVITÉS. Le président du comité local d'organisation est Ron Bianchi et la coordonnatrice des célébrations est notre présidente sortante, Martha Anderson. Nous vous serons reconnaissants de toute aide. Pour offrir vos services, veuillez communiquer avec Martha ou Ron (coordonnées ci-dessous).

L'été 2016 s'achève et l'automne arrive sans grande pompe, semble-t-il. Ottawa, où j'habite, a connu l'été le plus sec et le plus chaud de son histoire. Le climat de la Terre change, les températures augmentent, la neige et la pluie semblent adopter de nouvelles configurations et des événements météorologiques extrêmes, comme des pluies torrentielles ou des températures records, nous touchent déjà. La preuve que notre monde se transforme rapidement, le *Crystal Serenity*, un navire de croisière de 280 mètres, a accosté à Cambridge Bay le 29 août, tandis qu'il traversait le passage du Nord-Ouest. Je n'ai pu m'empêcher de sourire, l'autre jour, quand j'ai entendu que certains passagers pensaient poursuivre le croisiériste, car ils ne voyaient ni icebergs ni glace arctique. Allez savoir! Je suppose que ces passagers ne saisissent pas l'ironie de la situation. Tandis que les changements climatiques sont le domaine d'étude de plusieurs scientifiques passionnés membres de la SCMO, pour d'autres, l'évolution du climat est synonyme d'activité touristique accrue dans les régions éloignées autrefois inatteignables.

J'ai participé aux dix derniers congrès de la SCMO. Bien que les thèmes de chacun d'eux aient abordé les tendances climatiques du moment, le thème principal demeure. Nous continuons de nous poser la même question : notre climat change, que le futur nous réserve-t-il? Ce qui me ramène à notre Société : le seul organisme au Canada qui regroupe sous un même toit les meilleurs spécialistes en météorologie et en océanographie. Nous y partageons nos défis, nos découvertes et nos pronostics. Ces pronostics comprendront-ils le fait que Cambridge Bay verra s'aligner les boutiques de souvenirs qui accommoderont la visite de 3 ou 4 paquebots par jour grâce aux étés arctiques libres de glace? Tandis que nos scientifiques évaluent l'existence de la variabilité du climat en étudiant les changements microturbulents dans la colonne d'eau océanique, l'indicateur incontestable pourrait bien être les passagers du futur méga paquebot nordique, « *Sérénité arctique* », qui continueraient de se plaindre de l'absence de glace dans l'Arctique.

En dernier lieu, ces quelques mots. En 2009, quand mon ami Bill Crawford était président de la SCMO, il rappelait aux membres que ce numéro du *Bulletin* arrivait dans leur boîte aux lettres presque en même temps que l'avis de renouvellement d'adhésion à la SCMO. Comme Bill autrefois, je vous prie instamment de renouveler votre adhésion. Et pourquoi ne pas recruter par la même occasion un de vos collègues ou rappeler aux étudiants de votre entourage que l'adhésion est gratuite? Le formulaire d'adhésion est offert en ligne, tout comme la liste des types de membres.

Bienvenue, en cette nouvelle saison de la SCMO.

Bon vent, bonne mer!

M. L. Taillefer, Président

PERSONNES-RESSOURCES POUR LE 50^e ANNIVERSAIRE

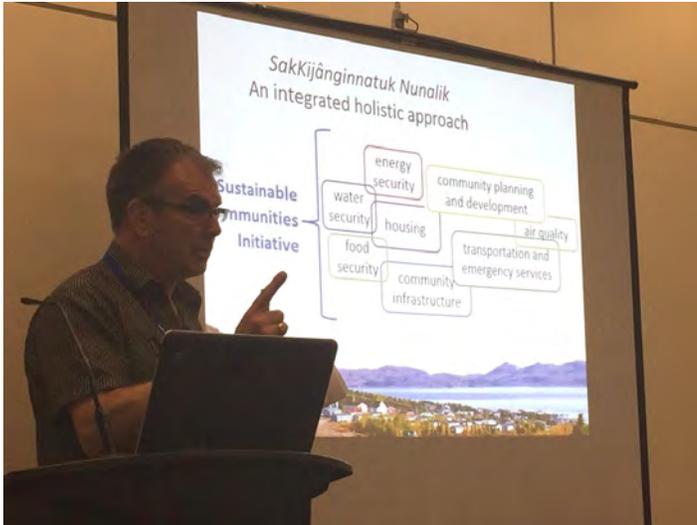
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Martha Anderson, coordonnatrice des célébrations: martha.cmos.exec@gmail.com

Arctic Leaders: Interview with Trevor Bell and Andrew Arreak

By Ann McMillan, Co-Manager of CMOS' Arctic Special Interest Group

The opportunity to interview Trevor (below left) and Andrew (below right) presented itself when they were panelists at an event entitled "Two Ways of Knowing" at the 2016 CMOS Congress in Fredericton. The event was organized by the CMOS Arctic Special Interest Group (ArcticSIG) and sponsored by CMOS and Polar Knowledge Canada.



How did you get interested in the Arctic?

Trevor: I first worked on glaciers and glaciation in Labrador and over the past 30 years or so came to understand that there are other perspectives on the North than those I encountered through my landscape science. As a geographer with a holistic view, I transitioned from a purely physical approach to landscapes to focusing on human-environment interactions. I feel I've spent my whole career preparing for where I am now. In the last decade of my career it is important for me to do research that matters to communities. I cannot be in Northern communities without acknowledging their research needs and opportunities, and supporting their priorities.

Andrew: I grew up on the ice. We travelled on the ice to live and to hunt. I see that the ice is changing in ways we haven't seen before and some areas are becoming unpredictable to travel on. I want to be able to help predict the journey and make it safer for my community (Pond Inlet) to travel.

What do you see as some of the major issues?

Trevor: The changes gripping the Arctic are becoming immediate and impacting ways of life now. Climate science tells us that changes in climate are expected to be greater in the Arctic with predictions of sea-ice reductions and warming temperatures that will allow much more access to the Northwest Passage and hence to the resources of the Arctic. This will be a mixed blessing for the people of the North. The passage of large vessels will further change sea ice and reduce safe transportation routes for communities. The changes will influence the ecosystems that Inuit depend on, sometimes in ways that we don't yet understand. Working with Inuit to address these changes will produce the best outcomes for mitigating local impacts and responding to altered conditions.

The usual federal government services for the South are not always available or require modification for the North. For example, the Canadian Ice Service provides ice charts for safe ship navigation; they are not at a spatial scale suitable for the identification of ice hazards for over-ice travel by Inuit. Also, they do not produce ice charts as regularly in winter when shipping routes are frozen. We are working with the Canadian Ice Service to address these gaps for northern community sea-ice travel areas e.g. Nain, Nunatsiavut.

Andrew: As I said, the travel conditions are changing. The safety of people on the ice can be threatened by these changes. In order to maintain our way of life, travelling on the sea-ice is essential, so we need to provide information to travellers to allow them to plan for their safety. As a community member, I have the confidence and trust of the community. I want to use all the knowledge available to do the best job I can for the community.

How can northern and southern “ways of knowing” contribute to moving forward?

Trevor: Unfortunately, science in the North has, for the most part, been characterized by southern scientists dropping down from the sky or arriving by ship in communities, staying for a few days or weeks and then leaving. The interactions with communities have not in general been developed into relationships between the scientists and the communities. Results are published in academic journals or government reports and rarely disseminated in a manner that could make them useful and applicable in the community. Taking more care to understand the needs of the communities and to address them as part of the research is becoming much more important. As part of this process, understanding what Inuit know about their environment and how it pertains to the specific work at hand can provide the links to move research from a journal to an operational system that can enhance the safety and well-being of Inuit.

Andrew: The safe travel routes have been known for generations. The expected conditions of the ice and snow are well known and the elders share this knowledge. The ways to find prey for the hunt are dependent on conditions and hunt parties understand how to find prey and hunt safely. Unfortunately, conditions today are not as consistent or safe and there are changes both to the ice and the safe routes and to the hunt itself. New information can provide more up-to-date advice to hunters so that they can plan their journey and be prepared for conditions they are likely to encounter.

SmartICE is a program to produce maps of sea-ice hazards for Inuit, which uses our joint knowledge. Radarsat or Sentinel satellite imagery is used and combined with local knowledge. The data is combined with local measurements from a network of low cost, recoverable, stationary sea-ice thickness sensors. In addition, the SmartQAMUTIK that I use takes measurements in areas that we have concerns with based on our knowledge. We then produce colour-coded maps of ice thickness, which can help hunters decide where to go.

How are you involved in the North now?

Trevor: My priority is to conduct action-oriented research that addresses community needs as well as important science questions. The sustainability of northern communities depends on a collective effort and an integrated holistic approach. First we need to listen to communities to understand how we can co-design our projects to generate knowledge that informs community decision-making. Inuit want to be part of this research design, especially Inuit youth who have the desire to bridge both western science approaches and traditional (Inuit) knowledge.

Andrew is a wonderful example of an Inuk who wishes to both retain his culture and traditional knowledge as well as to enhance it with information from science to monitor ice conditions in real time and use that knowledge to provide improved sea-ice information to the community.

Andrew: I am part of the community with a wife and daughter and twins on the way. Growing up I wanted to help my community. When the opportunity came to go to the Arctic College Environmental Technology Program (ETP), I went along with 12 others from my community. Now there are three of us working full time back in the community. I'm working with the SmartICE Program and the others are working on water quality projects.

Knowing the ice and snow conditions locally through measurement is one way to provide information to the community. In our system, there are 4 outer sticks to measure sea-ice thickness and 9 inner sticks for snow depth. In addition, we have buoys with smart sensors for the temperatures of air, ice, snow and water. We also have a SmartQAMUTIK (developed with Dr. Christian Haas, York University). which measures the conductivities of ice and seawater. From these measurements we can determine ice thickness in real time.

What are your plans for next steps?

Trevor: I am hooked on helping northern communities and plan to spend the last decade of my career trying to make a difference there. Pond Inlet has been a successful model for this kind of community driven program and we have ambitious plans to turn such community science partnerships into northern social enterprises. SmartICE, although highly successful in itself, is also intended as catalyst for co-designed research agendas in the North, inspiration for emerging Inuit scientists and entrepreneurs, and motivation for integrated holistic approaches to sustainability challenges in northern communities.

