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La Société canadienne de météorologie et d'océanographie

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Photo: Dan Weaver

ASL Environmental Sciences

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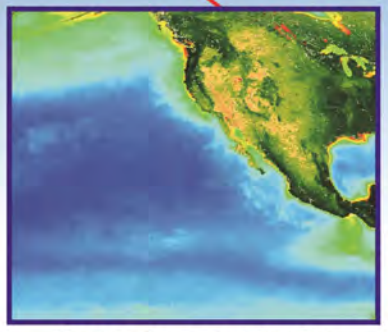
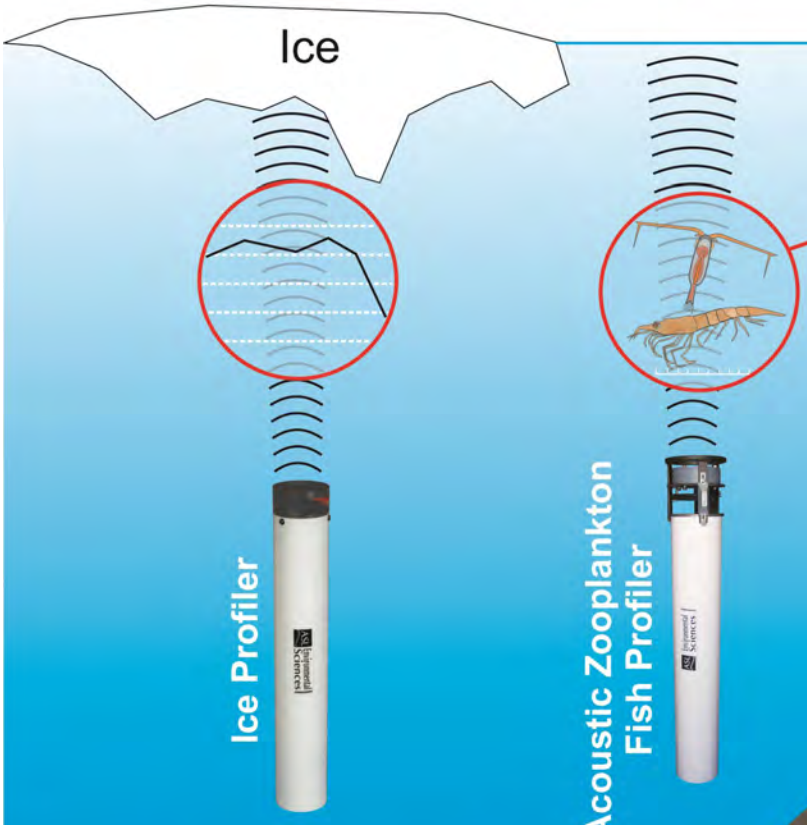
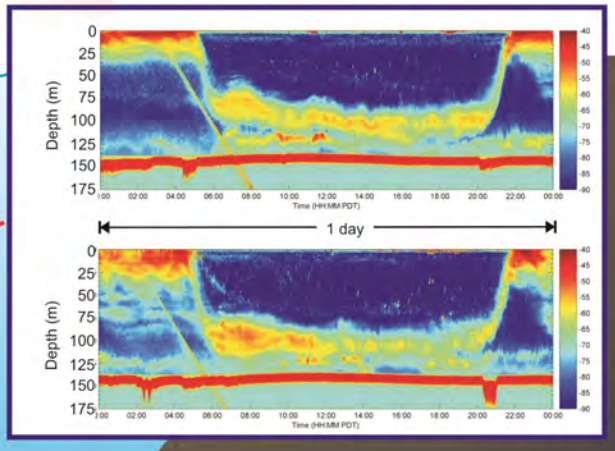


Ocean colours are chlorophyll concentrations and land colours are NDVI





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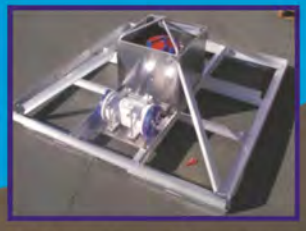

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CMOS Bulletin SCMO

"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.

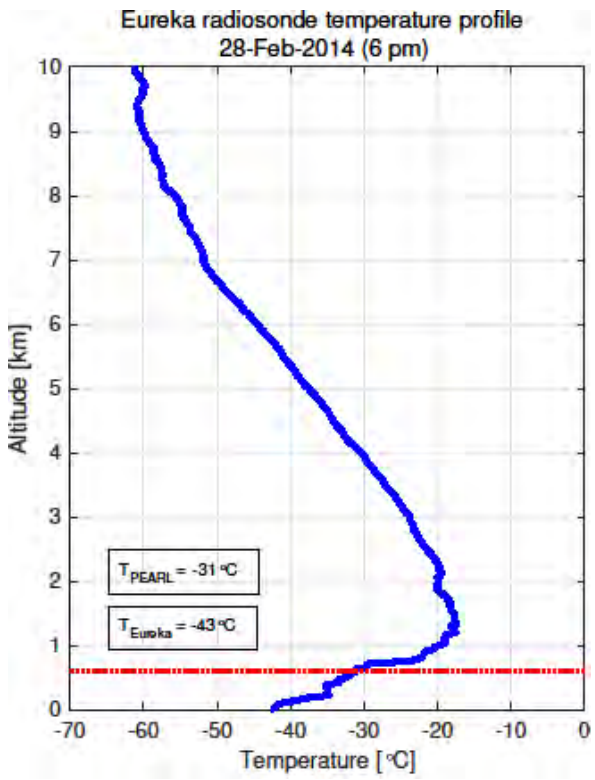
Cover Page / Page couverture

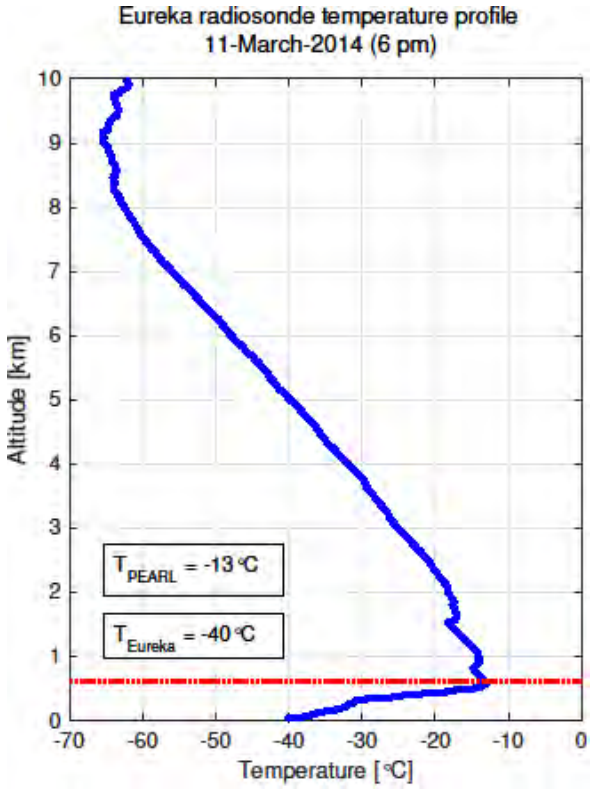
The photo on the cover was taken by University of Toronto Ph.D. student Dan Weaver. He captured this moment during a satellite validation measurement campaign on February 28, 2014, at the Polar Environment Atmospheric Research Laboratory (PEARL) on Ellesmere Island (80N), near Eureka, Nunavut. The team of researchers from U of T, York U, and U of Saskatchewan were installing a ground-based version of an instrument (MAESTRO) also aboard the Atmospheric Chemistry Experiment (ACE) satellite. People visible in the photo are: Prof. Tom McElroy (York U), Zahra Vaziri (York U), Paul Loewen (campaign operator, U of Saskatchewan), and Dr. Sophie Tran (U of T).

Dan is pursuing his doctorate at the University of Toronto Physics Department, with Prof. Kim Strong's experimental atmospheric physics group. His work primarily revolves around measurements taken at PEARL, which have applications for research into climate, ozone depletion, atmospheric dynamics, and air quality.

Dan, pictured here, hiking north of PEARL along a ridge (March 11, 2014), at an altitude that was in a temperature inversion layer. At a relatively balmy -20 °C (much warmer than the -40 °C in Eureka), Dan removed his hat and hood long enough for this photo to be snapped.

Dan, qu'on voit ici, est en randonnée au nord du PEARL, le long d'une crête (11 mars 2014), à une altitude qui se trouvait sous une inversion de température. Par une journée relativement chaude (-20 °C tandis qu'Eureka était à -40 °C), Dan a retiré son chapeau et son capuchon le temps d'une photo.





The temperature profiles from the Eureka Weather Station's radiosonde data on the dates mentioned here. The temperature and altitude of the PEARL Ridge Lab (610 m) is indicated by the dotted red line.

Le profil de température à la station météorologique d'Eureka provient des données de radiosondage enregistrées à la date figurant ici. La ligne rouge pointillée indique la température et l'altitude de la crête où se situe le laboratoire PEARL (610 m).

Cover Page / Page couverture

La photo de couverture a été prise par Dan Weaver, étudiant au doctorat de l'Université de Toronto. Il a capturé ce moment au cours d'une campagne de mesure visant à valider des données de satellite, le 28 février 2014, au Laboratoire de recherche atmosphérique dans l'environnement polaire (PEARL), sur l'île Ellesmere (80° N), près d'Eureka (Nunavut). L'équipe de chercheurs des universités de Toronto, de York et de la Saskatchewan installait une version terrestre d'un instrument (MAESTRO) aussi embarqué sur le satellite ACE (Atmospheric Chemistry Experiment). La photo montre le professeur Tom McElroy (York), Zahra Vaziri (York), Paul Loewen (Saskatchewan), responsable de la campagne, et Sophie Tran Ph.D. (Toronto).

Dan poursuit ses études de 3^{e} cycle au département de physique de l'Université de Toronto, sous la direction de Kim Strong, au sein du groupe de physique atmosphérique expérimentale. Ses travaux portent principalement sur les mesures prises au PEARL et qui serviront aux études sur le climat, la diminution de la couche d'ozone, la dynamique de l'atmosphère et la qualité de l'air.

The team, hiking along a ridge north of PEARL.

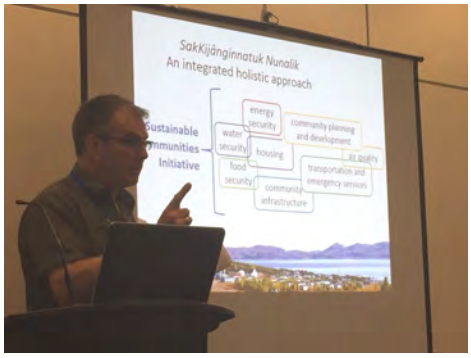
L'équipe en randonnée le long d'une crête au nord du PEARL.

The Brewer spectrophotometer dome. The instrument is deployed around the world to measure ozone.

Le dôme du spectrophotomètre Brewer. Ce type d'instrument mesure partout dans le monde les concentrations d'ozone.

Correction, October 2016 (Vol 44. No. 5) issue of the CMOS Bulletin:

Captions for photos were not included by the editor in the article by Ann McMillan "Arctic Leaders: Interview with Trevor Bell and Andrew Arreak" (p. 5 of the print edition, p. 7 of the web edition):



Trevor Bell presenting at the CMOS Congress in Fredericton. (Photo credit: Norah Foy)

Andrew Arreak being interviewed at the CMOS Congress in Fredericton. (Photo credit: Helen Joseph)

This photo, from "Meet the North", shows Andrew Arreak from Pond Inlet out on the ice with the SmartQAMUTIK, taking ice thickness measurements. (Photo credit: Eric Guth, www.meetthenorth.org)

Words from the President

Friends and Colleagues

This week the Editor of the Bulletin was again faced with an article submission that questioned the legitimacy of climate change, by presenting science data that would suggest otherwise. I supported the Editor's strong response to the authors, rejecting the article by stating that CMOS will not support submissions that contain baseless claims to refute anthropogenically-induced climate change.

The article in question looked at a very regionalised, and in my view limited, set of data to suggest that the idea of climate change in Canada is still uncertain and continues to be intensely debated in Canada. In fact, it is only debated in the fringes of science. Using scant and inconclusive datasets to suggest that anthropogenic effects are not the cause of climate change was, in my personal view, irresponsible science. CMOS has consistently and unambiguously recognized the reality of anthropogenic climate change. This fact is reflected in the Society's Statement on Human-Induced Climate Change, last updated in 2014.

Blanket policies, such as "to not publish anything that puts a question mark around the broadly accepted reality of climate change" can be problematic. The appropriate policy, for both peer-reviewed journals such as Atmosphere-Ocean and non-peer-reviewed publications like the Bulletin, should restrict publishing articles that simply lack scientific merit. There are past examples of challenges to anthropogenic global warming that have turned out to be off-base - but which weren't a priori impossible, and because of which the science has improved. Examples are Lindzen's "Iris hypothesis" and criticisms that the observed temperature record is contaminated by urban heat island effects. Neither of these could be rejected outright, but the process of showing that they don't rubbish the fact of anthropogenic warming, resulted in otherwise useful research and data analysis.

I suppose that a blanket policy may play right into the hands of the deniers - it provides them with ammunition for the false claim that the scientific literature contains few studies challenging the fact of anthropogenic global warming because of the actions of politically-motivated gatekeepers, rather than because such studies generally do not have sufficient scientific merit to be published. Therefore our policy should be to assess submissions based on the quality of the science - irrespective of the conclusions reached. Anything else simply plays into the hands of the people who call climate science politicized - and as we are seeing in some political forums elsewhere around the world right now, this perspective can have catastrophic consequences.

Consequently, we have to be mindful and vigilant to ensure that what is presented in our publications have merit and meet the understood norm and scientific standards of our community. My motivation for bringing these concerns to the Society is to assure our scientific community (meteorologists and oceanographers alike) that the editors of our publications are choosing articles that are scientifically sound and not as an "easy" platform to voice fringed opinions. The Atmosphere-Ocean Journal and the CMOS Bulletin are our external voices. These publications need to garner the respect of our scientific community, inside and outside CMOS.

Fair winds and a following Sea,

M.L. Taillefer, President

Allocution du président

Amis et collègues

Cette semaine, la rédactrice en chef du *Bulletin* a de nouveau reçu un article qui met en doute l'existence des changements climatiques. Les auteurs y présentent des données scientifiques qui laissent penser que ce phénomène n'est pas réel. J'ai approuvé la réponse sans équivoque que la rédactrice en chef a transmise aux auteurs, en rejetant l'article et en affirmant que la SCMO n'adhérait pas aux allégations sans fondement qui nient l'apport de l'homme aux changements climatiques.