Andrew: I will continue to live in the Arctic. As a husband and father it is important that I support my family and for me it is important to support the community. With my college training I am able to provide advice on travel conditions and I am able to provide feedback to southern scientists through the monitoring of conditions

Interview

well as my experience on the ice. The dialogue between my community and scientists is an important one for us to maintain in order to base our lives on the latest knowledge about our environment. I feel I can maintain the trust of both communities.

What are your hopes for the future of the Arctic?

Trevor: While I am worried about the changes in the Arctic that will surely present major challenges, I will work with many others to ensure that communities adapt and become sustainable. I am encouraged by the progress of communities such as Pond Inlet, in which the community itself has supported the integration of their knowledge with developing northern science. In the future I hope that scientists of all communities can share their passion for knowledge and strive to make their results useful and accessible.

Andrew: I hope that we can continue to travel on sea-ice to access our traditional ways of life. I would like to be part of a future where that can happen so that I can take my daughters onto the ice and teach them what I know about survival there.



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Announcement: White Paper and Webinar on Atmosphere-Related Research in Canadian Universities (ARRCU)

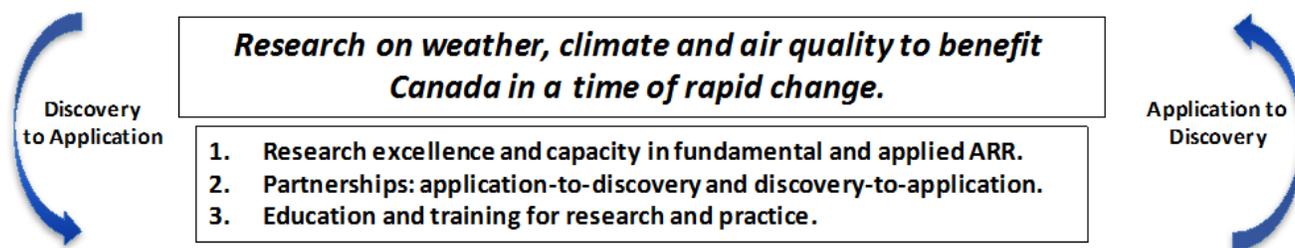
P. J. Kushner, P. Gauthier, J. Gyakum, A. Monahan, R. Martin, P. G. Myers, K. Strong, R. Stull, P. Taylor

We are pleased to announce the posting of a “White Paper on Atmosphere Related Research in Canadian Universities” (ARRCU). The White Paper can be found at the website ARRCU.ca under the “Documents” tab.

This paper represents the viewpoint of the working group on Atmosphere-Related Research in Canadian Universities (ARRCU). This is a self-organized 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, cryospheric, and space systems. Work in this area connects atmospheric and related sciences to many other areas of environmental and social science.

Following preparatory workshops in August 2014 and May 2015 (see *CMOS Bulletin* August 2015, 43(4), <http://tinyurl.com/arrcu-CMOS-Bull-2016>), the ARRCU working group has initiated a strategic planning process in Canadian ARR across the university, government, and industrial sectors. We aim to help configure academic ARR to most benefit Canada in a time of rapid environmental and socio-economic change. We believe that a strategic plan initiated from the Universities, renewable on a 5-7 year basis, will benefit ARR

Research disciplines and infrastructure to study coupled physical/chemical/biogeochemical processes in supporting integrative research in ...
<ul style="list-style-type: none"> Physical, chemical, and life sciences Mathematics and statistics Laboratory Remote sensing In situ measurements, field campaigns Advanced research computing 	<ul style="list-style-type: none"> Atmosphere Ocean Land Hydrosphere Cryosphere Biosphere 	<ul style="list-style-type: none"> Weather Climate Air quality



Direct Applications	Other Spinoffs	Expert Input and Assessment	Education
<ul style="list-style-type: none"> Weather forecasting Air quality assessments and forecasts Seasonal climate and hydroclimate prediction Understand historical and current climate change. Climate change projections. Hazard mitigation Sea ice forecasting 	<ul style="list-style-type: none"> Environmental prediction (e.g. hydrological, marine, stratospheric and tropospheric ozone, space weather) Climate impact assessment Applications in agriculture, forestry, human health, renewable-energy/other resource sector activities, transportation, commerce, and other industries. 	<ul style="list-style-type: none"> Input into policy, resource planning, and industrial planning Communication of ARR to media and public: attribution, articulating scenarios and outcomes, assessing risk for the public and institutions 	<ul style="list-style-type: none"> Undergraduate teaching Education and training of highly qualified personnel Professional certification programs

Figure 1: Scope and framework for university-based ARR, from the ARRCU White Paper.

Update

activities within and outside the wide range of University departments and disciplines where ARR takes place. The planning process is structured on the themes of 1) building research capacity and excellence; 2) partnerships with government and industry and sustainable research support; and 3) education, training, and outreach.

A hallmark of ARR as an area of research and scholarship is its applied relevance, given its strong linkages to environmental forecasting and spin-off applications. In the White Paper we emphasize the strong connection between applied and fundamental research in ARR --- we frame this in terms of the two-way flow of research ideas and results from “Discovery to Application” and from “Application to Discovery” (see Figure 1, which is described in more detail in the White Paper). We aim to enhance the University community’s research capacity, partnerships, and efforts in education and training to provide the most benefit to Canadians in a time of rapid environmental and socio-economic change. The ARRCU effort does not direct priorities in fundamental research but we instead summarize priority areas for research partnerships that the Canadian research community is well positioned to undertake in the next several years.

Our effort has received the encouragement and support of the CMOS Scientific Committee, the Canadian Space Agency (CSA), and NSERC, as well as other agencies and industry. The White Paper has been signed by over 70 Canadian University faculty after an extensive review process that has taken place over the last six months. We invite readers of the CMOS Bulletin to read and give us further feedback on the White Paper and this initiative. (University faculty who agree with the White Paper’s perspective are invited to add their names to the list of signatories on an ongoing basis.)

We also invite interested readers to attend a webinar on November 7 from 2 p.m. to 4 p.m. Eastern Time, to discuss those aspects of strategic planning related to academic-government partnership, in preparation for a focus paper on this theme. To participate in the webinar, please follow the link

<https://www.surveymonkey.com/r/XF9RNLD>

or simply email Dr. Sylvie Roy of NSERC (Sylvie.Roy@NSERC-CRSNG.GC.CA) who will send you additional briefing materials and joining instructions.

Please address comments and correspondence to the ARRCU Working Group Committee:

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Prairie Summer Weather Potpourri: moderate summer with good rains and excellent harvest expectations

Ray Garnett, Agro-Climatic Consulting, Winnipeg, Manitoba

Low solar activity, a westerly phase of the Quasi-Wind Oscillation (QBO) during the fall and early winter, plus El Nino conditions and low North American snow cover in the spring months, synergistically foreshadowed a wetter than normal May-July period over the Canadian Prairies in 2016. Statistics Canada estimated spring wheat yield as approaching the 2013 record. In August the International Grains Council (IGC) reported record world grain production for 2016.

The Canadian prairie provinces of Alberta, Saskatchewan, and Manitoba produce an average of over 50 million tonnes of grain a year. Severe droughts can affect prairie agriculture as well as the national economy. Wheaton (2011) describes how the droughts of 2001 and 2002 affected Canada's GNP, which fell \$5.8 billion during 2001 and 2002, with the biggest loss occurring in 2002 at \$3.6 billion.

The summer of 2016 was by no means a drought, with May-July of 2016 rainfall averaging 118% of normal as shown in Table 1. On August 23, with 40% of the harvest completed, Statistics Canada estimated spring wheat yield at 3.26 t/ha (48.6 bu/ac) slightly below the 3.60 t/ha (53.5 bu/ac) achieved in 2013. The two largest crops on the prairies, spring wheat and canola, were pegged at 20.2 and 17.0 million tonnes respectively, which is 6% higher and 5% lower respectively than in 2015. The area around Calgary in July was reportedly the wettest on record. In August 96 mm of rain (239% of normal) occurred in the Palliser Brown soil zone, which is thought to have hurt durum wheat quality and reduced lentil yields.

Table 1: Climatic Summary for May-July 2016

Month	May		June		July	
Element	Rainfall	Temp	Rainfall	Temp	Rainfall	Temp
DFN	136%	2.2	87%	1.3	132%	0.6

*Data based on 31 stations. Normal mean for the period 1980-2009.
DFN is departure from normal in % of normal for rainfall and °C. for temperature.*

The January 7, 2016 Ray Garnett 2016 Climate and Crop Letter indicated that, "Two Predictors Are More Favorable than a Year Ago for May-July Rains." May-July rainfall was 118% of normal compared to 74% in 2015. This forecast was based on research by Garnett *et al* 2006.

On July 21, 2016, the weekly Western Producer carried the headline, "Flooding the newest threat to prairie crops." During the period 2005-2015, flood losses dominated insurance claims in Saskatchewan and Manitoba. In Saskatchewan, 49% of the insurance claims were for excessive rain versus 18% for drought. Similarly, in Manitoba, 49% of the claims were related to rainfall excess with 18% for drought.

Other grain-growing regions of the Northern Hemisphere also received heavy rains this year:

- In India, persistent rain and hail in early March (at early harvest) led to a 3-11 million tonne shortfall in wheat production.
- In France, Europe's largest wheat producer, untimely heavy rains at ripening in June and earlier in April and May lead to an 11 million tonne shortfall in production.
- Most of the U.S. spring wheat region (North Dakota) received 150-200% of normal rainfall March 1- August 20.
- Most of the key U.S. corn and soybean growing states of Nebraska, Minnesota, Iowa and Illinois received 150-200% of normal rainfall March 1-August 20.
- Most of the Russian winter wheat region in Central, Caucasus and Volga regions received over 200% April 1-August 20.
- Russian spring regions of the Urals and Kazakhstan received over 150% of normal rainfall April 1-August 20.
- The northern half of China's North China Plain, a key winter wheat producing region, received over 150% of normal rainfall January 1 to August 20.
- The west central states of India received over 150% of normal rainfall since June 1st. The overall monsoon performance has been normal. (Ray Garnett, Climate and Crop Letter Vol.12 No 02: August 25, 2016)

The International Grain's Council estimates a record grain production in 2016

The adage that 'Rain makes Grain' is evident globally as revealed in Table 2 from the International Grains Council (IGC) which shows record grain production. A record wheat crop in Russia, which the United States Department of Agriculture (U.S.D.A) in August estimated at 72 million, offset Indian and European wheat production shortfalls. The previous Russian record was 63.7 million tonnes in 2008.

Table 2: August 2016 International Grain Council (IGC) production estimates

Year	2013	2014	2015	2016
Total Grain	2008	2047	2000	2069
Wheat	717	730	736	743
Corn	998	1018	969	1030
Soybeans	284	320	316	325
Rice	478	479	473	484

**Note: Units in million U.S. tonnes*

Source: IGC statistics cited by Wild Oats Vol. 27, number 5 August 30, 2016

Did low solar activity play a role internationally?

Garnett *et al* 2006 found that when sunspot activity averages less than 60 sunspots per month between September and August it is conducive to very heavy rainfall over the Canadian Prairies May through July. In 2016 there has been an average of 52 sunspots per month. We are currently entering year 8 of sunspot cycle # 24 of the Eddy solar minimum as described by Garnett and Khandekar (2016). Could the low solar activity have also favoured rains in other grain growing regions such as the Russian steppes?

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About Ray

Ray Garnett is an independent consultant (Agro-Climate Consulting) who for decades worked in the Canadian Wheat Board's Weather and Crop Surveillance and Planning Departments.

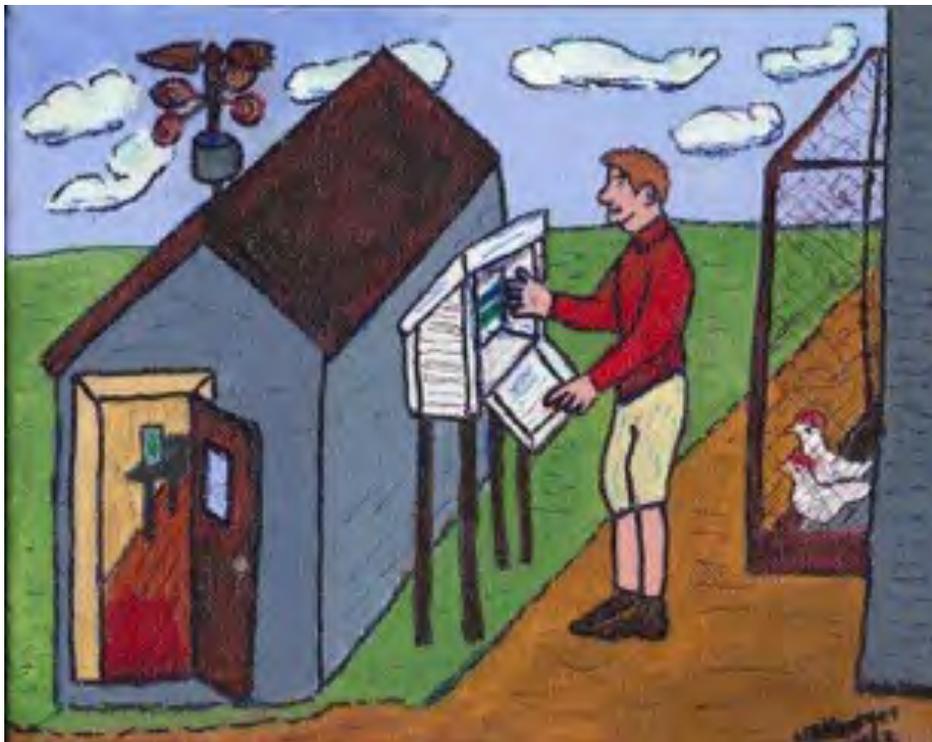
About Me

How I Became a Meteorologist

By Herb Kruger, Retired Meteorologist

I grew up in Regina. One day, when I was about seven or eight, we were experiencing a thunder storm. I was standing at the front door looking out at the storm, watching the lightening and listening to the thunder. The lady from two houses to the north of us was visiting my mother –Mrs. Kayter was her name. I said, “I wonder what makes thunder and lightning?” Mrs. Kayter said, “God does it.” I thought that didn't make sense. How could God waste his time on making storms? So I resolved to find out some day. That was my first step in becoming a meteorologist.

That was followed by a number of things in later years. When I was in high school I built a Stevenson Screen—as much as I could tell from photographs--and put in a wet bulb thermometer –it was a pot of water with a strip of cloth wrapped around the bulb of a thermometer. When you fanned the thermometer the temperature would go down. According to tables I got from the US weather bureau, I could then determine the dew point. I took measurements every morning, noon and night. I also built an anemometer that I mounted on the top of the shack my parents called my "playhouse" that was in our backyard, along with a chicken coop. My anemometer was made out of halves of an old toilet tank copper float.

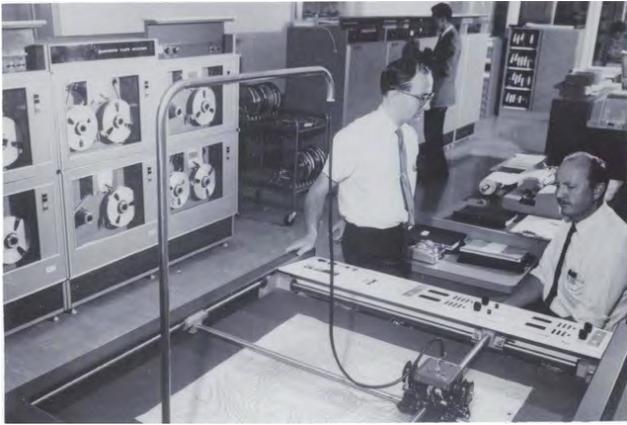


Recent painting by Herb, capturing the story of his experimental teenage years!

In the electrical shop we had at my high school, Balfour Tech, I designed a Selsyn system. It measured two things; wind direction and speed. The wind direction system was a wooden disk with various copper strips on it. To measure speed I used a copper coil—a motor that was turning. It was connected by wires down to my shack. Inside, on the desk, the wires were fastened to a series of lights in a circle. When the wind was from the north, the north light went on and so on, around the circle. The Selsyn had another motor which indicated some kind of electric current coming through and I calibrated it with reports from the radio station. So, for example, when the radio said the wind was northwest at twenty I recorded that wind speed as well. In school I got over 90% on these projects, and I was very proud of what I'd created..

I liked to listen to a radio program where one of the staff meteorologists presented a series of lectures on meteorology. It was fascinating. I decided to pursue the idea of becoming a meteorologist. This was in about grade nine or ten, and to make sure I got into the right courses, I wrote a letter to the controller of the Meteorological Service of Canada. He replied saying I needed to specialize in Physics and Mathematics. He said there were two avenues; if I got a Bachelor of Arts degree I could become a meteorologist (forecaster) in

About Me



Herb is pictured here, seated at the desk, with colleagues from the Canadian Meteorological Centre in Dorval, Quebec, in the early 1960's.

various small offices across the country under the guidance of a regional office. If I wanted to work in a regional office, I would have to get a Master's degree at the University of Toronto.

When I graduated from the University of Saskatchewan, in Saskatoon, I applied for two positions - one to a Geophysical company exploring for oil, the other to the Meteorologist Service of Canada. I was accepted at both, but I chose the meteorology job. My first posting was to Comox, BC.

Later, after being a forecaster for a while, I did go to the University of Toronto to get my Master's degree. I then spent my whole working career as a meteorologist in various locations across the country. I never regretted my decision to reject the job in the oil fields.



AES Network Standards Division (c.1977): Joe Kotylak, Herb Kruger, Bob McMaster



My husband Herb Kruger, had a 33 year career as a meteorologist with the Federal Government. He still enjoys going through the CMOS Bulletin. For some time I've thought of getting in touch with the Bulletin, because I felt some members would remember Herb.

About four years ago, while he was still able to tell an articulate story, I gathered tales from him. In his own words, here is what he recounted. Shortly after I "captured" his story, he made the painting to go with it.

Herb is pictured here, earlier this year, as he celebrated his 86th birthday.

- *Jockie Loomer-Kruger*

Meteorological Detective Work: CSI Mowat

By Phil “The Forecaster” Chadwick

Phil recently put both his meteorological and plein air painting expertise to work, as he assisted with verifying the authenticity and details of a recently discovered Tom Thomson painting. (More on Phil’s meteorological and artistic insights into Tom Thomson’s work at <https://niume.com/pages/post/index.php?postID=88013>)



Developing more than a passing interest in the art and life of Tom Thomson can open a Pandora’s Box of positive possibilities. Such was the case for me after starting my “Tom Thomson Was A Weatherman” presentations in the mid-eighties. I was on a first name basis with many Tom Thomson experts – one of those being Tim Bouma (<https://tlastspring.com/author/tlastspring/>).

Recently Tim was tasked with helping to establish the authenticity of a recently surfaced Thomson sketch (on left). There is a ton of money to be made from Thomson forgeries so one needs to be very careful indeed. I was asked to help with the weather. Being a plein air artist as well as a meteorologist puts me in a unique position to help and apply CSI – Creative Scene Investigation.

Without getting into the details, it was fairly easy to establish some facts. With the help of the weather and Tom’s known movements from Tim, the painting was completed on Sunday April 26th, 1914. Given the known orientation of the first Mowat Lodge, the artist was standing on the east side of the lane in front of Mowat Lodge looking westward with the rising sun on their back. The temperatures were around 6 Celsius and the thick snow and ice pack was

melting due to the humid air mass. A few millimetres of rain had fallen on Saturday with another trace of rain on its way. The band of nimbostratus on the western horizon was approaching but the morning rays of the sun still had a clear path to bring out the colours of Mowat. The colours of the nimbostratus were similar to those of the western horizon before sunrise but in this case the sun was certainly up and I could be more confident on the diagnosis of the cloud type. Another bit of rain was on the way so Tom had better paint fast.

The media (including the Globe and Mail) picked up on some of these points but not them all. I think that science scares them. Too bad...science is your friend just like art. Was this sketch a Thomson forgery? Not on your life...

Globe and Mail, 26 August, 2016. *Authenticity of latest Tom Thomson sketch remains a mystery*

Wreck of Franklin’s Second Ship, the HMS *Terror*, Discovered



More than 170 years since it disappeared, the wreck of the HMS *Terror* has been found in a bay off King William Island, Nunavut. Underwater video footage reveals the wreck to be in near perfect condition.