L'article en question examinait une série de données plutôt régionales et, à mon avis, limitées, afin d'appuyer la notion que les changements climatiques au Canada demeuraient incertains et que leur existence faisait encore l'objet de débats intenses au pays. En fait, ces débats ne se déroulent qu'au sein de milieux scientifiques marginaux. L'utilisation de séries de données insuffisantes et non conclusives pour laisser entendre que les changements climatiques ne découlent pas de l'activité humaine représente, selon moi, une application irresponsable de la science. La SCMO reconnaît depuis longtemps et sans ambigüité la réalité des changements climatiques d'origine humaine. Cette opinion se reflète dans la prise de position de la Société sur les changements climatiques anthropiques, mise à jour en 2014.

Un refus global de publier des textes qui mettent en doute la notion largement acceptée de l'existence des changements climatiques poserait problème. La politique qui convient à la fois aux publications à comité de lecture, comme *Atmosphere-Ocean*, et à celles qui n'en ont pas, comme le *Bulletin*, consiste à restreindre la publication d'articles qui manquent tout simplement de rigueur scientifique. Il existe des exemples passés d'études qui mettaient en doute l'origine humaine du réchauffement climatique. Elles étaient erronées, mais à priori possibles et elles ont contribué à l'avancement de la science. Il y a entre autres l'effet iris qu'a proposé Lindzen et les critiques sur la contamination des observations de température par le phénomène d'îlot de chaleur urbain. Aucune de ces affirmations n'a pu être rejetée d'emblée. Le processus démontrant qu'elles n'occultaient pas l'existence d'un réchauffement anthropique a entraîné des travaux et des analyses de données utiles.

Je suppose qu'une politique de refus instantané ferait l'affaire des climatosceptiques. Celle-ci leur fournirait les arguments nécessaires pour confirmer que la littérature scientifique ne contient que peu d'études contestant la responsabilité humaine quant au réchauffement climatique, parce que des cerbères aux motivations politiques leur en bloquent l'accès, et non parce que ces études sont insuffisamment étayées pour être dignes de publication. En ce sens, notre politique de publication devrait consister à évaluer les soumissions sur la base de leur qualité scientifique, plutôt que selon les conclusions qu'elles véhiculent. Autrement, nous entrons dans le jeu des tenants de la politisation de la science du climat. Comme nous le voyons actuellement dans certains milieux politiques, ailleurs dans le monde, cette perspective peut mener à des conséquences catastrophiques.

En conséquence, nous devons rester conscients et vigilants, et veiller à ce que les textes que nous sélectionnons soient dignes de publication et qu'ils se conforment aux normes reconnues et scientifiques de notre communauté. Je soulève ces préoccupations au sein de la Société, afin de signaler à notre communauté scientifique (météorologistes et océanographes) que nos rédacteurs en chef choisissent des articles qui se fondent sur une science rigoureuse et qu'ils ne laissent pas nos publications devenir des tribunes faciles servant à diffuser des opinions marginales. La revue *Atmosphere-Ocean* et le *Bulletin de la SCMO* sont notre voix vers le monde. Ces publications doivent susciter le respect de notre communauté scientifique, au sein de la SCMO et ailleurs.

Bon vent, bonne mer!

M. L. Taillefer, Président

Acting on Climate Change—Maintaining the Momentum

John Stone

The recently concluded Conference of the Parties under the United Nations Framework Convention on Climate Change, held in Marrakesh, ended with a grand act of defiance against statements of the recently elected new President of the United States, Donald Trump, regarding the threat of climate change. (Although he has recently said he now has an open mind on the issue, one can't ignore the fact that he has chosen a known climate change skeptic to lead the transition team for the Environmental Protection Agency. Incidentally, he argued for stronger climate action in 2009.)

Twelve months ago, at the previous Conference of the Parties in Paris, there was a shared sense of accomplishment and promise as virtually all countries signed on to a global agreement to address this threat and work together to keep global average temperatures from rising 2°C above pre-industrial levels. This year's meeting was seen very much as a low-key one of technical negotiations to elaborate the "rulebook" to implement the Paris Agreement.

This sense of confidence was upset by the claim of Donald Trump during the election campaign that climate change was a hoax perpetuated by China and his intention, once inaugurated as President, was to "rip up" US commitments made in Paris. This, understandably, cast a pall over the meetings in Marrakesh but one that, ultimately, governments sought to dispel in a joint statement – the Marrakesh Action Proclamation – that committed them to maintain the momentum of Paris.

The majority of governments effectively believe that the US President-elect is on the wrong side of history and that the World has begun to take coordinated action to address climate change by transitioning away from economies and societies based on fossil fuels to ones built around renewable energies. There is a sense that this transition is now irreversible as countries increasingly recognize the multiple ancillary benefits of such action – technological, economic, health etc…

MARRAKECH COP22 | CMP12
UN CLIMATE CHANGE CONFERENCE 2016
مؤتمر الأمم المتحدة لتغير المناخ

The Marrakesh COP was held from November 7 to 19, 2016. It attracted some 22,500 delegates including nearly 16,000 from governments and 1,200 media. These meetings are growing in their complexity as many past meetings have resulted in new processes, in addition to those put in place by the Kyoto Protocol and, of course, the Paris Agreement as well as the original UN/FCCC Subsidiary bodies for Implementation (SBI) and Science and Technology Advice (SBSTA). Each of these processes has its own agenda and coterie of negotiators who now know each other very well and are deeply engrossed in the minutia of their own piece of text. Even large delegations have difficulty keeping up with progress (or sometimes lack of progress) of these negotiating streams.

The grand designs having been put in place in Paris, this meeting was to begin the process of crafting the detailed accounting and reporting rules. The comparison with the Kyoto Protocol is interesting: the Kyoto Protocol rulebook was completed 15 years ago at a previous COP in Marrakesh. This took more than three years of fraught negotiating. In recognition of the urgency of taking action and in the light of previous experience, the Paris Agreement rulebook is to be completed by 2018. This accelerated timetable is a reflection of the fact that the Paris Agreement has already come into force, barely a year after it was signed, and has been ratified by 111 countries, whereas the Kyoto Protocol was completed in 1997 and did not come into force until 2005 – eight years later.

The Paris Agreement is based around two five-year cycles. In the first, countries will revisit their "nationally determined commitments". At each cycle it is expected that the level of ambition will be increased. The second cycle is intended to elaborate a "stocktake" of the adequacy of current national commitments. This latter cycle is intended to be informed by the next full Assessment Report of the Intergovernmental Panel on Climate Change (AR6) which is currently scheduled to be finalized by 2020.

Current commitments by countries are inadequate to achieve the 2°C target; in fact (depending on assumptions) we are presently headed for a 2.6 to 3.1°C temperature rise by 2100. There are, however, several encouraging signs: The Montreal Protocol process will now include limits on HFC's - powerful greenhouse gases - and the International Civil Aviation Organization has reached agreement on limiting emissions from international air travel. Forty-seven countries have made a commitment to go to 100% renewable energy by 2050.

But even more to the point is that despite President-elect Trump's bluster, there are limits to what he can achieve. Market forces are likely to be a crucial factor: the US Congress recently renewed incentives for wind and solar power and Mr Trump is unlikely to revoke them; US State initiatives are also likely to continue; the global coal industry is in decline and many shuttered coal-mines are unlikely to be re-opened; and it is currently cheaper to build new electricity generation facilities based on renewable energy than on fossil fuels (although the use of natural gas from hydraulic fracking is likely to see an increase). Even though President Obama's Clean Power Plan was stayed by the Supreme Court and appears doomed, the electricity sector has already met the Plan's 2024 goal for carbon emissions and its 2030 target for reducing coal use.

Thus, while the Marrakesh Action Proclamation may reflect some defiance, it also reflects a sense of confidence. Whether we act with sufficient ambition and urgency remains to be seen.

About John

John Stone is an Adjunct Professor in the Department of Geography and Environmental Studies at Carleton University, Canada. He received a Ph.D. in Chemical Spectroscopy (1969) from the University of Reading, UK.

His experiences since retiring from the Canadian Public Service in 2005 include: Visiting Fellow, International Development Research Council. He was a Member of the Bureau of the Intergovernmental Panel on Climate Change (IPCC) and most recently a Lead Author for the IPCC Fifth Assessment Report. He is Board member of the Pembina Institute.

Note from YS Chung, Editor in Chief of Air Quality, Atmosphere & Health (Springer):

Air Quality, Atmosphere & Health (2015 impact factor 2.324), now in its 9th year, is moving to publish 12 issues in Volume 10 (2017), up from 8 issues in Volume 9 (2016).

We welcome valuable papers in air quality and health topics from the CMOS community.

Yong Chung is a former Research Scientist, Environment Canada/AES, Downsview.

C4 2017

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Regional Fire Chief at Regional Municipality of Wood Buffalo

Keynote Speaker
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Storm Chaser / Explorer and Host of Angry Planet

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Article

Canada's Wildfire Risk in the Midst of a Changing Climate

Joanne Kunkel, CatIQ

Catastrophe Indices and Quantification (CatIQ) Inc. (catIQ.com) is an independent Canadian catastrophic loss index provider that delivers detailed analytical and meteorological information on Canadian natural and man-made catastrophes to better serve the needs of the insurance/reinsurance industries, public sector and other stakeholders. Through its online subscription-based application, CatIQ provides comprehensive insured loss indices, granular industry-wide loss estimates, geographic information systems (GIS) mapping, and other related information on Canadian catastrophes exceeding $25 million in insured property losses.

The devastating fire the struck the town of Fort McMurray remains fresh in the minds of Canadians. It is the costliest insured natural disaster in our country's history so far. The destructive fire began on May 1st, 2016, and on May 2nd, CatIQ began tracking and updating information on the fire to subscribers using information from The Regional Municipality of Wood Buffalo, as well as geostationary satellite data to detect fire hotspots. To survey the losses associated with the massive fire, CatIQ began collecting incurred losses from insurers, and these estimates were aggregated to provide industry wide estimates by line of business. CatIQ also completes resurveys 45, 90, 180, and 365 days, as well as 2 years on larger catastrophic events with losses over $500 million. CatIQ's most recent 90 day estimate of insured losses for the Fort McMurray fire is approximately $3.8 billion.

Although fires can be catastrophic when they encounter populated zones, they are an essential part of ecosystem sustainability through the maintenance of forest health, and increasing the productivity and density of forests. Over the past decade, approximately 2 million of Canada's 400 million hectares of forest are burned each year (*Flannigan et al. 2016*), but in the midst of a changing climate, this number is expected to rise. Fire frequency and intensity are predicted to increase (*Aponte et al. 2016*), especially in regions where climate change will increase dryness. This type of change is already evident in many northern regions, including Canada, where climate change-induced warming is expected to be more drastic.

Aerial view of the wild fires in the Fort McMurray area on May 4, 2016. Photo by MCpl VanPutten, Canadian Forces

According to *Hope et al. 2016*, Manitoba, Ontario, and the Northwest Territories are projected to experience frequent extreme fire events – larger than any past fire event – by the end of this century, while Saskatchewan, Quebec, and the Yukon are predicted to experience little change. However, all provinces showed an upward trend in the amount of area burned.

Fire activity is influenced by 4 primary factors: climate-weather, fuel, an ignitor, and people. In Canada, there are two primary wildfire ignitors: people (such as with Fort McMurray) and lightning. A warming climate is expected to change the amount of fuel loads (plant die-off and dead wood mass) across the country (*Aponte et al. 2016*). Warmer temperatures will increase the amount of evapotranspiration, which lowers the moisture content on the forest floor, drying the fuel loads further. Warmer temperatures are also linked to more lightning activity (*Price and Rind 1994; Romps et al. 2014),* as well as lengthening the forest fire season. As temperatures increase, drier fire fuels are more likely to ignite and the fire spread will likely strengthen (*Flannigan et al. 2016*).

The risk of wildfire to property, and the related insured losses, has increased as a growing number of people choose to live closer to nature in what's known as the Wildland Urban Interface (*Maynard et al. 2014).* However, the threat of severe weather across the country, such as hail storms and flooding, has also increased and continues to climb. This catastrophe trend is what sparked the formation of CatIQ in 2014. CatIQ is Canada's dominant catastrophe loss index provider and is guided by a senior advisory committee of the insurance and reinsurance industries, the Institute for Catastrophe Loss Reduction (ICLR), the Insurance Bureau of Canada, and Environment and Climate Change Canada.

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About Joanne

Joanne received an Honours BSc in Atmospheric Science and a Certificate in Meteorology from York University in 2012. In 2016 she completed an MSc also at York focusing on hurricane eyewall replacement cycles. Joanne enjoys the outdoors, and loves to sketch and paint wildlife.

Applications of CryoSat to Measure the Surface Elevation and Mass Balance of Canadian Arctic Glaciers and Ice Caps

Luke Copland and Laurence Gray, Department of Geography, Environment and Geomatics, University of Ottawa, Ottawa, Ontario.
David Burgess, Geological Survey of Canada, Natural Resources Canada, Ottawa, Ontario

The glaciers and ice caps of the Canadian Arctic cover an area of ~150,000 km^2, and comprise the largest area of land ice outside of the Greenland and Antarctic ice sheets. They have experienced strongly negative mass balance conditions over the past several decades, with a recent acceleration in mass losses as air temperatures have increased. Mean summer temperatures increased by an average of ~1°C across the Queen Elizabeth Islands between 2000 and 2015, with warming particularly concentrated at high elevations on the most northerly ice caps of Ellesmere and Axel Heiberg Islands (Mortimer et al., 2016). Terrestrial ice mass losses in the Canadian Arctic Archipelago averaged 60 Gt yr^{-1} over the period 2002-2014 (Harig and Simons, 2016), approximately 3 times greater than they were between 1995 and 2000 (Abdalati et al., 2004). This makes the Canadian Arctic the largest recent contributor to sea level rise outside of the ice sheets (Jacob et al., 2012). This aligns with observations from passive satellite microwave records that the average melt season on Barnes Ice Cap lengthened by ~33% between 1979–1987 and 2002–2010 (Dupont et al., 2012), and that near-surface firn temperatures have increased by ~10°C in the summit region of Penny Ice Cap since the mid-1990s (Zdanowicz et al., 2012). Losses have been particularly marked on small glaciers and ice caps, with independent ice masses <25 km^2 in size on Axel Heiberg Island retreating by ~50-80% between 1958-59 and 1999-2000 (Thomson et al., 2011).

Figure 1: Downloading an automated weather station near the summit of White Glacier, Axel Heiberg Island, Nunavut.