In 1845, explorer Sir John Franklin set sail from England with two ships, HMS *Erebus* and HMS *Terror*, in search of a Northwest Passage across what is now Canada’s Arctic. In spite of being fitted with all of the latest technology of the time, the ships with their crews vanished, leaving only small clues and speculation as to their fate behind. In September of 2014 the wreck of the HMS *Erebus* was discovered. Mention of this was made in the *CMOS Bulletin* (45(5), p. 152) at that time.

The location of the HMS *Terror* was identified not by using tools of technology, but rather by establishing a relationship with the local Inuit population and listening to, and learning from, their observations of the seascape. In fact, the whereabouts of this ship were first known seven years ago, when Sammy Kogvik and James Klungnatuk, residents of a remote Nunavut community, were travelling across the ice of the Bay on snowmobiles. They noticed a wooden pole, sticking straight up out of the ice. They knew that it was most likely the mast of one of the two lost Franklin ships, but chose to keep it a secret, until recently when Sammy Kogvik decided to share his find with the Arctic Research Foundation.

Parks Canada archaeologists aboard the ice breaker CCGS Sir Wilfrid Laurier are making their way to Terror Bay for a look at the latest Franklin find.

Source: Parks Canada and MacLeans Magazine, 14 September 2016, *HMS Terror: How the final Franklin ship was found*

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Regional Fire Chief at Regional Municipality of Wood Buffalo



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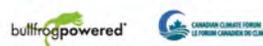
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Report: Seasonal Outlook for Fall 2016

Seasonal Outlook for the fall 2016 (SON) based on CanSIPS forecast issued on the 31st of August, 2016 / Prévision saisonnière pour l'automne 2016 (SON) par le système SPISCan, produite le 31 août 2016

Marko Markovic, Bertrand Denis and Marielle Alarie; Canadian Centre for Meteorological and Environmental Prediction / Centre canadien de prévision météorologique et environnementale

For more recent seasonal forecast (Oct-Nov-Dec) please visit http://meteo.gc.ca/saisons/prob_e.html
 Pour une prévision plus récent (Oct-Nov-Dec) consultez http://meteo.gc.ca/saisons/prob_f.html

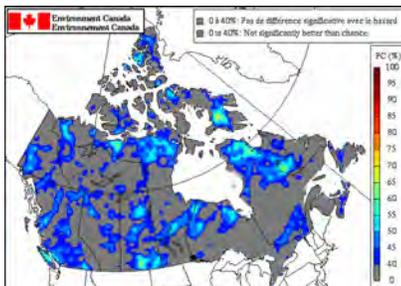
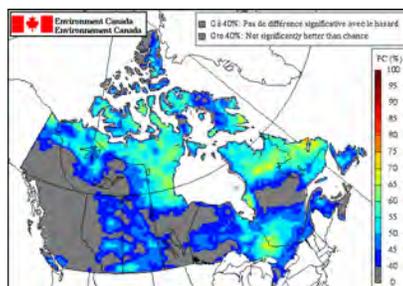
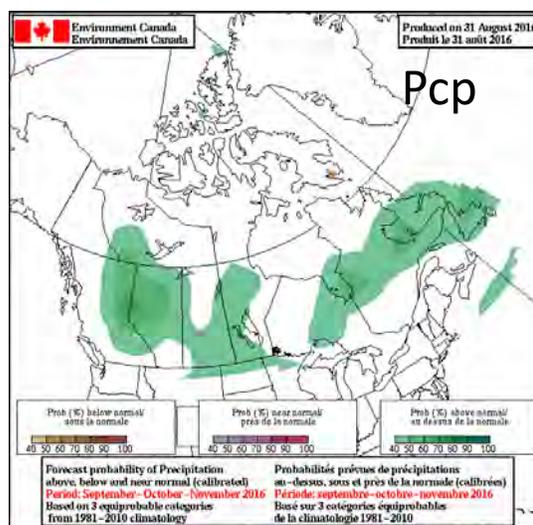
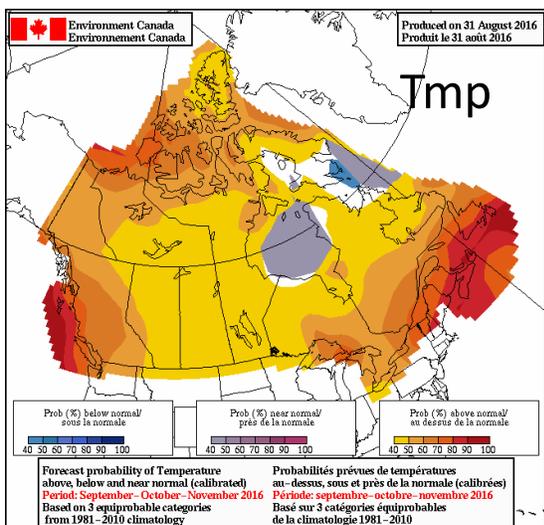
Above normal temperature autumn is expected across Canada. Above normal temperatures are likely to occur everywhere in the continental Canada. The highest probabilities (70% and +) for such a forecast are in the Maritimes and coastal BC. Southern ON and southern QC have the expectancy of at least 50% of above normal values.

Un automne plus chaud que la normale est anticipé. Des températures au-dessus de la normale sont très probables partout au Canada. Les probabilités les plus élevées (70% et +) sont anticipées dans les provinces de l'Atlantique et sur la côte du Pacifique. Sur le sud de l'Ontario et du Québec, les températures au-dessus de la normale sont attendues avec une probabilité de près de ~50%.

Above normal precipitation is expected across the prairies, eastern BC and northeastern Canada.

There is > 40% probability for this outcome in the central prairies, northern ON, central QC and NFLD. Highest probabilities >60% for above than normal precipitation are expected for eastern BC and western AB. Other Canadian regions have equal probability chances.

Préc. au-dessus de la normale pour les Prairies, l'est de la C-B et le secteur nord des provinces de l'est? Il y a plus que 40% de probabilité que les préc. soient au-dessus de la normale pour les Prairies, nord de l'ON, nord du QC, Terre-Neuve et Labrador. Les plus fortes probabilités (60%) sont attendues à l'est de la C-B et à l'ouest de l'AB. Sur le reste du Canada, on s'attend aux probabilités égales pour les préc.



Historical Skill, Tmp.
Habilité historique, Temp.

Historical Skill, Pcp.
Habilité historique, Préc.

CanSIPS SON16 forecasted Indices:

Niño3.4 = -0.42 (neutral conditions)
 PDO = 0.35 (moderate index)
 NAO = 0.11 (weak index)
 PNA = will be available soon

Les indices climatiques prévus par le SPISCan, SON16:

Niño3.4 = -0.42 (condition neutre)
 PDO = 0.35 (indice modéré)
 PNA = 0.11 (indice faible)
 NAO = disponible bientôt

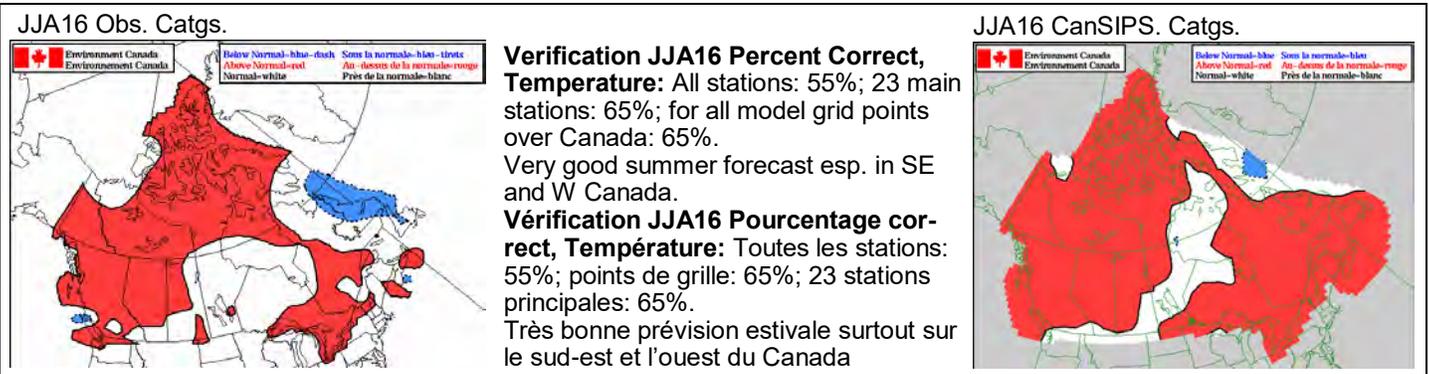
What will influence the next season? ECCC predicts neutral ENSO conditions to develop in SON16 and to persist in the following winter. According to the longer lead seasonal forecast issued by International Research Institute (IRI), there is a probability of ~50% that the neutral conditions will be replaced by a weak **La Niña** in

Qu'est-ce qui influencera le climat la saison prochaine? ECCC prévoit le maintien d'une condition neutre d'ENSO sur le Pacifique central pour SON16, et devrait persister l'hiver prochain. Selon leur prévision à plus longue échéance, IRI (International Research Institut) prévoit une probabilité de ~50% pour le

Report: Seasonal Outlook for Fall 2016

fall or early winter. **PDO** will likely exert an additional warming influence on the western coastal regions. Warm ocean surface temperatures will prevail along Canada's entire west coast. PDO is likely to remain positive in SON16. Weakly positive **NAO** is forecasted for SON16, mainly in September, after which skill is low. Although positive NAO is historically connected with below normal temps. over E. Canada in SON, its influence is weaker than in winter. **PNA** index will likely stay positive (until mid-Sep, according to the NOAA-Climate prediction Center). There is **little La Niña impact over Canada during fall.**

développement de **La Niña** en SON16 ou au début de l'hiver prochain. L'indice **PDO** forcera probablement un réchauffement additionnel sur les régions côtières de l'ouest. Les températures chaudes sur l'océan Pacifique persisteront au large de ces côtes. Un indice **NAO** faiblement positif est prévu pour SON16, surtout en septembre, après quoi l'habileté à prévoir est limitée. Un indice NAO positif est associé historiquement à des températures en-dessous de la normale dans l'est du pays, et son impact est plus faible l'automne qu'en hiver. L'indice **PNA** restera probablement positif jusqu'à la mi-septembre (selon le CPC). **Commentaire: l'incidence de La Niña sur le Canada est faible en automne.**