A significant challenge with measuring changes to the glaciers and ice caps in the Canadian Arctic is their remoteness and large spatial extent. The traditional method of glacier mass balance measurement uses the 'glaciological' method of measuring the annual change in height of a series of poles drilled into the surface along the centreline of a glacier. These measurements started in the late 1950s in the Canadian Arctic, and today the Geological Survey of Canada maintains long-term mass balance networks on Devon Ice Cap, Meighen Ice Cap and Melville South Ice Cap, while the University of Ottawa maintains the network on White Glacier, Axel Heiberg Island (Fig. 1). The data recorded by these mass balance networks is submitted annually to the World Glacier Monitoring Service in Zurich, Switzerland (http://wgms.ch/), and provides a valuable record of the long-term mass balance changes for these glaciers (Thomson et al., 2016). However, there are large regions of the Canadian Arctic where no *in situ* mass balance measurements exist, so airborne or remote sensing methods must be used to monitor the glaciers in these locations. To date, there are two primary methods that have been used to measure regional glacier changes in the Canadian Arctic:

(a) Measurements of changes in gravitational attraction, primarily measured by the Gravity Recovery and Climate Experiment (GRACE) satellite. Once corrections have been made for effects such as isostatic uplift, this method can provide detailed temporal information (~monthly) about mass balance changes since 2002, but at a low spatial resolution (~200 km) (Jacob et al., 2012; Harig and Simons, 2016).

(b) Measurements of changes in surface elevation, derived from repeat airborne altimetry measurements (Abdalati et al., 2004) or the construction of repeat digital elevation models (DEMs) of the glacier surface, typically derived from stereo aerial photography (Thomson et al., 2016) and/or stereo satellite imagery

(Gardner et al., 2012). This method can provide excellent spatial resolution (to a few centimetres), but typically poor temporal resolution (often at least 5 years between repeat measurements). The poor temporal resolution mainly relates to the high expense of conducting airborne surveys in the Canadian Arctic and the long periods of darkness and cloud cover that reduce the availability of optical satellite imagery for DEM production. In addition, spatial resolution is limited in areas of extensive snow cover, such as in the accumulation area of ice caps, where matching of surface features is problematic, particularly when relatively low resolution satellite imagery (e.g., ASTER, 15 m) must be relied upon.

From the above review, it is clear that we are currently lacking a method that can provide high spatial *and* temporal resolution records of glacier mass balance changes across the Canadian Arctic. Fortunately, there is a new source of data that can help to address this: the surface elevation information provided by the CryoSat-2 satellite. This satellite was launched by the European Space Agency in 2010 (after the failed launch of Cryo Sat-1 in 2005), and carries a radar altimeter, which means that it is able to make measurements during the polar night and in cloudy conditions. Previous high accuracy satellite altimetry measurements were undertaken by the laser-based ICESat satellite operated by NASA, which operated intermittently between 2003-2010, but suffered from premature failure of its lasers that limited the spatial coverage and temporal repeatability of its measurements.

Ice Cap DEM Production from CryoSat Data

Our first work with CryoSat data (Gray et al., 2013) demonstrated that 'swath processing' of radar interferometric data recorded by the satellite can be used to produce high resolution DEMs of glacier surface topography. Our method enables the determination of surface topography in regions away from the 'point-of-closest-approach' (POCA) that is most typically mapped by the satellite. This relies on using the interferometric phase of the returns in the L1b CryoSat product to map the heights of footprints beyond the POCA. This method is limited to regions where average surface slopes in the cross-track direction lie between ~0.5° and 2.0°, but fortunately these conditions often exist across the accumulation area of Canadian Arctic ice caps. By combining data from repeat passes, a DEM can then be created across large regions. CryoSat records waveforms approximately every 300 m along the satellite flight path, with a ground range swath of up to 5 km, dependent on the cross-track slope, and resolution of ~100 m.

We used this method to create a DEM of the western slopes of Devon Ice Cap (Fig. 2), based on satellite passes that typically occur 2 or 3 times per month on both ascending and descending orbits. A comparison of the DEM with near-simultaneous airborne laser altimetry measurements indicated a mean difference of 0.49 m and standard deviation of 0.75 m (Gray et al., 2013). While this DEM was created under ideal conditions, this method provides promise for measuring inter-annual changes in surface elevation in the accumulation region of Arctic ice caps.

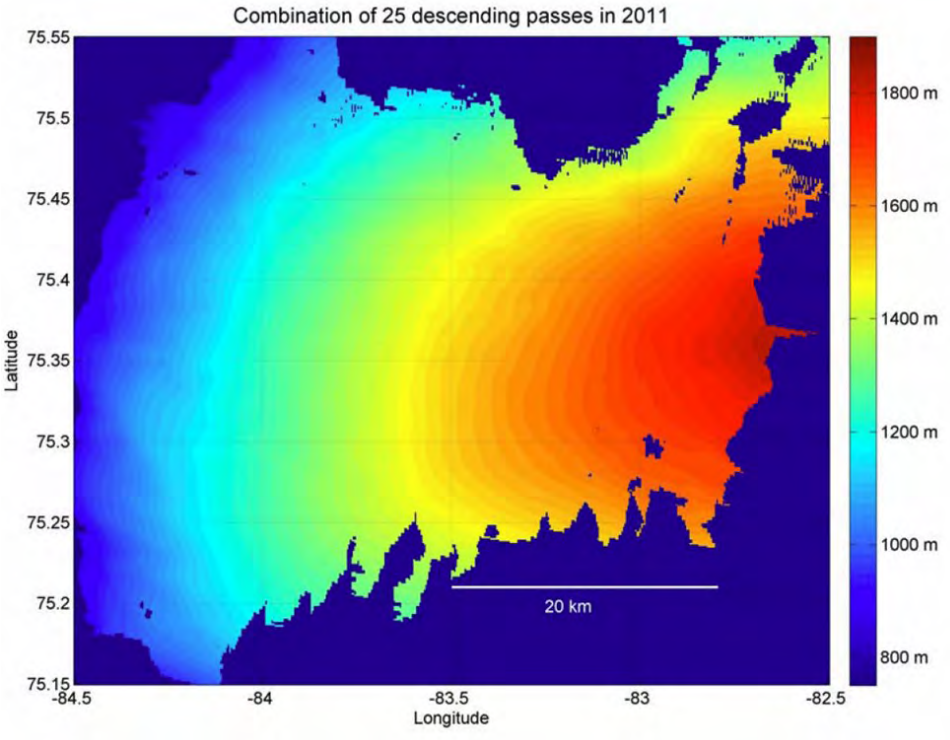

Figure 2: Digital elevation model of the western part of Devon Ice Cap produced from 25 descending CryoSat passes between February 2011 and January 2012. The rough north and south edges reflect locations where the surface slope is greater than ~2.0°, indicating locations where the interferometric processing produces a poor solution. From Gray et al. (2013).

Monthly Determination of Surface Elevation Changes from CryoSat Data

More recently we have extended our work to improve detection of the position of the POCA in CryoSat records, and from that the measurement of monthly changes in the height of ice caps in the Canadian and Norwegian Arctic (Gray et al., 2015). By developing a 'retracker' that estimates the POCA position in a CryoSat waveform from the maximum slope on the first significant leading edge of the return, we can measure individual point elevations on ice caps to an accuracy of ~1-1.5 m. However, by comparing spatial averages at different time periods, height change can be estimated with sub-meter accuracy. The repeat orbit period of CryoSat is 369 days, but it contains a 30-day orbit sub-cycle that enables approximately monthly measurements of the surface elevation of ice caps by averaging many thousands of individual returns. When applied to Barnes Ice Cap, Baffin Island, for example, this enables the nearly continuous monitoring of surface mass balance conditions (Fig. 3). An analysis of CryoSat records from the same period each year can then provide information on the annual mass balance. Comparisons between CryoSat-derived height changes on Devon Ice Cap and those recorded with an automated snow depth sounder show close correspondence, with the CryoSat measurements recording a mean height change of -0.72 ±0.5 m for 2011, compared to -0.64 ±0.03 m recorded by the in situ sensor (Gray et al., 2015).

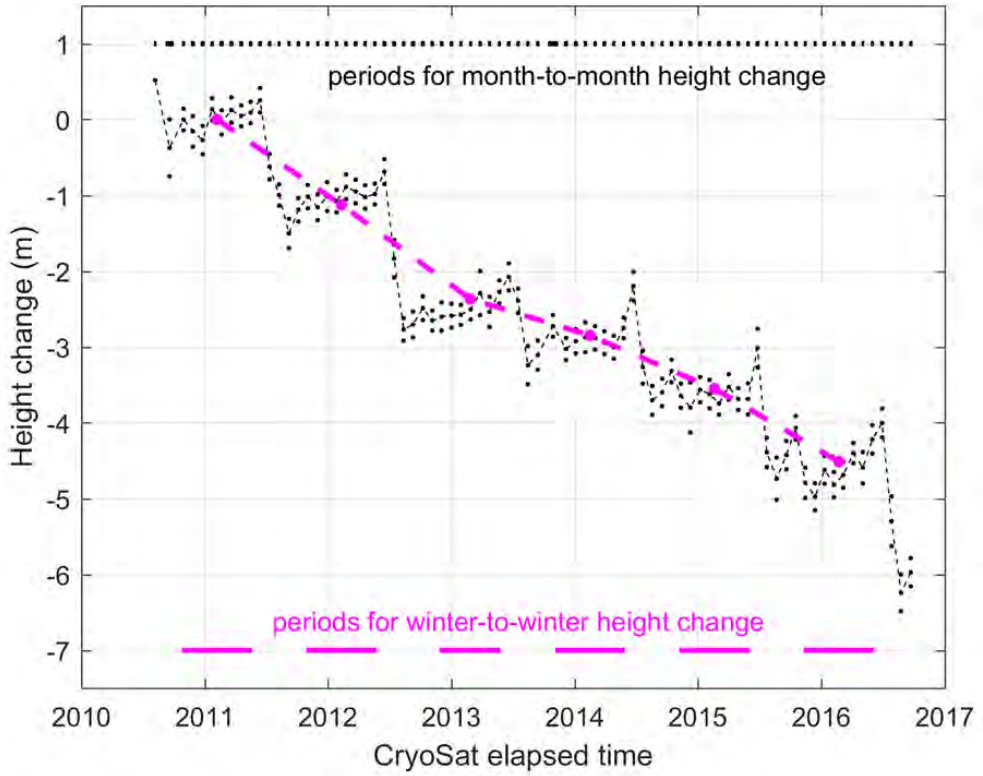

Figure 3: Evolution in surface height of Barnes Ice Cap between 2010-2016 based on the average of >65,000 waveforms recorded on >400 CryoSat passes. Data is grouped into approximately monthly periods, which are indicated by short dashed lines in the upper part of the figure. Purple dots and dotted purple line indicates the winter-to-winter height change calculated from the periods indicated by the solid purple lines.

These results do not come without limitations, however. One of the most significant issues is that CryoSat waveforms will penetrate a snow surface when it is dry, but reflect from the top of the snow surface when it is wet. This results in an apparent seasonal variability in the surface height of Arctic ice caps that isn't real, but instead reflects differential penetration of the radar wave. This is evident in Figure 3, where an apparent increase in surface height of >0.2 m occurs every May/June as melt starts on the ice cap surface. This means that only CryoSat data from the same period each year should be used to derive annual mass balances. However, this effect can also be useful by providing a method to detect timing of the onset of summer melt. A further limitation of CryoSat data is that it can only be used to measure surface slopes less than ~2.0°. This precludes the use of it to measure surface elevation changes on most outlet glaciers and the lower ablation regions of many ice caps.

Despite these limitations, CryoSat data can still provide valuable information concerning changes in the surface height, and therefore mass balance, of Arctic glaciers and ice caps at a higher spatial and temporal resolution than is possible with almost any other current remote sensing method. Ongoing work is focused on reducing errors in the CryoSat processing method and implementing CryoSat data for the operational monitoring of ice caps in the Canadian Arctic.

Acknowledgements

We wish to thank NSERC, ArcticNet, Polar Continental Shelf Program, Canadian Space Agency, Norwegian Center for International Cooperation in Education and University of Ottawa for funding and logistics in support of our work.

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About Luke

Luke Copland is a Professor in the Department of Geography, Environment and Geomatics at the University of Ottawa, and holds a University Research Chair in Glaciology.

His research program is focused on understanding the dynamics and recent changes of glaciers, ice caps and ice shelves across northern Canada, including in the St. Elias Mountains, Yukon, and the Queen Elizabeth Islands, Nunavut. This includes maintenance of the mass balance monitoring program at White Glacier, Axel Heiberg Island, which was established in 1959 and is the longest running in the Canadian Arctic.

North-American CryoSat Science Meeting

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www.cryosat2017.org

CryoSat 2017 will provide a unique and timely forum for scientists and end-users of CryoSat data to share the state-of-the-art in research and applications, review mission achievements and prepare for the continued use of the CryoSat mission in the future. It will highlight areas where the mission has made significant contributions including cryosphere, oceanography, geodesy, hydrology, topography, meteorology and climate change.

Cryosat 2017 is part of a broader 2017 ESA Earth Explorer science meeting, which also includes the Fourth Swarm Science Meeting and Geodetic Mission Workshop.

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Lessons From the Field: Broken Gliders Make for an Entertaining Sailor

Richard Davis and Anja Samardvic, Dalhousie University

The last thing you want to do is trip and look clumsy on your first date with the person you've been dying to go out with for months. The second last thing you want to do is chase a glider across choppy Nova Scotian waters, while the film crew from Discovery Planet staggers back and forth on a tilting ship deck with bulky camera equipment in hand. I've found myself in both of these scenarios, and I can tell you that the latter makes for better entertainment.

I'm the technical team lead for the joint Marine Environmental Observation Prediction and Response Network (MEOPAR) and Ocean Tracking Network (OTN) Ocean Glider Program, located at Dalhousie University in the port city of Halifax, Nova Scotia. The glider team and I focus on marine autonomous vehicles - primarily Teledyne Webb Slocum Gliders and our Liquid Robotics Wave Gliders. These gliders expand our ability to sample our grossly under-sampled ocean. We send our AUVs into the open ocean upward of 250 kilometres from the shoreline, providing information on animal movements, such as blue sharks ranging for food, and collect crucial oceanographic data such as salinity and water temperature of a particular location.

Recently we were contacted by Discovery Channel's Daily Planet show who wanted to join us and film a recovery of our Liquid Robotics Wave Glider off Halifax Harbour. While the harbour is a relatively sheltered and forgiving body of water, we were going to have to travel a bit further offshore. We were happy to have the crew on deck, and were hopeful for good weather and a smooth recovery.

The Wave Glider had been out for almost a month on the Scotian Shelf, listening for whales in support of the Whale Habitat and Listening Experiment (WHaLE) project, when we received a message that the rudder module had developed a leak. We knew we had to recover the glider quickly so we turned it toward home base and crossed our fingers. Hoping to avoid the cost of renting a large recovery vessel, we held our breath as it slowly made its way back closer to the coast where a smaller vessel could be used for retrieval.

The glider came within 40 kilometres of the original planned recovery point, when a wicked current to the North-east prevented it from coming closer, and bad weather set in. Hoping the current would abate before too long, we kept the vehicle fighting toward the safety of shore, waiting for a weather window to open up. The rudder finally failed 24 hours before the weather was predicted to improve, leaving the glider slowly spinning away from shore. Plans were quickly made for a rescue mission for the next day.

MEOPAR technician Kat Fupsova wishes her arms were just a little bit longer. (photo courtesy of MEOPAR)

On the morning of the rescue we loaded up the rented vessel with the film crew from the Daily Planet in tow. The Wave Glider was a four-hour steam from port, but everyone was in high spirits as we left dock. Needless to say, some of those spirits were lagging by the time we reached the glider after a bumpy ride out.

Technical Team Lead Richard Davis listens to graduate student Hansen Johnson as they secure the Wave Glider to the deck. (photo courtesy of MEOPAR)

During a typical glider recovery, we centre the rudder while pulling the boat next to the glider - but since we had lost communications to the rudder module, the glider was making a constant curve to starboard with a turn radius tighter than that of the boat. As we approached the glider, it kept carving away from us, causing us to flail about with boat hooks trying to snag it before it would move out of reach once again.

So there I was with a television crew, explaining what my job entailed and trying to actually do it without looking like a circus clown as the failures piled up. After a less-than-graceful game of cat and mouse, we snared a hook onto the aft float handle and pulled the glider next to the boat for a relatively normal recovery. The entire unscripted production was caught on film, complete with expletives.

Despite the early abort of the mission, it was a success. We collected slightly over 30 days of whale call (acoustic) data on the towed hydrophone and many whales were heard, including the endangered North Atlantic right whale. Coupled with environmental data and soundings from our profiling Teledyne Webb Slocum Gliders, the acoustic detections from the Wave Glider will help the WHaLE project elucidate suitable conditions for whale habitat. We also managed to capture action-packed footage for the film crew and our soon-to-be national audience. As our mission concluded and I envisioned myself on national television, I had an important realization: smooth sailing might make for a skilled sailor, but a broken rudder makes for an entertaining one.

If you'd like to learn more about the gliders and see them move in near-real time, please visit the Ocean Glider Program website: http://gliders.oceantrack.org/. You can see the Wave Glider clip from the Daily Planet programme that aired in November at https://review.bellmedia.ca/view/1278493820 .

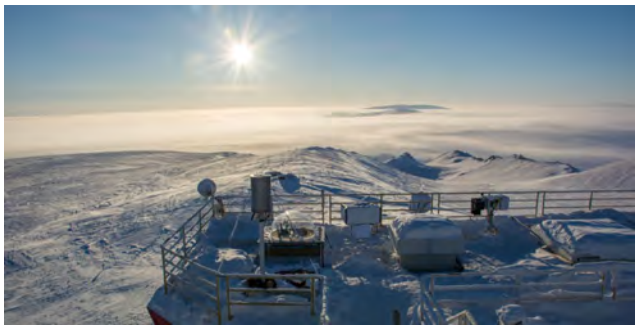
Until the next (mis)adventure,

Richard Davis
Technical Team Lead, MEOPAR/OTN

Ph.D. Fieldwork in the Canadian High Arctic

Dan Weaver, University of Toronto

Dan has been doing fieldwork at the Polar Environment Atmospheric Research Lab (PEARL) since 2012. Here, he offers some thoughts about projects he's been involved in.



The PEARL Ridge Lab, overlooking a blanket of fog. This fog likely resulted from a lead opening up in the area (i.e. a crack in the sea ice that exposes liquid water). The temperature inversion would help keep the fog in place for longer, as it impedes air from rising past its height.

- - -

At 80°N, PEARL and the nearby Environment and Climate Change Canada weather station (Eureka, Nunavut) are located at one of the most northern places in the world. The location offers extraordinary opportunities to investigate the Arctic and global atmosphere. Despite the important role played by the Arctic in environmental issues such as climate change and ozone depletion, there are few measurements of the atmosphere taken at high northern latitudes. It's remote, and conditions are difficult. Because there are few places in the world like it, PEARL is the site of dozens of instruments, experiments, and international collaborations. PEARL's Principal Investigator, James Drummond, offered an overview of the wide-ranging research conducted at PEARL last year in the December 2015 issue of the CMOS Bulletin.

No single instrument can comprehensively map the atmosphere. Each instrument at PEARL has advantages and limitations. Collectively, they are offering a more complete picture of the Canadian high Arctic atmosphere than ever before. My efforts have primarily involved working with a high resolution Fourier transform Spectrometer (FTS) at PEARL, the Bruker 125HR. It's a sophisticated instrument that measures spectra from sunlight as frequently as every few minutes. Techniques for using FTS spectra to observe atmospheric gases have been under continuous development for decades. New analysis techniques can be applied to past spectra. One of the key advantages of FTS instruments is their ability to measure many gases simultaneously. This enables the capture of information about atmospheric processes that I'm interested in, such as the chlorine chemistry related to ozone depletion. The 125HR also measures gases related to global warming, pollution, biomass burning, and other topics.

Recently, I've compared techniques used by several PEARL instruments to measure atmospheric water vapour. I documented how well these techniques are performing, and quantified the agreement and biases between them. There is a lot of interest in understanding water vapour because of its substantial influence on weather, climate, and radiative balance. My work showed, for example, that a new 125HR dataset, produced using the recently-developed MUSICA[1] project retrieval technique, captures accurate measurements of high Arctic water vapour and its vertical distribution. This complements other datasets. Radiosondes, for example, have better vertical resolution but take infrequent measurements. Uniquely at PEARL, the 125HR can measure atmospheric HDO (semi-heavy water). Looking at the ratio of H_2O and HDO (i.e. δD) enables investigation of the water cycle, and tell us about the history of physical processes experienced by the air above the lab. Its ability to frequently measure water vapour and its isotopologue HDO with high accuracy makes PEARL's new 125HR MUSICA product a valuable addition to high Arctic datasets. The suite of instruments at PEARL offers a useful laboratory for experimenting with new measurement techniques, since the results can be compared to a variety of instruments and datasets.

FTS instruments like the 125HR can't take measurements at night because they use sunlight. Moreover, at 80° N, the sun sets mid-October and doesn't rise until mid-February (Figures 1 & 2). Polar Night lasts four months. Work towards using moonlight for 125HR measurements is ongoing and promising. But the moon is often not available, and it offers a significantly less intense signal than the sun, limiting what can be measured. (To start, I aim to get information about ozone and HNO_3). Other instruments can measure the atmosphere in the dark. For example, PEARL is equipped with an FTS instrument that measures infrared radiation emitted from the atmosphere (an Atmospheric Emitted Radiance Interferometer (AERI)) every few minutes. It can take measurements anytime. While it can't get information about gas profiles like a solar-viewing FTS, I've shown

[1] *Multi-platform remote sensing of Isotopologues for investigating the Cycle of Atmospheric water (MUSICA):* http://www.imk-asf.kit.edu/english/musica.php

that the AERI, too, can accurately measure atmospheric water vapour (total columns). We're making progress towards having continuous observation of the atmosphere, day and night, year-round.

When sunlight finally returns to Arctic latitudes, it initiates atmospheric chemistry processes that dramatically change the composition of the atmosphere. Intense ozone depletion happens. PEARL instruments make crucial measurements of this chemistry, but they are best able to understand what is happening across the Arctic in combination with satellite measurements.

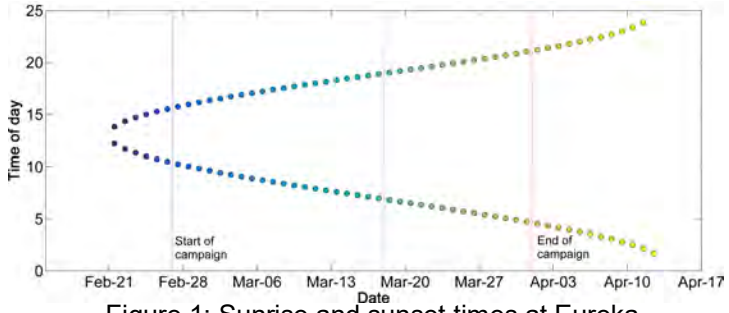


Figure 1: Sunrise and sunset times at Eureka.

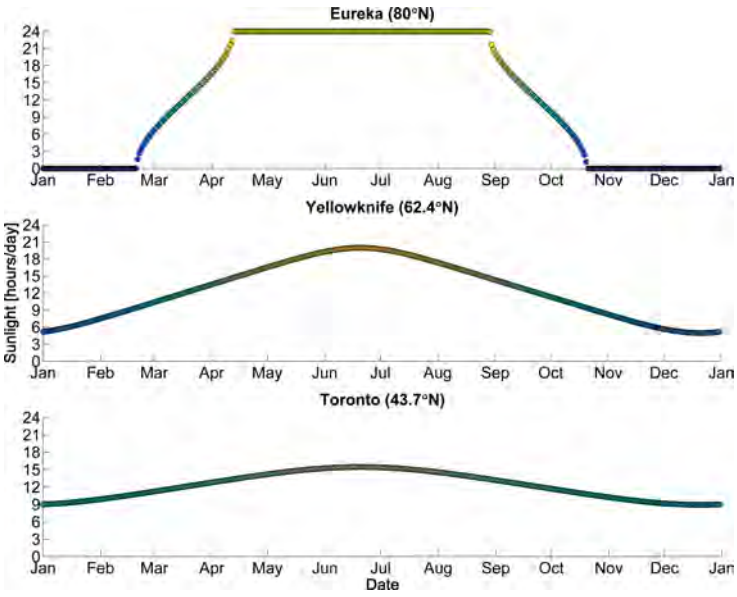


Figure 2: Sunlight hours per day (top to bottom): Eureka, Yellowknife, Toronto

A Canadian satellite, the Atmospheric Chemistry Experiment (ACE), has been monitoring ozone depletion chemistry for over a decade. Working with ACE data, and being a member of the validation campaigns has been a fantastic experience. The satellite validation campaigns at PEARL have taken place every winter/spring since 2004, supported by the Canadian Space Agency. They involve setting up, maintaining, upgrading, and troubleshooting instruments. And making measurements. I took the image on the cover of this issue of the CMOS Bulletin on one of the first days of the campaign in 2014, when the team was installing a ground-based version of an instrument on the ACE satellite (MAESTRO) on the roof of the PEARL Ridge Lab. It's quite the view from up there!

Operating state-of-the-art instruments in the Canadian high Arctic's extreme environment poses challenges. Not only for instruments (I've had to carefully free protective instrument covers that became frozen shut), but also for researchers. Whether you are a professor or grad student, you are likely to pick up a shovel at some point and dig the truck out of a snowdrift between Eureka and the PEARL Ridge Lab. There are some respites from the cold during strong temperature inversions. The PEARL Ridge Lab is sometimes 20°C warmer than Eureka.

If weather is favorable, it takes me a few days to travel from my home in Toronto to the PEARL Ridge Lab (located 4000 km North). Satellites in near-polar orbits, on the other hand, pass over the Arctic often. This type of orbit is often used by science missions because it enables instruments to have near-global coverage. Ground-based measurements taken at PEARL are used to complement, reinforce, and validate satellite data from a variety of missions. (Validation ensures the satellite data is accurate.) For example, using the ground-based 125HR and radiosondes, I've shown that ACE instruments are able to accurately measure high Arctic water vapour profiles in the upper troposphere, a part of the atmosphere significant for its influence on radiative balance. I've also supported teammates in taking measurements that support validation of NASA's Orbiting Carbon Observatory (OCO-2) and Japanese Greenhouse gases observing satellite (GOSAT) missions. Eureka is useful location for satellite validation, but it is also a challenge. The Arctic can be a difficult place for satellite measurements because of snow cover, clouds, and variable land cover types and terrain. PEARL-based validation measurements allow us to check if instruments in orbit are able to overcome those challenges.

To follow the annual field campaigns at PEARL, visit the campaign website between mid-February and late-March. I won't be there this time. I'll be writing my thesis. But I'll follow along. It's a great story of science and adventure in the Canadian North.

Campaign website: acebox.uwaterloo.ca/eureka/; Dan's website: www.danweaver.ca/photography/arcticphotos; CANDAC/PEARL website: www.candac.ca

Report: Seasonal Outlook for Winter 2016/17

Seasonal Outlook for the winter 2016/17 (DJF) based on the non-official CanSIPS forecast issued on the 24th Nov. 2016 / Prévision saisonnière pour l'hiver 2016/17 (DJF) basé sur la prévision non-officielle du système SPISCan, produite le 24 Nov. 2016

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

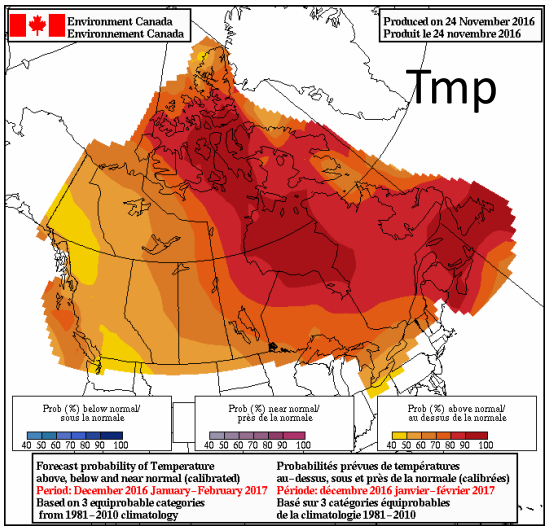
For the official seasonal forecast (issued on Dec 1) please visit http://meteo.gc.ca/saisons/prob_e.html
Pour la prevision officielle (émise le 1 Déc) consultez: http://meteo.gc.ca/saisons/prob_f.html

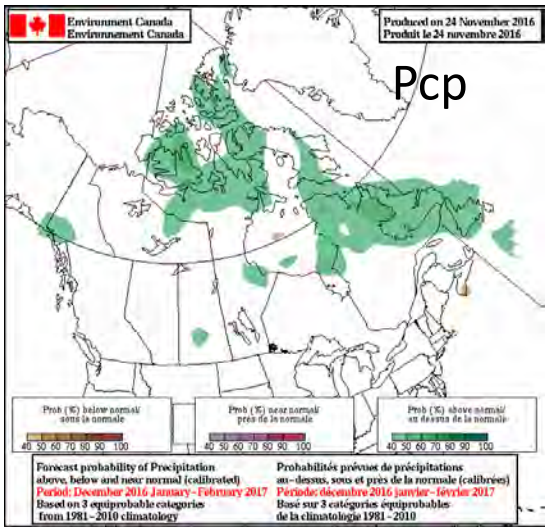
Above normal temperature winter is expected across Canada. Above normal temperatures are likely to occur everywhere in the continental Canada. The highest probabilities (70% and +) for such a forecast are in the Maritimes and over northern Canada. Southern ON, southern QC and central prairies have the expectancy of at least 60% of above normal values.