Seasonal forecast by other centers

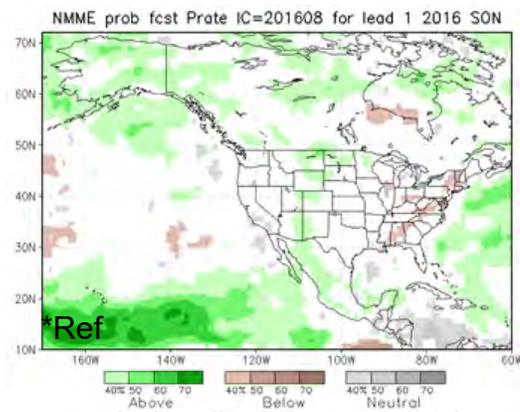
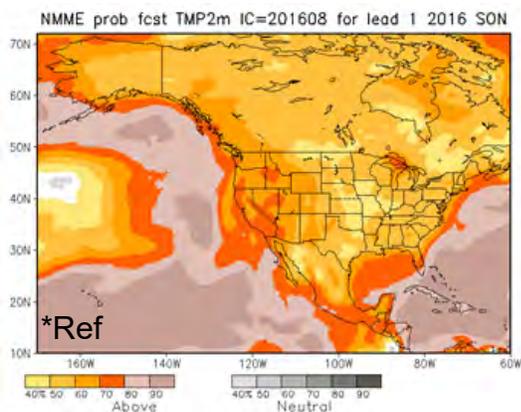
Temperature: according to the NMME (North American Multi Model Ensemble) (lead 1 month), probability of above normal temperatures (>60%) is forecasted in western Canada and Maritimes. Coastal regions of BC, Maritimes and region over the Great Lakes have probability values of >70% to have above normal temperatures. Central and Northern Canada have 50% probability to reach above than normal temperatures. This is in accord with the CanSIPS forecast.

Precipitation: There is a difference between CanSIPS and longer lead forecast from NMME (on the figure), WMO, APEC and IRI (not shown) especially in the central Canadian prairies where other centers forecast equal probability chances for precipitation. Over eastern Canada, CanSIPS is forecasting above normal precipitation across a large region, opposite from other forecasting centers expecting above normal precipitation over more scattered locations.

Les autres centres

Températures: selon le NMME (North American Multi Model Ensemble) (délai de 1 mois), on a une probabilité forte d'avoir des valeurs au-dessus de la normale (>60%) pour les régions de l'ouest du Canada et sur les Maritimes. Les régions côtières de la C-B, de la région des Grands-Lacs et des Maritimes affichent des probabilités de plus de 70% d'observer des valeurs au-dessus de la normale, cette probabilité est de 50% sur le centre et le nord du Canada. Cette prévision est en accord avec celle de SPISCan.

Précipitations: On remarque une différence entre les prévisions du SPISCan et celles (avec un délai plus long) fournies par le NMME (ci-contre), WMO, APEC et IRI (ne sont pas illustrées). Spécialement sur les Prairies canadiennes où les autres centres prévoient des probabilités égales. Sur le nord de l'est du Canada, le SPISCan prévoit des préc. au-dessus de la normale, pour une région plus importante, comparé aux autres centres. Ceux-ci suggèrent des préc. au-dessus de la normale, mais pour des régions beaucoup plus isolées.



*Ref: <http://www.cpc.ncep.noaa.gov/products/NMME>

Report: 2016 Summer Workshops for Teachers

In collaboration of the American Meteorological Society, the US National Oceanic and Atmospheric Administration, the US Naval Academy, Canadian Geographic Education and the Canadian National Committee/Scientific Committee on Oceanic Research, CMOS offers two 2-week summer workshops (one in atmospheric sciences, the other in oceanographic sciences) for teachers from Kindergarten to Grade 12. Here, the 2016 teacher workshop participants, David Summerhays and Carrie Antoniazzi, share their experiences.

Project Maury Summer Workshop

By David Summerhays, Claremont Public School, Claremont, ON

I was fortunate to be given the opportunity to participate in the Maury Project this past summer. The Maury Project is designed to give science teachers and science supervisors an in-depth study of various oceanographic and meteorological subjects including waves, tides, density and wind-driven oceanographic circulations and ocean-atmosphere interactions. The workshop equips teachers with training and teaching materials that can be used in their classrooms. Teachers participate in lectures, tutorials, research cruises, hands-on laboratory exercises and field trips. This year, the program hosted teachers from 14 different states across the US, one from Guam and one from Canada, who was sponsored by the Canadian Meteorological and Oceanographic Society. The Project is the work of Dr. David Smith, retired professor and former chairman of the Naval Academy oceanography department, and Dr. Jim Brey, Education Director of the American Meteorological Society, who serve as co-directors of the Maury Project Workshop. Speakers featured in the workshop included oceanographers and senior scientists from the National Oceanic and Atmospheric Administration (NOAA), the University of Maryland at College Park, and the United States Navy¹.

The Maury Project Workshop is named in honor of Navy Lt. Matthew Fontaine Maury who lived from 1806 until 1873 and is considered to be the founder of physical oceanography.

The Maury Project Workshop is funded by the Naval Meteorology and Oceanography Command, the Office of Naval Research and the NOAA. The workshop is made possible by considerable support from the United States Naval Academy, the State University of New York at Brockport and the American Meteorological Society². One of the most exciting aspects of the program is that it is hosted by the U.S. Naval Academy in historic Annapolis, MD. Founded in 1845, the U.S. Naval Academy today is a prestigious four-year service academy that prepares midshipmen morally, mentally and physically to be professional officers in the naval service. More than 4,400 men and women representing every state in the U.S. and several foreign countries make up the student body, known as the Brigade of Midshipmen. Midshipmen learn from military and civilian instructors and participate in intercollegiate varsity sports and extracurricular activities. They also study subjects like small arms, drill, seamanship and navigation, tactics, naval engineering and weapons, leadership, ethics and military law. Upon graduation, midshipmen earn a tax-payer funded Bachelor of Science degree in

a choice of 23 different subject majors and go on to serve at least five years of exciting and rewarding service as commissioned officers in the U.S. Navy or U.S. Marine Corps³. The city of Annapolis is located a short distance from both Washington, D.C. and Baltimore, MD. The city is very picturesque with a beautiful waterfront, and several major tributaries crossing the city and flowing into the Chesapeake Bay. Its historic downtown is a focus for the many tourists that visit each year, with lovely shops and fantastic restaurants located throughout.

The Maury Project included a variety of oceanographic topics of study including:

- El Niño, la Niña;
- Ocean tides;
- Ocean sound and the Deep Sound Channel;
- Deep and shallow ocean waves;
- Pacific Ocean currents;
- Estuaries and deltas;
- Deep-ocean Assessment and Reporting of Tsunamis (D.A.R.T.);
- Arctic and Antarctic conditions.



Students of the Maury Project conduct water sample tests on the Navy Research Vessel YP686.

Report: 2016 Summer Workshops for Teachers

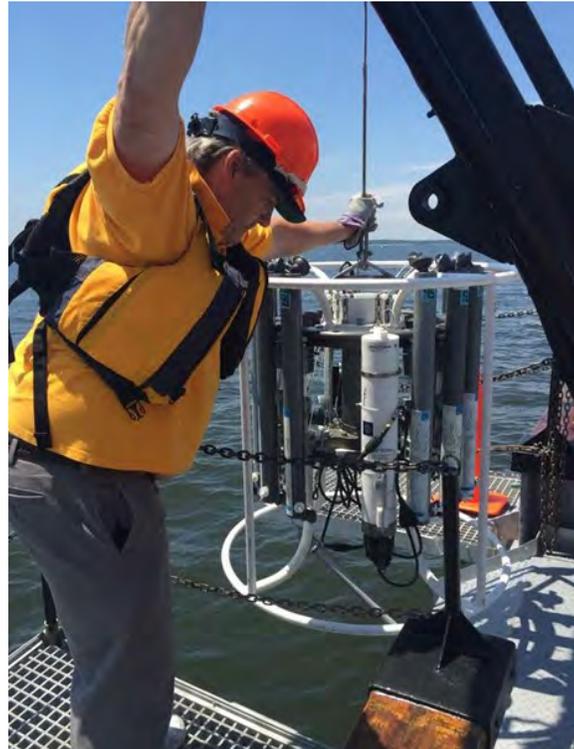
The topics were presented in a variety of lectures, hands on activities, demonstrations, and field trips. Instructors were mostly made up of the Oceanography faculty from the Naval Academy, and did an excellent job of presenting the material to a relatively diverse group of learners who taught from the kindergarten right through to college level. The enthusiasm and obvious passion each had for their areas of expertise was apparent, and made the learning experience second to none. Also part of the program were several field trips which really helped participants to understand the program from both an academic as well as a practical perspective.

A trip to the National Aquarium in Baltimore, MD provided participants with a connection to the biotic environment present in our oceans. A huge range of aquatic life, both plant and animal, allowed participants to make connections to several course lectures. A visit to the National Oceanic and Atmospheric Administration (NOAA) allowed participants the opportunity to interact with the Science on a Sphere (SOS) program. Science On a Sphere® (SOS) is a room sized, global display system that uses computers and video projectors to display planetary data onto a six foot diameter sphere, analogous to a giant animated globe. Researchers at NOAA developed Science On a Sphere® as an educational tool to help illustrate Earth System science to people of all ages. Animated images of atmospheric storms, climate change, and ocean temperature can be shown on the sphere, which is used to explain what are sometimes complex environmental processes, in a way that is simultaneously intuitive and captivating⁴. A trip to the NASA Goddard Space Center allowed participants to learn more about the instruments used by the science community to better understand our oceans and atmosphere.

A real highlight was being able to discuss with a mission engineer the James Webb Space Telescope project. The James Webb Space Telescope is a large, infrared-optimized space telescope that is designed to study the earliest galaxies and some of the first stars formed after the Big Bang⁵. It was really fantastic to watch the various scientists and engineers working on testing for the upcoming launch of this potentially game changing technology. Finally, participants each spent a half-day on a Naval research vessel conducting a variety of tests and experiments on the Chesapeake Bay, as well as a half-day doing a beach study, in which the biotic elements of the Chesapeake bay were explored. This provided participants with the ability to really connect the lecture topics to both real-life, as well as classroom applications of the scientific concepts explored.



Maury participants learn about the James Webb Space Telescope from the Mission Engineer at the NASA Goddard facility.



Maury participants use the Rosette CTD device to measure different water properties in Chesapeake Bay.

Report: 2016 Summer Workshops for Teachers

As a Maury participant, it is now my responsibility to pass on the expertise gained from the program to other educators. I am currently scheduled to make a presentation to the Science Teachers Association of Ontario (STAO) at the annual conference in the fall. I will also make a presentation at the board level later in the academic year. Because of this commitment to the sharing of knowledge, the hundreds of Maury participants over the years have been able to connect with thousands of teachers who are then able to apply the programs materials and concepts to their own instructional programs. It is this aspect of Maury that makes it such an effective teacher professional development opportunity. In my own practice as an elementary science teacher, I have developed programming plans that make connections to my grade 7 "Interactions in the Environment" and "Pure Substances and Mixtures" curriculums, as well as my grade 8 "Water Systems" and "Fluids" curriculums. I am sure as I continue to develop my knowledge of the oceans, I will continue to make these connections to a variety of other subjects and curriculums. I really appreciate the opportunity I was given by the Canadian Meteorological and Oceanographic Society, as well as their American counterpart, the American Meteorological Society, and I am looking forward to now paying this generosity forward through my own inservicing of other teachers in the province.

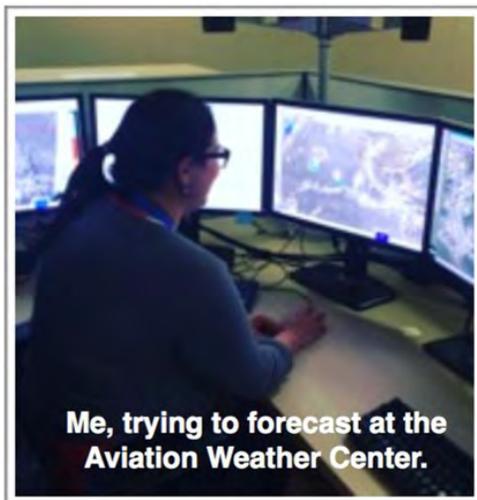
^{1,2,3}**United States Naval Academy.** Oceanography Department. *CLAREMONT PS TEACHER ATTENDS U.S. NAVAL ACADEMY OCEANOGRAPHY TRAINING.* Annapolis, MD: USNA Public Affairs Office, 2016. Print.

⁴**"What Is Science On a Sphere®?"** *What Is Science On a Sphere.* National Oceanographic and Atmospheric Administration, n.d. Web. 31 Aug. 2016. <http://sos.noaa.gov/What_is_SOS/>.

⁵**"James Webb Space Telescope."** NASA. NASA, 27 Apr. 2016. Web. 31 Aug. 2016. <<http://www.nasa.gov/content/goddard-missions-present>>.

Project Atmosphere Summer Workshop

By Carrie Antoniazzi, Commission scolaire Francophone de la C.B, Richmond, BC



Me, trying to forecast at the Aviation Weather Center.

In April, I found out that I had been selected by the Canadian Meteorological and Oceanographic Society and Canadian Geographic Education as the Canadian participant at Project Atmosphere. Project Atmosphere is a Summer Teacher's Workshop offered by the American Meteorological Society at the National Weather Service Training Center in Kansas City, Missouri for K-to-12 teachers in the USA. For 2 weeks, 22 teachers from all over the US and I participated in professional development workshops designed for teaching atmospheric content.

The location for our workshop was the National Weather Service Training Center (NWSTC). Having the workshop in this meteorological training facility allowed us to have access to a large assortment of computerized weather information systems as well as see firsthand the equipment used in forecasting such as the Automated Surface Observing System (ASOS) and surface stations.

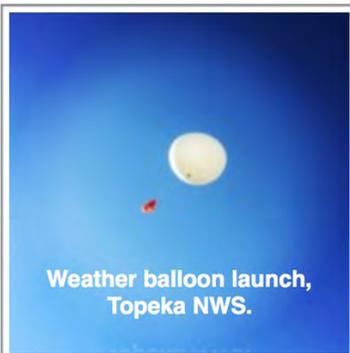
The Aviation Weather Center, responsible for aviation forecasting, is also in the building, allowing us to see real-world applications of weather forecasting.

During the 2 weeks, we learned from experts in the field, were taught weather and climate concepts by professors, and were given modules to apply the knowledge in the classroom. Topics such as satellite and radar imagery interpretation, space weather, thunderstorms and severe storms, and weather forecasting were addressed by experts in their fields. One evening, we had a field trip to the National Weather Service (NWS) Topeka weather station to launch a weather balloon. It was a great learning experience, especially the next day when we were able to take the raw data collected by the balloon and analyze it. We were also fortunate enough to have Louis Uccellini, Director of the National Weather Service, speak to us about the National Oceanic and Atmospheric Administration (NOAA) and a Weather-Ready Nation. Although all of the speakers were great, the highlights for me were presentations by Richard Knabb, Director of the National Hurricane Center, Miami, Florida, who spoke about the impact of social scientists, on how they now alert the public about hurricanes, and by Barbara Mayes Boustead, Climate program

Report: 2016 Summer Workshops for Teachers

manager at NWS forecast office Nebraska, whose dissertation was on the historical accuracy of the weather in Laura Ingalls Wilder's book "The Long Winter".

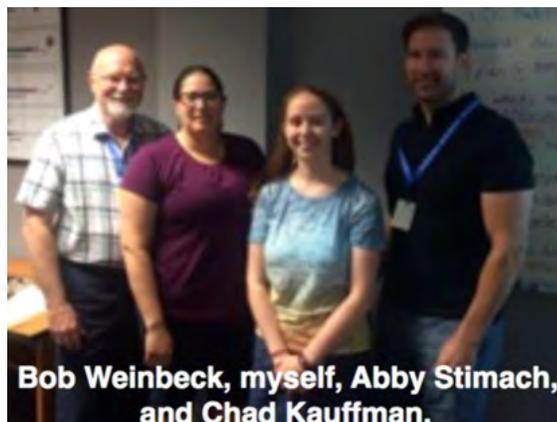
Each day we had a weather briefing with Jerry Griffin, Master Instructor in the Forecast Operations Programs, at the NWSTC. During these briefings, we observed radar and satellite imagery and learned to interpret surface station data and 500-millibar charts. We also followed storm systems as they moved through the Pacific and explored many great online resources that we can use to forecast weather with our students.



Beyond the workshop, I really enjoyed learning more about the education system in the US. It was interesting to hear how different education can be, even between the states. With our transformation in education here in BC, it was great to share what we are doing here and to hear feedback from others. I also enjoyed having the weekend off between the two weeks to explore Kansas City. There are some great museums to visit, such as the National WWI Museum, and I went to my first ever baseball game!

As a district teacher mentor with the Conseil Scolaire Francophone de la Colombie-Britannique, I am looking forward to using the new skills and resources obtained during this workshop to create new professional development opportunities for teachers as well as better integrate atmospheric content into classroom projects I develop with teachers. The modules presented are engaging and meaningful activities that I will be able to share with teachers as well.

I would like to thank the workshop faculty for all their help over the two weeks. Abby Stimach, Jim Brey, Bob Weinbeck and Chad Kauffman did an amazing job of sharing their knowledge with us, keeping us organized and getting us ready to share what we've learned with other teachers. Also, thank you to Canadian Meteorological and Oceanographic Society and Canadian Geographic Education, the educational committee of The Royal Canadian Geographical Society, for continuing to support Canadian participation at these workshops.



Pictured above left are: Front (L-R): Instructor Bob Weinbeck, Instructor Barbara Boustead, Michael Joyce, Joan Drew, NWS Director Louis Uccellini, Julie Wight, Diane Ripollone, Helaine Hager, Instructor Abby Stimach; **Middle:** Kevin Mart, Karen Merritt, Mary Jane Ziehl, Samantha Adams, Julianne Codd, Carrie Antoniazzi, Julia Schroeder, Nora Collazo; **Standing:** George Nahay, Jared Foro, Brian Soash, William Donald, Sara Finnemore, Instructor Jerry Griffin, Margaret Wylie, Barbara Stanoff, Nancy Hoehn, Instructor Jim Brey, Amethyst Klein, Raymond Szczerba, Instructor Chad Kauffman; **NWS:** Chief Learning Officer John Orgen

50th Anniversary: Historical Highlights of CMOS

Excerpts from: Atmosphere Volume 3, 1965

Compiled by Richard Asselin, Former Director, CMOS Publications, Member of Ottawa Centre



Canadian
Meteorological and
Oceanographic Society

La Société Canadienne
de Météorologie et
d'Océanographie

“METEOROLOGY AT THE UNIVERSITY OF TORONTO: Part I. The Past. By Alan W. Brewer, Professor of Physics (Meteorology) University of Toronto”

This article covers a good part of the history of meteorology in Canada, from 1839 to 1880. [Note: Part 2 does not appear to have been published in Atmosphere, but a short continuation was published in Volume 4 no 3, 1966, titled The Inaugural Stages, in connection with the formation of the CMS.]

“METEOROLOGY IN CANADA 1964 An Abstract from the text of CANADIAN GEOPHYSICAL BULLETIN Vol.17, Dec. 1964 to be published by the RESEARCH COUNCIL OF CANADA”

This article describes the meteorological programs at Universities of British Columbia, Alberta, Saskatchewan, Western, Toronto, Waterloo, McGill, Collège Brébeuf and the Canadian Meteorological Service. The International Activities of the Meteorological service are summarized by Warren Godson

25th anniversary of the Canadian Branch of the RMS

“The 25th anniversary of the formation of the Canadian Branch of the Royal Meteorological Society was commemorated by the Toronto Centre on November 5, 1964, at a 25th Anniversary Dinner attended by 180 members and guests of the Centre. The speaker for the occasion was Mr. J. R.H. Noble, recently appointed Director of the Canadian Meteorological Service, who took as his topic “Meteorology in Canada: A Look at the Past and Some Thoughts about the Future” . The history of the Royal Meteorological Society dates back to 1850, with the granting of a Royal Charter by Queen Victoria and the assumption of the name Royal Meteorological Society dating from 1866. The granting of a charter by the R.M.S. to an overseas branch of the Society in Canada took place in May 1939, followed by organization of the Canadian Branch in August 1939”

“The first regular meeting of the Branch was held on February 2, 1940, with 17 members and 11 guests in attendance. Since the total membership of the branch was then only 34, this represented an attendance of 50% of the total membership. From this modest beginning, the ranks of the Branch have swelled to a present membership of about 385, with Centres at Toronto, Montreal and Winnipeg.”