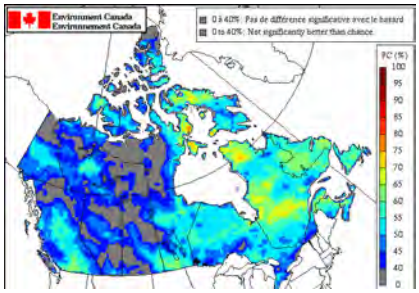
Above normal precipitation is expected over northern Canada? There is > 40% probability for this outcome in the regions across the northeastern Canada, Newfoundland and Labrador and Canadian Archipelago. Other Canadian regions have equal probability chances.

Un hiver 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 Maritimes et sur le Nord du Canada. Sur le sud de l'Ontario, sud du Québec et aux prairies centrales, les températures au-dessus de la normale sont attendues avec une probabilité de près de ~60%.

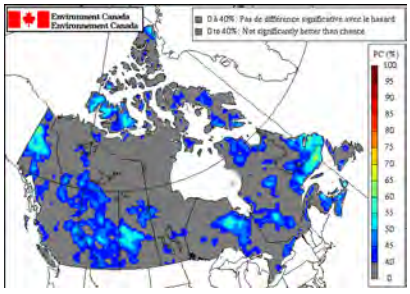
Précip. au-dessus de la normale pour le nord du Canada? Il y a plus que 40% de probabilité que les précipitations soient au-dessus de la normale pour les Terre-Neuve et Labrador, le nord-est du Canada et l'Achipel Canadien. Sur le reste du Canada, on s'attend à des probabilités égales pour les précipitations.







Historical Skill, Tmp.
Habileté historique, Temp.



Historical Skill, Pcp.
Habileté historique, Préc.

CanSIPS DJF16/17 forecasted Indices:
Nino3.4 = - 0.23 (neutral conditions)
PDO = - 0.29 (moderate index)

Les indices climatiques prévus par le SPISCan, DJF16/17:
Nino3.4 = - 0.23 (condition neutre)
PDO = - 0.29 (indice modéré)

What will influence the next season? We are currently experiencing mild **La Niña** conditions (just below -0.5°C) in the central Pacific. However, ECCC predicts neutral ENSO conditions (-0.5 to +0.5 °C) to develop this winter and to persist in the following spring. But according to the longer lead seasonal forecast issued by International Research Institute (IRI), there is a probability of ~50%

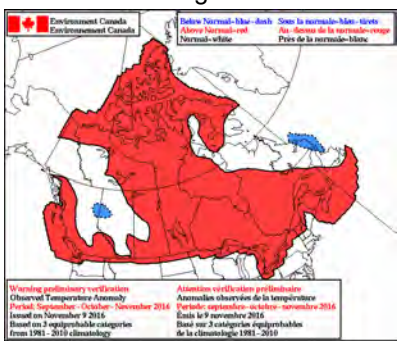
Qu'est-ce qui influencera le climat la saison prochaine? Nous vivons actuellement des conditions de faible La Niña (juste au-dessous de -0.5 ° C) dans le centre du Pacifique. Cependant, ECCC prédit que des conditions neutres d'ENSO (entre -0.5 et +0.5 °C) se développeront cet hiver et persisteront le printemps prochain. Mais selon les prévisions saisonnières publiées par l'International Research Institut (IRI), il y a une

Report: Seasonal Outlook for Winter 2016/17

that mild **La Niña** will prevail this winter and of ~40% to continue in spring. **PDO** index is expected to stay negative this winter. This means that the North Pacific colder waters are approaching the west coast. However, warmer than normal SST are expected to prevail near western coast, with a moderate impact on the neighbouring regions. According to the ECCC seasonal forecast, mild La Niña will probably have no significant impact over Canada this winter. As reported by the latest sea-ice observations, a later than normal ice formation in the Hudson Bay could potentially exert an abnormal warming in the vicinity during early winter.

probabilité de ~ 50% qu'un faible La Niña prévale encore cet hiver et de ~ 40% qu'il se poursuivre au printemps. L'indice PDO devrait rester négatif cet hiver. Cela signifie que les eaux froides du Pacifique Nord s'approchent de la côte ouest. Cependant, on s'attend à ce que la SST soit plus chaude que la normale plus près de la côte ouest, avec un impact modéré sur les régions voisines. Selon les prévisions saisonnières d'ECCC, les conditions neutres ou faibles de La Niña n'auront sans doute pas d'impact significatif sur le Canada cet hiver. Comme l'indiquent les observations les plus récentes sur la glace de mer, un retard dans la formation de la glace dans la Baie d'Hudson pourra potentiellement exercer un réchauffement anormal dans le voisinage au début de l'hiver.

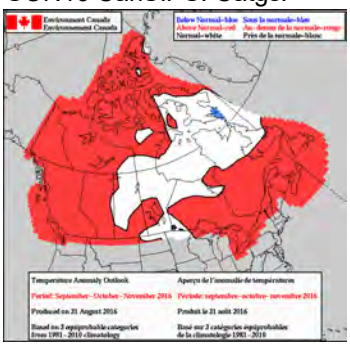
SON16 Obs. Catgs.



Verification SON16, Based on 69 observational days, Percent Correct, Temperature:
All stations: 66%; 23 main stations: 70%; for all model grid points over Canada: 62%. That is a good performance.

Vérification SON16 basé sur les obs de 69 jours, Pourcentage correct, Température:
Toutes les stations: 66%; points de grille: 62%; 23 stations principales: 70%. Ce qui constitue une bonne performance

SON16 CanSIPS. Catgs.



Seasonal forecast by other centers

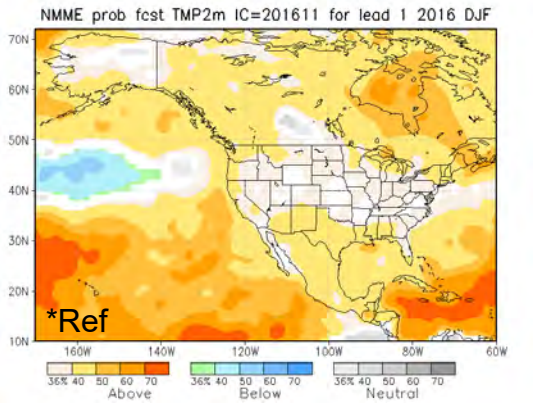
Temperature: according to the NMME (North American Multi Model Ensemble) (lead 1 month), probability of above normal temperatures (>40%) is forecasted in western and SE parts of Canada. Maritimes, region over the Great Lakes and the Hudson Bay region have higher probabilities (50% or more) to have above normal temperatures. Contrarily to CanSIPS, near normal temperatures are expected in a narrow region over the central prairies. Overall, the NMME and CanSIPS generally agree for a warm winter.

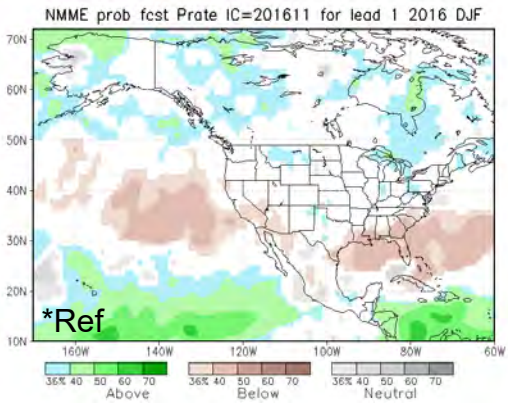
Precipitation: There is a difference between CanSIPS and longer lead forecast from NMME (on the figure), especially in the eastern ON, over the Great Lakes and western Quebec. Over these regions NMME is forecasting ~40% probability of above than normal precipitation. NNME is also forecasting above normal precipitation over various scattered regions over north western and western Canada.

Les autres centres

Températures: selon le NMME (North American Multi Model Ensemble) (préavis de 1 mois), on a une probabilité faible d'avoir des valeurs au-dessus de la normale (>40%) pour les régions de l'ouest, sud-est du Canada et des Maritimes. Les régions des Grands-Lacs et de la Baie d'Hudson affichent aussi des probabilités de plus de 40% d'avoir des températures au-dessus de la normale. À l'inverse de SPISCan, les températures près de la normale sont anticipée dans le région des prairies centrales. Au final, le NMME et CanSIPS s'accordent en général pour prévoir des températures plus chaudes que la normale sur le pays.

Précipitations: On remarque une différence entre les prévisions du SPISCan et celles (avec un préavis plus long) fournies par le NMME (ci-contre),spécialement sur les est de Ontario, Grands-Lacs et ouest du Québec. Il y a une probabilité de 40% de précip. au-dessus de normale sur ces régions. Également, le NMME prévoit les valeurs de précip. au-dessus de normale dans les région isolée de nord-ouest et ouest du Canada (~40%).





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

50th Anniversary: Historical Highlights of CMOS

Excerpts from: Atmosphere Volume 4, 1966

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

Progress toward formation of the Canadian Meteorological Society

In letters dated April 1 and May 27, 1964, from Mr. J. S. Sawyer, President of the Royal Meteorological Society at the time, it is clear that the RMS was cooperative:

"We think that it should be possible to continue the arrangements whereby the subscriptions of Fellows of the Royal Meteorological Society in Canada may be collected in Canada. In the future this could be done by the Canadian Meteorological Society in place of the Canadian Branch, …The subscription could be on the reduced subscription allowed to overseas Fellows …at present 3/4 of the full rate and equal to the sum received in London for each Canadian Fellow."

"We had a preliminary discussion in Council on May 19 regarding the assets of the Canadian Branch. There was general agreement that if a new Canadian Meteorological Society is formed, and the Canadian Branch of the Royal Meteorological Society is wound up, the assets of the latter might be transferred to the new Society."

"..we have invited Dr. G.D. Robinson, the 1965-66 President of the Royal Meteorological Society, to attend our June 1966 National Congress at the expense of the Canadian Branch."

"We are asking you to indicate your preference between "Canadian Meteorological Society" and "Canadian Association for the Atmospheric Sciences".

"The picture is now much brighter. Centres have been formed in Halifax, Edmonton and Vancouver, while another is being considered by Fellows in the Ottawa area. In addition, the Quebec Meteorological Society in Quebec City and the Labrador Meteorological Society in Goose Bay have indicated interest in joining a Canadian organization."

"The Royal Astronomical Society of Canada has over a thousand amateurs in its membership - people who enjoy building telescopes and looking at the stars or who are interested in some branch of astronomy. If a Canadian Meteorological Society were formed, the amateurs might be offered Weather and Weatherwise as an optional extra at cost, in addition to any Canadian publications."

"For many years the Canadian Branch tended to be ingrown, a fault that it could not avoid because meteorology was largely limited to government service. The picture began to change with the formation of the Department of Meteorology at McGill University. It became possible to move the Executive of the Canadian Branch to Montreal, and this had a very stimulating effect. One of the major achievements of the Montreal group was the development of annual Congresses, which have given the Canadian Branch a truly national character."

The first constitution of the CMS will be the template for all versions or revisions to come.

The first budget is:

	Expenditures 1965	Estimated CMS
Postage	$140.86	$200.00
Grants to Centres	$95.20	$150.00
Travel	$8.00	$400.00
Miscellaneous	$51.69	$100.00
Stationery	$2.96	$50.00
Printing ATMOSPHERE	$873.91	$1500.00
Bank charges	$10.00	$20.00
Total	$1182.62	$2420.00

"There are now six Centres. Unless these finance their own programmes, increased support from the national organization will be necessary. The travel bill for 1965 was only eight dollars. However, it would exceed $1000 if the Society paid for all the travelling which might be desirable to maintain the proper liaison between Centres. While the membership may not wish to support large expenses for travel, there may be occasions when some allowance for travel is absolutely necessary. We have put forward a tentative proposal to the National Research Council requesting a travel grant of $1000, undertaking to add $400 of our own funds ($1.00 per capita) to bring two speakers a year from Toronto, Montreal or Ottawa to each of the Centres . In this way the total annual expenditures of the Canadian meteorological society have been roughly doubled. From this investment income of about $100 per annum may be deducted leaving a net expenditure of $2320. The membership of the Canadian Branch is about four hundred so that fees of about six dollars per member would be necessary. We may hope to increase membership but this will involve a corresponding increase in expenses."

Transition Action Plan

"PROPOSAL

You are being asked to consider dissolving the Canadian Branch of the Royal Meteorological Society and forming a Canadian Meteorological Society on or about July 1, 1966. The precise date would have to be negotiated with Council in London."

"All Members of the Canadian Branch who are in good standing on June 30 1966, would remain as Fellows or Student Members in the Royal Meteorological Society until at least December 31, 1966."

"Canadian Branch funds in the hands of the Treasurer on June 30, 1966, would become the property of the new Canadian Meteorological Society on July 1, 1966. The new Canadian Society would continue to collect all outstanding 1966 fees, and forward the proper share to London as if the Canadian Branch were still in existence."

"The first Canadian Meteorological Society Executive would take office on July 1, 1966. Until the first election of the new Society in 1967, the 1966-67 Executive Committee of the Canadian Branch would serve as the first Executive and Council of the new Society."

"The Society exists for the advancement of meteorology" The Executive and Council of the Society would attempt to provide one or two outside speakers each year to each Local Centre: and in addition would be responsible for sponsoring at least one national meeting each year - the National Meteorological Congress."

"…for at least the next few years, the new Canadian Meteorological Society would forego the luxury of having a professional or scientific publication. In ATMOSPHERE we already have a vehicle for carrying Society news, stories on recent or modern weather developments, reviews, etc., and your present executive hopes ATMOSPHERE will continue to develop in every way."

Membership in the Canadian Branch, 1965

Life Fellow 5, Fellow 397, Foreign Member 1, Student Member 14, Total 417

Development of ATMOSPHERE

"requests are received for information regarding the policy for accepting advertising in "Atmosphere". …it was agreed in principle that advertising might be accepted. This decision has several financial and legal implications, and it will now become necessary to formulate a definitive publication policy."

"We now face a drastic change. The members of the Canadian Meteorological Society will receive the periodicals of other organizations only if they separately subscribe. Obviously ATMOSPHERE must expand its scope in order to fill this impending need.… by publishing a periodical that can appeal to everyone who has an interest in Meteorology."

7th National Meteorological Congress

Université de Sherbrooke, Sherbrooke, Qué. June 8 - 10, 1966

G. D. Robinson, Meteorological Office, Bracknell, England President, Royal Meteorological Society spoke at the General Session. Other sessions were on Mesometeorology (5 papers), Dynamic Meteorology and Numerical Weather Prediction (5 papers), Atmospheric Diffusion (5 papers), Physical Meteorology (5 papers), Micrometeorology (5 papers).

50th Anniversary: Golden Jubilee Fund

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 50e anniversaire de la SCMO

Nous continuons de planifier les célébrations du 50e anniversaire de la fondation de la Société de météorologie du Canada (SMC) et du 40e 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 1er 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.