“From its early beginnings in 1839, when weather observations were taken as part of normal duties by the British Army at Fort York, Mr. Noble sketched the history of meteorology in Canada up to the present time, when the Canadian Meteorological Service is one of the largest in the world, and meteorology is winning increased attention in Canadian Schools and Universities. More than 2200 Canadians now make meteorology their life work and there are perhaps as many as 4,000 more who contribute on a day-to-day basis.”

Sponsoring of scientific meetings

“The American Association for the Advancement of Science visited Canada for the sixth time, to hold its 131st Annual Meeting, at the end of the year 1964. Montreal was the venue for the third occasion, the last being 1882: lack of adequate convention space had prevented such a gathering in Canada since the end of World War II (apart from a Division of the Association), but the construction of the Queen Elizabeth Hotel had now afforded the necessary facilities. American Meteorological Society normally participates, but on this occasion the Canadian Branch of the Royal Meteorological Society seized its opportunity to act as a co-sponsor - the first since its foundation in 1939. Previous joint meetings of two Societies (Toronto 1939, 1953) had been arranged by the Parent Society.”

50th Anniversary: Historical Highlights of CMOS

Annual Business meetings

"24th Annual Business Meeting June 11, 1964. Halifax, N. S. Approximately 45 meteorologists were present at the meeting."

The Branch was hesitating between the meetings of the Royal Society or of the Conference of Learned Societies for the selection of the venue for its own meetings.

"It is resolved that an ad hoc committee to plan the organization of the Canadian Meteorological Society be composed of the president and the vice-president of both the outgoing and the incoming executives of the Canadian Branch of the Royal Meteorological Society, with a view to submitting a provisional constitution to the Executive for subsequent membership's approval. A progress report on the constitution is to be submitted to the Executive by December 31st, 1964."

Atmosphere

"EDITORIAL COMMITTEE REPORT: Three issues of "Atmosphere" were published in 1964. The issues are printed in 450 copies, the number of pages were as follows: 16 (no. 1), 31 (no. 2), and 23 (no. 3). The cost of printing the three issues was, respectively, \$190, \$235 and \$218.

We are now beginning to receive enquiries about subscription to "Atmosphere". We have had them from Canada, U.S.A. and U.K. It is most encouraging!"

6th Annual National Meteorological Congress

University of British Columbia, Vancouver, B. C. June 8 - 9, 1965.

There were 4 Sessions on Weather Forecasting (10 papers), Cloud and Precipitation Physics and General (10 papers), Wave Motions And Atmospheric Dynamics (9 papers), Dynamic Meteorology and Numerical Weather Prediction (8 papers). Abstracts were printed in the program and 10 to 15 minutes per paper were allowed for presentation. 60 participants.

"The scientific sessions were being taped for use at the Local Centres and Meteorological Offices. The Halifax group will have first use of the tapes and then they will be offered to other Centres."

New centres

"Dr. R. E. Munn commented on the expansion of the Canadian Branch of the Society with the establishment of two new centres in May 1965: British Columbia and Halifax ...more time [needs to] be allotted for the business meeting next year." [The Alberta Centre was formed in July 1965]

"The Meteorological Society of Quebec and the Labrador Meteorological Society have been formed. The President interpreted this as yet another indication of the growth of meteorology in Canada. It was hoped that ultimately the three Societies could merge."

MCGILL OBSERVATORY THROUGH 100- YEARS by Nancy Bignell

This article forms part of the history of Canadian meteorology.

Symposium on "The Urban Effect on Climate".

"It has been predicted that before many more years have passed, people living in cities will be more interested in whether the air is fit to breathe than in whether there will be rain."

50th Anniversary: Golden Jubilee Fund



Canadian
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de Météorologie et
d'Océanographie

Turning CMOS 50th Anniversary Celebrations into Action

Plans are continuing to develop to celebrate the 50th anniversary of the creation of the Canadian Meteorological Society (CMS) and the 40th anniversary of the addition of the oceanographic disciplines to create the Canadian Meteorological and Oceanographic Society (CMOS). The anniversary date is January 1, 2017 but we will recognize this important milestone many ways over the coming months.

During the last 50 years, CMOS and its members have made invaluable contributions to Canadian and global science. They have improved the safety of Canadians and assisted economic advancement in Canada. To celebrate these achievements, CMOS is planning a series of activities for 2017 including:

- a public webcast by prominent scientists or spokespersons in collaboration with the Canadian Climate Forum, to provide credible scientific information on climate change to Canadians;
- special sessions at the Toronto Congress in June 2017, with invited speakers, international guests and media publicity; and
- a special publication highlighting the best of *Atmosphere-Ocean* over the years, showcasing the “state of the art” of our disciplines.

The Council of CMOS has created the Golden Jubilee Fund for 2016-17 that will provide CMOS with the resources to showcase our rich history and our sciences through these activities. A tax-deductible donation to the Golden Jubilee Fund will offer individuals, organizations and companies the opportunity to support CMOS in our ambition to be more visible as we celebrate our special anniversary.

Please consider making a donation as you renew your membership for 2017. You can donate today in the Member Area of the CMOS web site (preferred method) or by using the DONATE ONLINE NOW button on the CMOS home page (www.cmos.ca). Donations will be accepted any time in the coming year, but project planning in fall 2016 will be linked to available budgets, so your early consideration of this venture is important.

CMOS thanks you for your support. Watch the CMOS Bulletin and CMOS web site for updates on these and other 50th anniversary activities.

Martin Taillefer, CMOS President

Concrétiser les célébrations du 50^e anniversaire de la SCMO

Nous continuons de planifier les célébrations du 50^e anniversaire de la fondation de la Société de météorologie du Canada (SMC) et du 40^e anniversaire de l'ajout des sciences de la mer, qui mena à la création de la Société canadienne de météorologie et d'océanographie (SCMO). La date exacte de l'anniversaire est le 1^{er} janvier 2017, mais nous soulignerons cet important jalon de plusieurs façons, au fil des mois.

Au cours des 50 dernières années, la SCMO et ses membres ont considérablement contribué aux sciences canadiennes et mondiales. Ils ont renforcé la sécurité des Canadiens et participé à l'avancement économique du pays. Afin de célébrer ces réalisations, la SCMO planifie une série d'activités pour l'année 2017, y compris :

- Un web émission publique mettant en vedette d'éminents scientifiques ou porte-paroles, et ce, en collaboration avec le Forum canadien du climat, afin d'offrir aux Canadiens une information scientifique crédible sur les changements climatiques;
- Des séances spéciales au Congrès de Toronto en juin 2017, comprenant des conférenciers, des invités internationaux et une campagne publicitaire dans les médias;
- Une publication spéciale qui souligne le meilleur d'*Atmosphere-Ocean* et témoigne de la fine pointe de nos domaines.

Le conseil de la SCMO a créé le Fonds du jubilé pour l'année 2016-2017, afin de nous fournir les moyens de présenter la riche histoire et les sciences de la Société grâce à ces activités. Un don déductible d'impôts au Fonds du jubilé offrira aux particuliers, aux organisations et aux entreprises l'occasion de soutenir la SCMO dans son désir d'accroître sa visibilité tandis que nous célébrons cet anniversaire spécial.

N'hésitez pas à effectuer un don tandis que vous renouvelez votre adhésion en 2017. Vous pouvez le faire dès aujourd'hui dans l'Espace membres du site Web de la SCMO (méthode préférée), ou en cliquant sur le bouton DON EN LIGNE, sur la page d'accueil de la SCMO (www.scmo.ca). Nous accepterons les dons tout au long de l'année, mais la planification des projets se déroulera à l'automne 2016 et sera tributaire des fonds amassés, en conséquence, les dons hâtifs s'avéreront les plus utiles.

La SCMO vous remercie de votre soutien. Consultez le *Bulletin* et le site Web de la SCMO pour vous tenir au courant des activités du 50^e anniversaire.

Martin Taillefer, Président de la SCMO



Mike Crowe is CMOS' interim treasurer until June 2017

Mike Crowe is currently the Executive Director Policy and Partnerships, Meteorological Service of Canada in Gatineau, QC. At present he supports David Grimes and the WMO finance committee, and reviews their books and audit statements.

He has a self-professed passion for finances and is very interested in assisting CMOS with budgeting and strategic planning.

Books in search of a Reviewer* (partial list):

(2015-1) *Particles in the Coastal Ocean, Theory and Applications*, by Daniel R. Lynch, David A. Greenberg, Ata Bilgili, Dennis J. McGillicuddy, Jr., James P. Manning and Alfredo L. Arexabaleta, Cambridge University Press, 978-1-107-06175-0, Hardback, 510 pages, \$130.95.

(2015-2) *Climate Conundrums, What the Climate Debate Reveals about Us*, by William B. Gail, Published by AMS and distributed by the University of Chicago Press, ISBN 978-1-935704-74-4, Paperback, 235 pages, US\$30.00.

(2015-4) *Thermodynamics, Kinetics, and Microphysics of Clouds*, by Vitaly I. Khvorostyanov and Judith A. Curry, Cambridge University Press, 978-1-107-01603-3, Hardback, 782 pages, \$108.95.

(2015-5) *Hurricane Pioneer: Memoirs of Bob Simpson*, by Robert H. Simpson with Neal M. Dorst, AMS and distributed by the University of Chicago Press, ISBN 978-1-935-70475-1, Paperback, 210 pages, US\$25.00.

(2015-8) *Radar Meteorology, Principles and Practice*, by Frédéric Fabry, 2015, Cambridge University Press, 978-1-107-07046-2, Hardback, 256 pages, \$81.95. Book received December 2015.