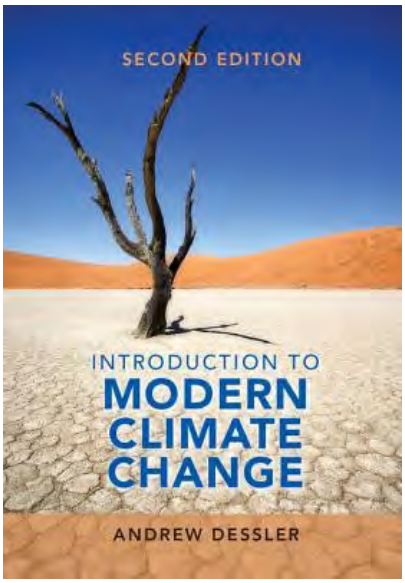
Le conseil de la SCMO a créé le Fonds du jubilé pour l'année 2016-2017, afin de nous fournir les moyens de présenter la riche histoire et les sciences de la Société grâce à ces activités. Un don déductible d'impôts au Fonds du jubilé offrira aux particuliers, aux organisations et aux entreprises l'occasion 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 50e anniversaire.

Martin Taillefer, Président de la SCMO

Book Review



Introduction to Modern Climate Change, Second Edition

by Andrew Dessler

Cambridge University Press, ISBN 978-1-107-48067-4
2016, softcover, xiii + 257 pages, $62.95

Book reviewed by J.J.P. Smith[1]

A vast literature about climate change has emerged in recent years. It comes at a critical moment, in the aftermath of the Paris conference where the imperative for collective action by all countries was clear. Keeping track of the results of research, even in narrow fields of climate change such as Arctic sea ice loss and the recent El Niño event, demands more and more time. Among the scholarly works on the scene are some innovative texts. Andrew Dessler's second edition of *Introduction to Modern Climate Change*, following its original five years ago, is a welcome addition.

Dessler is a professor of atmospheric science at Texas A&M University. Trained as a physicist and chemist, he is active in policy-making circles and his 2010 published *The Science and Politics of Global Climate Change: A Guide to the Debate* (with E.A. Parson) – recommended reading – reveals his experience. In *Introduction to Modern Climate Change* he pursues two objectives, namely, a comprehensive explanation of causal mechanisms and a thoughtful outlining of policy responses. The new edition is current, concluding a survey of international developments (together with the more influential scientific studies, including the International Panel on Climate Change *Fifth Assessment Report*), to a point just before the 2015 Paris conference. The work necessary for countries to respond to the conference's governance regime means the book will be relevant for a few years at least.

Fourteen chapters take the reader through the essentials of climate change. Each concludes with a summary, recommended further readings, a list of key terms, and problem questions. A reference list (bibliography), colour plates and index round out the book. Chapter 1 starts the reader off with definitional basics, including an essay ("Why you should believe this textbook") which makes the case for scientific certainty and the legitimacy of indicated responses. Dessler uses the opportunity to establish his comparison study of how doubt about the about adverse health effects from smoking was sustained by parties interested in the tobacco industry. He explores this at length in Chapter 13 ("The tobacco strategy"). Chapter 2 poses the question, "Is the Climate Changing?". The approach here is well conceived, an assessment of temperature change models and evidence – on a global basis – before it deals with the physical manifestations of climate change including loss of ice and sea level variation. A passage about ocean temperature change is too brief, the phenomenon deserving more treatment because of its implications for the functioning of the atmosphere-ocean system, and because it presents a useful pedagogical analog to atmospheric temperature change.

To better set up the middle part of the book, Chapter 3 presents the concepts of radiation and (heat) energy balance. Dessler has an engaging conversational style, revealed in his adept coverage of the principles of blackbody radiation. (An infrared photo of his dog serves to illustrate the Stefan-Boltzmann radiation energy equation.) Chapter 4 offers a simple climate model, one based on the earth's insolation and atmospheric heat balancing mechanisms with a helpful comparison to other planets in our solar system. Chapter 5 takes the reader to the carbon cycle. The mechanisms of exchange between atmosphere and ocean and the lithosphere ("rock reservoir") are described before the influence of humans on the carbon cycle is addressed. The discussion of historical trends (with the *Keeling Curve* getting a necessary mention) driven by human releases of carbon is succinct. Dessler means to be convincing about what causes climate change. Chapter 6 considers forcing, both radiative and from the presence of materials (aerosols) in the atmosphere, and then feedback mechanisms. Fast feedbacks include (a now worrisome) loss of ice cover/ reduced albedo phenomenon, and cloud cover feedback which Dessler concludes will likely contribute to warming. (The US National Snow and Ice Data Centre and others remind us that in the summer of 2016,

[1] *McGill and Carleton Universities, and the government of the Saharawi Arab Democratic Republic.*

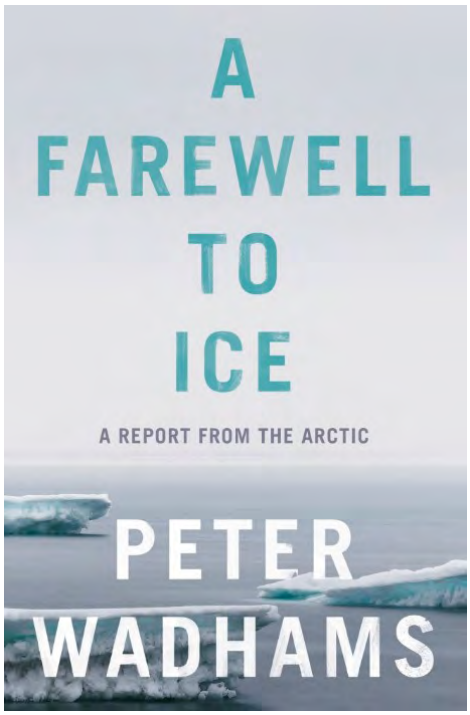
Arctic sea ice reached its second lowest extent since the start of consistent satellite monitoring in 1981.) Several *slow* feedback mechanisms, including a possible rate change in the carbon cycle itself, and changes in permafrost and vegetation, are canvassed. Dessler is right to note that there is insufficient data in such long time-scale events to be certain of their role. Comparative analysis of the recently finished El Niño may yield insights.

Chapter 7, "Why is the climate changing?" marks a turn to the empirical, with qualitative discussion of the several factors suspected to be in play: continental drift, long term variations in the sun's energy, the earth's orbit, and internal variabilities (including the ENSO, and Pacific and Atlantic Oscillation events). Not surprisingly, greenhouse gases receive the most treatment. Dessler is careful to not repeat his earlier introduction of this phenomenon, neatly summarizing the chapter with a recital of the IPCC's statements over time of an ever-greater certainty of climate change being due to anthropogenic forcing. We begin to get the sense his aim is just short of advocacy; scientific conviction for those who are doubtful. Chapter 8 addresses the predictions of future climate change. There is a mixed, and adept, discussion of social causes and presentation of the IPCC's representative concentration pathways of atmospheric temperature trend (*i.e.* emission-radiative forcing) scenarios in the decades to come. The problem of rising affluence is featured, something the econometric models will have to address in order for tangible reductions in greenhouse gases to be achieved post-Paris. (An instructive article is Liam Wagner ***et al***, "Trading Off Global Fuel Supply, CO_2 Emissions and Sustainable Development" (2016) PLoS One 11(3).)

The balance of *Introduction to Modern Climate Change* answers the questions of why we should care about this subject and how it can be remedied. Chapter 9 explores the physical and biological effects, with useful examples such as the predicted flooding of Florida's coastal areas, acidification of the oceans, and not-fully-understood agricultural consequences. This reviewer, with an eye to the Arctic, would prefer a discussion of things to come for the "cryosphere", those areas of the earth with a formerly permanent ice-cover. (The evidence of the effects of glacial retreat in the Canadian Rockies is surely cause for concern.) Chapter 10, styled as "exponential growth" is an insightful examination of what Dessler calls the social costs of carbon. Here is where the UN *Framework Convention on Climate Change*–Kyoto Protocol regime became out-stripped. The imperative as a result of the scientific certainty that we now enjoy is one of reduced consumption of things which generate carbon. Putting a present value on carbon emissions is one device to influence behavior. For a Canada now entering the difficult question of how its governments might (more fully) regulate greenhouse gas emissions, it will be helpful to think of carbon dioxide as having a net present cost of about $50 per tonne. Chapter 11 presents policy prescriptions to deal with climate change. The discussion here is sensible, covering adaptive measure, the use of technology to mitigate greenhouse gases, both produced and captured after emission, and geoengineering. The case for nuclear power gets thoughtful treatment (too expensive in capital cost) and the feasibility of carbon capture and storage (in the context of thermal coal use) is discussed. Chapter 12 deals with mitigation policies: carbon tax, cap and trade, offsets, as well as their comparative merits and the regulatory measures needed to accomplish them. Chapter 13 presents "A brief history of climate science and politics". Dessler presents a fascinating review of a dawning understanding of climate change as a problem in recent decades, and the responses to it, notably on the American political scene. (Canada merits a brief mention, the explanation for the country's 2011 withdrawal from the Kyoto Protocol including the fact of its "immense oil reserves in the form of tar sands, which will likely be worth significantly less if the world agrees to stringent emissions reductions.") After Paris (and with what the rest of us think we know about climate change) Chapter 14 may be the most compelling part of the book. The *problem-complexity* of climate change mitigation is explored, together with the utility of such goals as limiting the increase of global average temperature to 2 degrees Celsius. Six policy prescriptions conclude things, and recalling them here is worthwhile: (i) put a price on carbon and ensure that animates policy-making; (ii) pursue efficiency standards and reduction of high carbon energy, including coal; (iii) research new technologies; (iv) prepare adaptive measures; (v) consider geoengineering should the needed reduction in carbon emissions not be successful; and (vi) ensure a high degree of functional cooperation between countries.

It can be said that "we are all climate change educators now". Such is the imperative of the problem humanity faces and the moral obligation of scientists to make sense of things for their communities and governments. Andrew Dessler's *Introduction to Modern Climate Change* has an essential place in that work.

Book Review



A Farewell to Ice (with a foreword by Walter Munk)

by Peter Wadhams

Allen Lane, ISBN 978-0-241-00941-3.
2016, Hardcover, 240 pages, $36.00

Book reviewed by Paul LeBlond[1]

Few are more familiar with the Arctic Ocean than my old friend Peter Wadhams. Former Director of the Scott Polar Institute and now an Emeritus Professor at Cambridge University, Peter first encountered polar sea ice as a junior scientist on the Hudson 70 expedition, as it was completing the last leg of its voyage around the Americas. One of the very few who remained aboard the Hudson for the entire duration of the voyage, he later published an intimate and original account of his adventures as "The Great Ocean of Truth", (Melrose Books, 2009) which I reviewed for the CMOS Newsletter in December 2010 (vol. 38, No. 6).

Over the years, Wadhams has measured the properties of Arctic ice from below in submarines, at sea level from floating ice camps, and from above in aircraft, participating in more than 50 Arctic and Antarctic expeditions. He has published extensively on ice properties; on its formation and growth, spreading and thinning; on its impact on climate and ocean conditions. In his "Farewell to Ice" he brings his encyclopedic knowledge of sea ice and Arctic oceanography to bear on the broader global issue of climate change.

Starting with the basic properties of sea-ice, presented in a style accessible to a general public and enlivened by the author's personal experiences in the field -- including a harrowing account of surviving a fire in a submarine - the book quickly moves on to the broader perspective of ice ages and finally to today's climate change issue. Wadhams argues - convincingly, I believe - that the observed rate of melting of Arctic sea-ice is likely to result in an ice-free polar ocean much faster than models predict. He also takes issue with the IPCC about what he sees as its complacency about the threat of methane emissions from Arctic shelves and the problem of getting rid of the current load of atmospheric $C0_2$, which he argues is already "*sufficient to cause unacceptable amounts of warming in the future*."

Going to zero emissions is not enough! "*We must remove carbon dioxide from the atmosphere*", Wadhams insists and the solution, in his view, lies in geo-engineering. He strongly advocates focused research on direct removal of $C0_2$ from the atmosphere, "*a giant problem in chemistry, physics and technology, but not one that is greater than that of building a huge bomb out of a reaction which was previously only observed among single atoms in a laboratory.*" Progress will be assisted by stemming the "black tide of denial" and by the development of an *Integrated Arctic Science* with links and support from the World Economic Forum's Global Agenda Council on the Arctic.

"A Farewell to Ice" is informative, entertaining and thought provoking. Everyone interested in the Arctic and in its impact on the climate will want to read it.

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[1] *Professor Emeritus, Department of Earth, Ocean & Atmospheric Sciences, University of British Columbia*

Call for CMOS Undergraduate Scholarship Applications

CMOS Undergraduate Scholarship Application Deadline: March 15.

March 15th is the deadline for applications for the CMOS Undergraduate Scholarships. It may seem far away, but it always seems to arrive faster than we thought.

CMOS offers three undergraduate scholarships. Surprisingly, we get very few applicants. Your assistance in forwarding this information to family, friends, colleagues and students would be appreciated. Anyone can apply: applicants do not have to be CMOS members. Don't wait - do it now!

The scholarships are listed below. Instructions on how to apply are found at http://www.cmos.ca/site/scholarships. Note that any inquiries and all applications are to be forwarded to the CMOS Awards Coordinator (Denis Bourque) at awards-coord@cmos.ca.

- The **CMOS Undergraduate Scholarships** ($1,000) are awarded to students applying while in their penultimate undergraduate year at any Canadian University who, *in their final year, will be taking four or more half courses in meteorology, oceanography, limnology, hydrology or climatology*. Two scholarships can be awarded each year.
- The **CMOS Daniel G. Wright Undergraduate Scholarship** ($1,000) is awarded to an undergraduate student applying while in the penultimate undergraduate year intending entering the final year of a B.Sc. Honours program in Mathematics and/or Physics or a related discipline, *with interest in pursuing graduate work in physical oceanography*.
- The **CMOS The Weather Network/MétéoMédia Undergraduate Scholarship** ($1,500) is awarded to a female student applying while in her penultimate year of an atmospheric science program at a Canadian university who intends to pursue a career in the fields of meteorology or atmospheric science.

Appel de candidatures pour les bourses d'etudes SCMO (premier cycle)

Date limite pour les soumissions des applications : 15 mars.

Le 15 mars est la date limite pour la soumission les soumissions pour les Bourses d'études de premier cycle de la Société. Cela semble peut-être loin, mais il semble toujours que la date arrive soudainement.

La SCMO offre trois bourses aux étudiants du premier cycle. Fait surprenant : nous recevons peu de demandes. Donc, nous apprécierons grandement toute assistance de votre part à faire connaissance de ces bourses à vos familes, amis, collègues et étudiants. N'importe qui peux nous envoyer sa candidature : on ne doit pas être membre de la SCMO. N'attendez pas : faites-le maintenant!