(2016-1) *Stochastic Analysis of Scaling Time Series: From Turbulence Theory to Applications*, by François Schmitt & Yongxiang Huang, 2016, Cambridge University Press, ISBN 978-1-107-06761-5, Hardback, 226 pages, \$85.95

(2016-2) *Heliophysics: Active Stars, their Astrospheres, and Impacts on Planetary Environments*, Edited by Carolus J. Schrijver, Frances Bagenal, and Jan J. Sojka, 2016, Cambridge University Press, ISBN 978-1-107-09047-7, Hardback, 406 pages, \$68.95

(2016-3) *Dynamics and Predictability of Large-Scale High-Impact Weather and Climate Events*, by Jianping Li, Richard Swinbank, Richard Grotjahn, Hans Volkert, 2016, Cambridge University Press, ISBN 978-1-107-07142-1, Hardback, 370 pages, \$160.95

***You review it, yours to keep!**

Dr. Benjamin Halpern, 2016 A.G. Huntsman Award Recipient

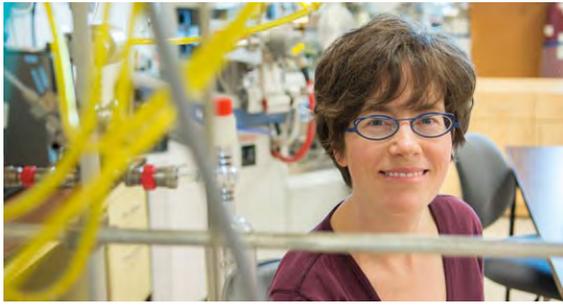


The A.G. Huntsman Foundation is pleased to announce that the 2016 A.G. Huntsman Award will be presented to Dr. Benjamin Halpern of the University of California Santa Barbara. The award ceremony will take place at 2:00 pm on Thursday 17 November 2016 at the Bedford Institute of Oceanography in Dartmouth, Nova Scotia. Following the ceremony, Dr. Halpern will present a distinguished lecture entitled "Opportunities and Challenges for Aquaculture to Feed the Planet".

Benjamin Halpern is Director of the National Center for Ecological Analysis and Synthesis and widely recognised for his work on marine conservation and resource management. His research developing the Ocean Health Index (OHI) has transformed how oceans are measured and managed. After the launch of this Index, governments and organizations from 28 different countries on every continent have developed or are developing regional OHI assessments, various United Nations assessment and reporting bodies include OHI as a main metric of ocean health, and many global conservation NGOs and Foundations are using the Index to track progress and inform investments.

The A.G. Huntsman Award was established by the Bedford Institute of Oceanography in 1980 to recognize excellence of research in, and outstanding contribution to, the marine sciences. The award honours those men and women, of any nationality, who have had, and continue to have, a significant influence on the course of marine scientific thought. The award was created to honour the memory of Archibald Gowanlock Huntsman (1883–1972), pioneer Canadian oceanographer and fishery biologist. More at <http://www.huntsmanaward.org/>.

Events



Each year CNC-SCOR selects someone from the West coast to give a lecture tour heading East, and someone from the East to give a lecture tour heading West. The person heading East gives talks, over about 1 week at some combination of eastern oceanographic institutes and schools. The 2015 Eastern annual CNC-SCOR tour speaker is Dr. Roberta Hamme from the University of Victoria. She will presenting a talk titled: *Using dissolved gases to diagnose the ocean's carbon pumps.*

Dr. Hamme is a chemical oceanographer who studies the marine carbon cycle. She works on understanding and quantifying the natural mechanisms that transport carbon from the surface ocean to the deep, reducing atmospheric carbon dioxide levels. Her main tools are high precision measurements of dissolved gases, both bioactive gases like oxygen and inert gases like neon, argon, and krypton. Ongoing projects include developing methods to quantify the effect of water mass formation on gases, measuring biological carbon export through oxygen mass balance, and determining amounts of denitrification (the transformation of bioavailable nitrate to unavailable nitrogen gas). She holds a Canada Research Chair in Ocean Carbon Dynamics at University of Victoria's School of Earth and Ocean Sciences. Exact dates and venues of the eastern tour have not been settled, but the lecture tour will take place between November 1 and 10. Check with your local CMOS centre to see if and when Roberta might be speaking in your area.



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Moderated by Chris Ragan



Practical solutions for growing prosperity

The distinguished panel who will be addressing energy policy will include:

- **Dominic Barton**, Global Managing Director, McKinsey & Company
- **Elyse Allan**, President and CEO, GE Canada / Vice-President, GE
- **Dr. Paul Boothe**, Managing Director, Trillium Network for Advanced Manufacturing

Symposium 2016 will bring together distinguished leaders and innovators to address critical sustainable energy issues: the future of the electricity grid, carbon pricing, energy storage, health implications, bioenergy, sustainable transportation, and ways to mobilize Canadians to embrace the greener and cleaner economy of tomorrow.

A sample of confirmed speakers include:

- **Honourable Catherine McKenna**, Minister of Environment and Climate Change Canada
- **Honourable Jim Carr**, Minister of Natural Resources Canada
- **Merran Smith**, Director, Clean Energy Canada
- **Dr. Mark Jaccard**, Energy Economist / Professor of Sustainable Energy, Simon Fraser University
- **Linda Coady**, Chief Sustainability Officer, Enbridge
- **Annette Verschuren**, Chair and CEO, NRStor Inc.
- **Ian Parry**, Principal Environmental Fiscal Policy Expert, International Monetary Fund (IMF)
- **Celine Bak**, Founder and CEO, Analytica Advisors / Senior Fellow, Centre for International Governance Innovation
- **Gwen Holdmann**, Director, Alaska Center for Energy and Power
- **Tom Rand**, Senior Advisor, MaRS Discovery District / Managing Partner, Arctern Ventures / Author

To see our full lineup of speakers and to register, visit:

WWW.CLIMATEFORUM.CA

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Tickets are limited - Register now!

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Ocean articles, news and more in the September issue of the Canadian Ocean Sciences Newsletter (see <http://cncscor.ca/site/canadianprogram/newsletter>), including:

Mixing rates, mechanisms and impacts in the Arctic Ocean: Highlights of recent work by a new research group at UBC; Stephanie Waterman, Benjamin Scheifele, Melanie Chanona and Jacquie-Lee Thibault Department of Earth, Ocean & Atmospheric Sciences, University of British Columbia

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Atmosphere-Ocean 54-4 Paper Order

Applied Research / Recherche appliquée

AO-2015-0040

Pre-Melt Energy Budget of an Arctic Snowpack on Landfast First-Year Sea Ice

R. L. Raddatz, T.N. Papakyriakou, and D. G. Barber

Fundamental Research/Recherche fondamentale

AO-2015-0028

Searching for Added Value in Simulating Climate Extremes with a High-Resolution Regional Climate Model over Western Canada

Charles L. Curry, Bárbara Tencer, Kirien Whan, Andrew J. Weaver, Michel Giguère, Edward Wiebe

AO-2016-0002

Searching for Added Value in Simulating Climate Extremes with a High-Resolution Regional Climate Model over Western Canada. II. Basin-Scale Results

Charles L. Curry, Barbara Tencer, Kirien Whan, Andrew J. Weaver, Michel Giguère, Edward Wiebe

AO-2015-0054

The Fluxes and Behaviour of Plumes Inferred from Measurements of Coherent Structures within Images of the Bulk Flow

H.C. Burridge, J.L. Partridge, and P.F. Linden

AO-2015-0056

Evaluation of Precipitation Indices over North America from Various Configurations of Regional Climate Models

Emilia Paula Diaconescu, Philippe Gachon, René Laprise, and John F. Scinocca

AO-2015-0048

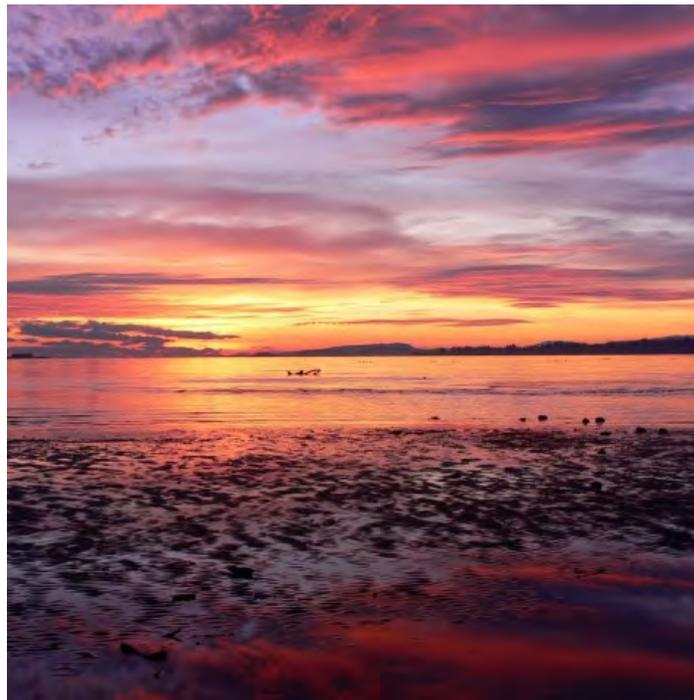
Different Impacts of Typical and Atypical ENSO on the Indian Summer Rainfall: ENSO-Developing Phase

Lei Zhang, Zhiwei Wu, and Yefan Zhou

AO-2015-0012

Simulation of the 2014 Anomalous Warming in the Northeast Pacific

Shawn M. Donohue and Michael W. Stacey



Next Issue CMOS Bulletin SCMO

The next issue of the CMOS Bulletin SCMO will be published in December 2016. Please send your articles, notes, workshop reports or news items before November 6th, 2016, to bulletin@cmos.ca.

This publication is produced under the authority of the Canadian Meteorological and Oceanographic Society. Except where explicitly stated, opinions expressed in this publication are those of the authors and are not necessarily endorsed by the Society.

Prochain numéro du CMOS Bulletin SCMO

Le prochain numéro du CMOS Bulletin SCMO paraîtra en décembre 2016. Prière de nous faire parvenir avant le 6 novembre 2016 vos articles, notes, rapports d'atelier ou nouvelles à bulletin@cmos.ca.

Cette publication est produite sous la responsabilité de la Société canadienne de météorologie et d'océanographie. À moins d'avis contraire, les opinions exprimées sont celles des auteurs et ne reflètent pas nécessairement celles de la Société.

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