Les trois bourses sont décrites ci-bas. Pour lire les instructions, visiter http://www.cmos.ca/site/scholarships?language=fr_FR& . À noter que toutes enquêtes ainsi que toutes nominations doivent être soumises au Coordinateur des honneurs de la SCMO (Denis Bourque) au coord-honneurs@scmo.ca

- Les **Bourses d'étude de premier cycle SCMO** (1 000 $) sont décernées chaque année à des étudiant(e)s dans leur avant-dernière année du premier cycle dans une université canadienne qui, *dans leur dernière année suivront au moins quatre cours de 3 crédits chaque dans au moins un des domaines suivants : météorologie, océanographie, limnologie, hydrologie ou climatologie*. La Société offre jusqu'à deux bourse chaque année.
- La **Bourse d'étude de premier cycle Daniel G. Wright** (1 000 $) est décernée chaque année à un(e) étudiant(e) qui lors de la soumission de sa candidature est dans l'avant dernière année du premier cycle qui dans sa dernière année d'un programme du premier cycle poursuivra des études avec concentration en physique, en mathématique et/ou sciences connexes *,avec un intérêt à poursuivre des études de deuxième ou troisième cycle en océanographie physique.*
- La **Bourse SCMO-MétéoMédia/The Weather Network** (1 500 $) est décernée chaque année à une étudiante dans son avant-dernière année d'études en sciences atmosphériques en une université canadienne qui prévoit se diriger vers une carrière dans le domaine de la météorologie.

Call for CMOS Post-Graduate Scholarship Applications

CMOS Post-Graduate Scholarship Application Deadline: April 20.

April 20th is the deadline for applications for the CMOS Post-graduate Scholarship. It may seem far away, but it always seems to arrive faster than we thought.

CMOS offers one post-graduate scholarship. Your assistance in forwarding this information to family, friends, colleagues and students would be appreciated. Anyone can apply: applicants do not have to be CMOS members. Don't wait - do it now! The scholarship is described below. Instructions on how to apply are found at http://www.cmos.ca/site/scholarships . Note that any inquiries and all applications are to be forwarded to the CMOS Awards Coordinator (Denis Bourque) at awards-coord@cmos.ca .

The **CMOS - Weather Research House NSERC Scholarship Supplement in atmospheric or ocean sciences** (up to $10,000) awarded to a student in atmospheric or ocean sciences who must already be holding either an NSERC Postgraduate Scholarship or an NSERC Alexander Graham Bell Canada Graduate Scholarship.

Appel de candidatures pour les bourses d'etudes SCMO (deuxième et troisième cycle)

Date limite pour les soumissions des applications : 20 avril.

Le 20 avril est la date limite pour la soumission les soumissions pour la Bourse d'études du deuxième et troisième cycle de la Société. Cela semble peut-être loin, mais il semble toujours que la date arrive soudainement.

La SCMO offre une bourse aux étudiants du deuxième et troisième cycle. Nous apprécierons grandement toute assistance de votre part à faire connaissance de ces bourses à vos familles, amis, collègues et étudiants. N'importe qui peux nous envoyer sa candidature : on ne doit pas être membre de la SCMO. N'attendez pas : faites-le maintenant! La bourse est décrite ici-bas. Pour lire les instructions, visiter http://www.cmos.ca/site/sholarships?language=fr_FR& . À noter que toutes enquêtes ainsi que toutes nominations doivent être soumises au Coordinateur des honneurs de la SCMO (Denis Bourque) au coord-honneurs@scmo.ca

Le **Supplément SCMO – Weather Research House à la bourse du CRSNG pour les sciences de l'atmosphère ou de l'océan** (jusqu'à 10 000 $) est décernée à un(e) étudiant(e) dans les sciences de l'atmosphère ou de l'océan détenteur d'une bourse d'études supérieures du CRSNG ou d'une bourse d'études supérieures du Canada Alexander-Graham-Bell.

Calls for Fellow Nominations

CMOS FELLOWS and HONORARY FELLOWS Nominations Deadline: March 15.

March 15th is the deadline to recognize your colleagues by nominating one or more of them to be a CMOS Fellow or CMOS Honorary Fellow. It may seem far away, but it always arrives faster than we expected.

The titles "CMOS Fellow" and "Honorary CMOS Fellow" may be granted for exceptional long term service and support to the Society and/or outstanding contributions to the scientific, professional, educational, forecasting or broadcasting fields in atmospheric or ocean sciences in Canada.

Please take a moment to visit http://www.cmos.ca/site/fellows for information about these designations and instructions on how to submit a nomination. Don't wait - do it now! Note that any inquiries and all nominations are to be forwarded to the CMOS Awards Coordinator (Denis Bourque) at awards-coord@cmos.ca.

Appel pour nominations de Membres émérites

Date limite pour les nominations de Membres émérites et Membres honoraires : 15 mars.

Le 15 mars est la date limite pour la soumissions des mises en candidature pour le titre de Membre émérite et Membre honoraire de la SCMO. Cela semble peut-être longtemps, mais la date arrive plus vite que l'on si attendait.

Les titres « Membre émérite » et « Membre honoraire » sont accordés pour des services et/ou soutien exceptionnels à la Société, ou pour des contributions scientifique, professionnel, éducatif, ou en prévision ou présentation, dans les sciences atmosphériques ou océaniques au Canada.

Veuillez prendre quelques secondes pour visiter http://www.cmos.ca/site/fellows?language=fr_FR& pour les instructions, afin de soumettre la nomination d'un de vos collègues. N'attendez pas : faites-le maintenant! À noter que toutes enquêtes ainsi que toutes nominations doivent être soumises au Coordinateur des honneurs de la SCMO (Denis Bourque) au coord-honneurs@scmo.ca

CMOS Call for Awards nominations

CMOS AWARDS Nominations Deadline: Feb 15.

February 15th is the deadline for nominations for the CMOS Prizes and Awards. It may seem far away, but it always seems to arrive faster than we thought.

CMOS has a rich history recognizing deserving persons (members and non-members) through its awards programs. But regrettably, there are many deserving candidates who go unrewarded each year because we were too busy to work up a nomination. Don't wait - do it now!

The awards are listed below. Please take a moment to visit http://www.cmos.ca/site/awards for instructions on how to nominate someone and then submit a nomination on behalf of one of your colleagues or students. Note that any inquiries and all nominations are to be forwarded to the CMOS Awards Coordinator (Denis Bourque) at awards-coord@cmos.ca .

A - Prizes, Awards and Recognitions for Society Members

(Awarded to a Society member or members, with no restrictions on residency or citizenship)

The **President's Prize**, awarded for a "*recent paper or book of special merit in the fields of meteorology or oceanography."*

The **Dr. Andrew Thomson Prize in Applied Meteorology,** awarded for "*an outstanding contribution to the application of meteorology in Canada*."

The **François J. Saucier Prize in Applied Oceanography,** awarded for "*an outstanding contribution to the application of oceanography in Canada.*"

The **Neil J. Campbell Award for Exceptional Volunteer Service,** awarded for "*exceptional service to the society as a volunteer. The award may be made for an exceptional contribution in a single year or for contributions over an extended period. The contribution should have resulted in an important advancement for CMOS and/or its aims, nationally or locally.*"

B – Open Prizes, Awards and Recognitions (not restricted to Society Members)

The **Rube Hornstein Medal in Operational Meteorology,** awarded for "*providing outstanding operational meteorological service in its broadest sense, but excluding the publication of research papers as a factor, unless that research has already been incorporated into the day-to-day performance of operational duties. The work for which the medal is granted may be cumulative over a period of years or may be a single notable achievement*."

The **J.P. Tully Medal in Oceanography,** awarded to any person "*whose scientific contributions have had a significant impact on Canadian oceanography.*"

The **Tertia MC Hughes Memorial Graduate Student Prizes** ($500), awarded to graduate students registered at a Canadian university or Canadian graduate students registered at a foreign university for past "*contributions of special merit.* "

The **Roger Daley Post-Doctoral Publication Award** ($2,000), recognizes a candidate who, at the time of nomination, is working in Canada in a non-permanent position as a post-doctoral fellow or research associate and is within 5 years of having received a doctoral degree. The award is granted for "*excellence of a publication in the fields of meteorology or oceanography that has appeared, or is in press, at the time of nomination*."

Citations whereby the Society recognizes the contribution of any individuals, groups or organizations "*which have, in the previous year, made some outstanding contribution towards promoting public awareness of meteorology or oceanography in Canada*."

Appel pour les nominations : Prix de la SCMO

Date limite pour les nominations envers les Prix de la SCMO : 15 février.

Le 15 février est la date limite pour la soumission des mises en candidature pour les prix et honneurs de la Société. Cela semble peut-être loin, mais il semble toujours que la date arrive soudainement.

La SCMO a une histoire qui souligne les personnes méritantes (membres et non-membres) par ses programmes de reconnaissance. Malheureusement, il y a beaucoup de personnes qui méritent d'être nommées qui ne le sont pas, parce qu'on est trop occupé. N'attendez pas : faites-le maintenant!

La Veuillez prendre quelques secondes pour visiter http://www.cmos.ca/site/awards?language=fr_FR& pour lire les instructions, puis prendre le temps de soumettre la nomination d'un de vos collègues ou étudiants. À noter que toutes enquêtes ainsi que toutes nominations doivent être soumises au Coordinateur des honneurs de la SCMO (Denis Bourque) au coord-honneurs@scmo.ca

A – Les prix et honneurs réservés aux membres de la Société

(Décerné à un ou plusieurs membres de la Société, sans considération de résidence ou citoyenneté)

- Le **Prix du président**, décerné pour une « *excellente communication ou un livre de grande valeur traitant de météorologie ou d'océanographie.* »
- Le **Prix Dr. Andrew Thomson en météorologie appliquée,** décerné pour « *un travail exceptionnel dans le domaine de la météorologie appliquée au Canada.* »
- Le prix **François J. Saucier en océanographie appliquée**, décerné pour « *un travail exceptionnel dans le domaine de l'océanographie appliquée au Canada*. »
- La **Médaille Neil J. Campbell pour service bénévole exceptionnel,** décernée pour « *un service exceptionnel en tant que bénévole à la SCMO. La médaille peut être décernée pour une contribution exceptionnelle dans une seule année ou pour des contributions sur plusieurs années. La contribution devrait avoir fait progresser d'une façon importante la SCMO ou ses buts, au niveau national ou local.* »

B – Les prix et honneurs généraux (non réservés aux membres de la Société)

- La **Médaille Rube Hornstein en météorologie opérationnelle,** décerné pour « *un travail exceptionnel dans l'exploitation des services météorologiques, au sens large du terme. Ceci exclut cependant comme critère d'évaluation les publications scientifiques, à moins que leurs résultats ne soient déjà utilisés pour améliorer la performance quotidienne des services d'exploitation. Le travail pour lequel la médaille est donnée peut avoir été réalisé sur plusieurs années précédant l'année en cours ou encore, en récompense d'un accomplissement exceptionnel.* »
- La **Médaille J.P. Tully en Océanographie,** décernée à un individu « *dont la contribution scientifique dans le domaine de l'océanographie canadienne a été jugée exceptionnelle.* »
- Les **Prix Tertia M.C. Hughes pour étudiants diplômés** (500 $), décernés aux étudiant(e)s diplômé(e)s inscrit(e)s à une université canadienne ou aux étudiant(e)s canadien(ne)s inscrit(e)s à une université étrangère, ayant déjà *« accompli(e) un travail exceptionnel.* »
- Le **Prix Roger Daley de publication postdoctoral** (2 000 $), décerné à un(e) candidat(e) qui, au moment de la mise en candidature travaille au Canada dans un poste non-permanent à titre de boursier (ère) de recherche postdoctoral ou d'assistant(e) à la recherche et a obtenu son doctorat dans les cinq dernières années. Le prix sera remis en fonction « *de l'excellence d'une publication, dans les domaines de la météorologie ou de l'océanographie, déjà publiée ou en voie de l'être au moment de la mise en candidature.* »
- Des **Citations** par lesquelles la Société reconnaît les contributions d'individus, de groupes ou d'organisations « *qui ont contribué d'une façon exceptionnelle à éveiller l'intérêt du public au Canada en météorologie ou océanographie durant l'année précédente*. »

Summer Meteorology Workshop Project Atmosphere 2017

Call for Applications by Pre-College Teachers

As in previous years, the Canadian Meteorological and Oceanographic Society (CMOS) has been invited to select a Canadian teacher to participate in PROJECT ATMOSPHERE. This is a summer workshop for pre-college teachers of Atmospheric Science topics sponsored by the American Meteorological Society (AMS) and the National Oceanic and Atmospheric Administration (NOAA) of the United States. It will take place from **16 to 28 July 2017** at the National Weather Training Center, Kansas City, Missouri.

The essential expenses for the participating teacher are paid by AMS/NOAA, with a financial contribution from CMOS and the Canadian Council for Geographic Education (CCGE). This does not include the travel to and from Kansas City for which CMOS and CCGE provide $300 (Canadian) each (total of $600) to the selected Canadian participant.

Previous Canadian participants have found their attendance a very rewarding and significant experience. Presentations are made at the Workshop by some of the most respected American scientists in the fields of atmospheric and oceanographic sciences. Participants have returned with material, resources, and teaching modules readily adaptable to classroom presentations. The successful candidate will provide CMOS with a short report on his/her summer experience which may be published in the *CMOS Bulletin SCMO*.

Interested teachers can obtain more information on the workshop on the CMOS website www.cmos.ca/site/summerworkshops. An application form can be downloaded from the same CMOS website.

Completed application forms may be mailed or e-mailed to the address below no later than **March 15, 2017**.

CMOS - Project Atmosphere Workshop
P.O. Box 3211, Station D
Ottawa, ON K1P 6H7
Telephone: (613) 990-0300
e-mail: awards-coord@cmos.ca

Summer Oceanography Workshop Maury Project 2017

Call for Applications by Pre-College Teachers

The Canadian Meteorological and Oceanographic Society (CMOS) has been invited to select a Canadian teacher to participate in THE MAURY PROJECT. This is a summer workshop for pre-college teachers of Oceanographic topics sponsored by the American Meteorological Society (AMS) and the U.S. Naval Academy. This year's workshop will take place from **9 to 21 July 2017** at the U.S. Naval Academy, Annapolis, Maryland.

The essential expenses for the participating teacher are paid by AMS, with a contribution from CMOS and the Canadian National Committee / Scientific Committee on Oceanic Research (CNC/SCOR). This does not include the travel to and from Annapolis for which CMOS and CNC/SCOR provide $300 (Canadian) each (total of $600) to the selected Canadian participant.

Previous Canadian participants have found their attendance a very rewarding and significant experience. Presentations are made at the Workshop by some of the most respected American scientists in the fields of atmospheric and oceanographic sciences. Participants have returned with material, resources, and teaching modules readily adaptable to classroom presentations.

The successful candidate will provide CMOS with a short report on his/her summer experience which may be published in the *CMOS Bulletin SCMO*.

For further details about the Workshop, please visit http://www.cmos.ca/site/summerworkshops

Interested teachers should download the application form (in pdf format) and mail or e-mail the filled form as soon as possible not later than **March 15, 2017** to the address given below.

CMOS - Maury Project Workshop
P.O. Box 3211, Station D
Ottawa, ON K1P 6H7
Telephone: (613) 990-0300
e-mail: awards-coord@cmos.ca

Atelier d'été en météorologie Projet Atmosphère 2017

Demande de candidats enseignants de niveau pré-collégial

Comme par les années passées, la Société canadienne de météorologie et d'océanographie (SCMO) a été invitée à choisir un enseignant canadien qui participera au PROJET ATMOSPHÈRE. Il s'agit d'un atelier d'été à l'intention des enseignant(e)s de niveau pré-collégial spécialistes en sciences atmosphériques; cet atelier est parrainé par l'American Meteorological Society (AMS) et la National Oceanic and Atmospheric Administration (NOAA) américaine. Il aura lieu du **16 au 28 juillet 2017** au centre de formation du National Weather Service à Kansas City au Missouri.

Les dépenses de l'enseignant(e) choisi(e) seront assumées par l'AMS et la NOAA, avec une contribution financière de la SCMO et du Conseil canadien pour l'enseignement de la géographie (CCEG). Ceci n'inclus pas les déplacements à destination et au retour de Kansas City pour lesquels la SCMO et le CCEG offrent chacun 300 $ (canadiens), soit un total de 600 $, au participant(e) canadien(ne) choisi(e).

Les ancien(ne)s participant(e)s du Canada ont trouvé leur expérience très enrichissante et stimulante. Les exposés de l'atelier sont présentés par des experts américains les plus réputés dans les sciences atmosphériques et océanographiques. Les enseignant(e)s sont revenu(e)s avec du matériel, des ressources et des modules didactiques qu'ils peuvent facilement adapter dans leurs cours. Le/la candidat(e) choisi(e) devra écrire un court rapport pour la SCMO de son expérience estivale qui pourra être publié dans le *CMOS Bulletin SCMO*.

Les enseignant(e)s intéressé(e)s peuvent obtenir plus d'information en visitant le site de la SCMO sur la toile à www.scmo.ca/site/summerworkshops?language=fr_FR&. Ils/Elles peuvent également obtenir un formulaire en le téléchargeant du même site Web de la SCMO ou en le demandant à l'adresse ci-dessous.

Les formulaires dûment remplis doivent être envoyés par la poste ou par courriel à l'adresse ci-dessous au plus tard le **15 mars 2017.**

SCMO - Atelier Projet Atmosphère Casier postal 3211, Station D Ottawa, ON K1P 6H7
Téléphone: (613) 990-0300
courriel: coord-honneurs@scmo.ca

Atelier d'été en océanographie Projet Maury 2017

Demande de candidats enseignants de niveau pré-collégial

Comme par les années passées, la Société canadienne de météorologie et d'océanographie (SCMO) a été invitée à choisir un enseignant canadien qui participera au PROJET MAURY. Il s'agit d'un atelier d'été à l'intention des enseignant(e)s de niveau pré-collégial spécialistes en sciences océanographiques; cet atelier est parrainé par l'American Meteorological Society (AMS) et le U.S. Naval Academy. Il aura lieu du **9 au 21 juillet 2017** au U.S. Naval Academy à Annapolis au Maryland.

À l'exception des frais de déplacements à destination et au retour de Annapolis, toutes les dépenses de l'enseignant (e) choisi(e) seront assumées par l'AMS, qui recevra aussi une contribution de la SCMO et du Comité national canadien / Comité scientifique de la recherche océanographique (CNC/SCOR) à cette fin. La SCMO et le CNC/SCOR offrent aussi à l'enseignant choisi 300 $ (canadiens) chacun, soit au total 600 $, pour les déplacements.

Les ancien(ne)s participant(e)s du Canada ont trouvé leur expérience très enrichissante et stimulante. Les exposés de l'atelier sont présentés par des experts américains les plus réputés dans les sciences atmosphériques et océanographiques. Les enseignant(e)s sont revenu(e)s avec du matériel, des ressources et des modules didactiques qu'ils peuvent facilement adapter dans leurs cours.

Le/la candidat(e) choisi(e) devra écrire un court rapport pour la SCMO de son expérience estivale qui pourra être publié dans le *CMOS Bulletin SCMO*.

Les enseignant(e)s intéressé(e)s peuvent obtenir plus d'information en visitant le site Web http://www.cmos.ca/site/summerworkshops?language=fr_FR&.

Si vous êtes intéressé(e)s, vous devez télécharger le formulaire de candidature (en format pdf) et, une fois rempli, le poster ou l'envoyer par courriel à l'adresse donnée ci-bas avant le **15 mars 2017.**

SCMO - Atelier Projet Maury Casier postal 3211, Station D Ottawa, ON K1P 6H7
Téléphone: (613) 990-0300
courriel: coord-honneurs@scmo.ca

Canada Research Chair – Tier II

Geophysical Fluid Dynamics with Application To Physical Oceanography

The Department of Oceanography at Dalhousie University (www.dal.ca/faculty/science/oceanography.html) is seeking applicants for a Tier II Canada Research Chair in Geophysical Fluid Dynamics (GFD) with application to physical oceanography.

The successful candidate must have a Ph.D. in physical oceanography or related field, and have demonstrated research excellence in GFD. The candidate is expected to make effective use of (i) state-of-the-art models to better understand, and possibly predict, changes in the physical properties of the deep ocean and/or adjacent shelf seas, and (ii) modern data assimilation techniques in order to blend model predictions with observations. The successful candidate must have the potential to develop a collaborative and productive research program that is complementary to the ongoing research activities of the Department of Oceanography and other departments in the Faculty of Science (e.g., Physics and Atmospheric Science), and also engage with local, federally-funded research organizations and the national and international research community. In addition to research excellence, the successful candidate will be expected to contribute to the teaching and service mandates of Dalhousie University.

The Canada Research Chair (CRC) program was established by the Government of Canada to attract outstanding researchers to Canadian universities (www.chairs.gc.ca). The CRC program expects Tier II nominees to be excellent emerging researchers who have demonstrated research creativity and potential to achieve international recognition.

The successful candidate will be appointed to a tenure stream position at the rank of Assistant or Associate Professor. Review of applications will begin on December 1, 2016 but applications will continue to be accepted until the position is filled. The anticipated start date is 1 July, 2017 or as negotiated. The application should include a detailed *curriculum vitae*, a two to three page description of current research and accomplishments, three representative publications, the names and contact information of three referees, and a completed Self-ID questionnaire which is available at www.dal.ca/becounted/selfid. Please send the complete application to:

Professor Keith R. Thompson
Committee Chair ,Tier II CRC in GFD-PO
Department of Oceanography, Dalhousie University
GFD-PO@dal.ca

Dalhousie University is recognized internationally for its world-class academic programs and as one of Canada's leading research institutions. With its 200th anniversary on the horizon in 2018, Dalhousie continues to welcome talented scholars and encourages them to join its mission to make a lasting impact through the discovery, advancement and sharing of knowledge. The university is heavily involved in a number of major ocean-related research initiatives. A recent example is the new Ocean Frontier Institute (OFI; www.dal.ca/ofi) which will bring together researchers and institutes from across the globe to understand our changing oceans and create safe, sustainable solutions for ocean development. (The OFI will be supported by a $93.7M award from the Canada First Research Excellence Fund program (CFREF; www.cfref-apogee.gc.ca) and a similar contribution from government, private and partners.)

This Tier II CRC is reserved for external recruitment. Only candidates who are external to Dalhousie University may apply. Dalhousie is committed to fostering a collegial culture grounded in diversity and inclusiveness. The university encourages applications from qualified Aboriginal people, persons with a disability, racially visible persons, women, persons of minority sexual orientations and gender identities, and all qualified candidates who would contribute to the diversity of our community. All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority.

DALHOUSIE UNIVERSITY

The Morley K. Thomas Meteorology History Archives

I was privileged to be at a major event on November 1st in Downsview where Morley Thomas, 98, attended the dedication of the *Meteorology History Archives* in his name. About 80 people came to witness the dedication.

This event was well photographed and a collection is posted at:

http://cmosarchives.ca/Metphotos/T10/MKTArchives2016.html

Western University, London Ontario has offered to house and keep the *Morley Thomas Meteorology History Archives* in their climate controlled spaces but the material will remain property of Environment and Climate Change Canada (ECCC). The transfer will be happening soon.

Morley Thomas has been a major supporter of CMOS and our older members will remember his many contributions and awards including President 1968-1970, winner of the Andrew Thomson Prize in Applied Meteorology twice - in 1969 and 1982, and appointment as a Life Member in 1983. Morley also served many years as CMOS Archivist until 2006.

The following material and photo is reprinted with permission from ECCC Communications and its photographer, Nena Snyder.

Bob Jones

CMOS Archivist

Morley Thomas, Mary Attfield and David Grimes unveiling the plaque.

David Phillips speaking before the unveiling.

Career contribution recognized with the creation of the *Morley Thomas Meteorology History Archives*

A new page was added to the history of the Meteorological Service of Canada (MSC) and ECCC by the man who has organized most of those pages! Spanning more than half a century of important contributions to Canadian meteorology, Morley K. Thomas has cemented his place in the history of MSC.

On November 1, 2016, an event was held at Downsview to recognize the career and contributions of Mr. Thomas. The event culminated with the naming of the MSC's hard copy history collection organized by Mr. Thomas as the *Morley Thomas Meteorology History Archives.* The Archives will be loaned to Western University's Archives and Research Collections Centre to enhance its accessibility to the public.

Mr. Thomas' career spanned a remarkable 66 years, including over 41 years as a public servant and for a further 24 years as a volunteer archivist and historian. As a climatologist, Mr. Thomas contributed atlases, textbooks, scientific articles, monographs, guides and bibliographies. He was also instrumental in the inception of both the Canadian Climate Centre and the Canadian Climate Program. His work is recognized internationally, and he rose to be President of the Commission of Climatology and Applications of Meteorology in the World Meteorological Organization (WMO).

With not even a day off between jobs, Mr. Thomas retired in January 1983, and reported as a volunteer the very next day! His new challenge was organizing over two centuries of material to MSC's historic record. And once that was done and a finding guide for the collection created, Mr. Thomas wrote the history of the organization's first 75 years.

As ADM David Grimes remarked, "Your efforts to help us remember yesterday will inform our understanding of who we are today, and help us anticipate who we will be tomorrow."

Reconnaissance de la contribution professionnelle avec la création des *Archives de l'histoire de la météorologie Morley Thomas*

Un nouveau chapitre dans l'histoire du Service météorologique du Canada (SMC) et d'ECCC vient d'être ouvert par l'homme qui a organisé la plupart des pages de ce chapitre! Grâce à plus d'un demi-siècle de contribution importante au domaine de la météorologie au Canada, Morley K. Thomas a taillé sa place dans l'histoire du SMC.

Le 1 novembre 2016, un événement a eu lieu à Downsview pour souligner la carrière et la contribution de M. Thomas. Le point culminant de cet événement a été la création du fonds d'*Archives de l'histoire de la météorologie Morley Thomas*, la collection de documents historiques en copie papier du SMC que M. Thomas a lui-même organisé. Ces archives seront prêtées au centre d'archives et de collections de recherche de l'Université Western afin de les rendre plus accessibles au public.

Morley K. Thomas with the plaque that commemorates his namesake collection. / Morley K. Thomas avec la plaque qui commémore la création du fonds d'archives portant son nom. (photo by ECCC Communications - Nena Snyder)

La carrière de M. Thomas s'est étalée sur une durée remarquable de 66 ans. Il a travaillé pendant 41 ans à titre de fonctionnaire et pendant 24 années supplémentaires en tant qu'archiviste et historien bénévole. À titre de climatologue, M. Thomas a contribué à la création d'atlas et à la rédaction de traités, d'articles scientifiques, de monographies, de guides et de bibliographies. Il a également participé à la mise sur pied du Centre climatologique canadien et du Programme canadien de climatologie. Son travail est reconnu à l'échelle internationale et il a été nommé président de la Commission de climatologie et des applications de la météorologie de l'Organisation météorologique mondiale (OMM).

M. Thomas a pris sa retraite en janvier 1983 et, sans avoir pris une seule journée de congé, s'est proposé comme bénévole le jour suivant! Son nouveau défi consistait à mettre en ordre des documents historiques du SMC qui représentaient plus de deux siècles de matériel accumulé. Après avoir terminé cette tâche et créé un guide sur la recherche, M. Thomas a rédigé l'histoire des premières 75 années de l'organisation.

Comme le soulignait le SMA David Grimes : « Vos efforts pour nous aider à nous souvenir d'hier nous permettront de comprendre qui nous sommes aujourd'hui et d'anticiper qui nous serons demain ».

Announcement: AMS 2017 Annual Meeting
22-26 January 2017, Seattle WA

The American Meteorological Society's 2017 Annual Meeting will be held 22–26 January 2017 at the Washington State Convention Center in Seattle, Washington. The theme for the 2017 AMS Annual Meeting is "Observations Lead the Way."

The meeting will feature numerous town hall meetings and side panel discussions along with daily weather briefings that will be held during the lunch break each day beginning on Monday, 23 January, and will be hosted by both the local National Weather Service Forecast Office and the University of Washington. The AMS Annual Meeting is host to the largest exhibit program anywhere in the atmospheric, oceanic, and related sciences. Exhibitors come from all over the United States and abroad, with over 100 organizations showcasing a wide range of products, publications, and services. The show provides organizations with a forum to make major announcements and roll out new products. Demonstrations of new and innovative equipment are given daily.

The exhibit schedule is designed to both encourage social interaction and provide an opportunity to look at future trends in equipment, systems, and software. The Annual Meeting will be preceded by eight short courses, the 16th Annual WeatherFest, a briefing for first-time attendees to the meeting, the 97th Annual Review, New Fellows and Featured Awards, and a Welcome Reception.

The AMS Annual Meeting is cosponsored by the following organizations: American Geophysical Union (AGU); American Geosciences Institute (AGI); American Inst. of Aeronautics and Astronautics (AIAA); American Society of Agronomy (ASA) (Also Crop Science Society of America, and Soil Science Society of America); American Society of Agricultural and Biological Engineers (ASABE); American Water Resources Association (AWRA); Atmospheric Science Librarians International (ASLI); Australian Meteorological and Oceanographic Society (AMOS); Canadian Meteorological and Oceanographic Society (CMOS); Chinese Meteorological Society (CMS); European Meteorological Society (EMS); Indian Meteorological Society (IMS); International Association of Broadcast Meteorology; Natural Hazard Mitigation Association; The Oceanography Society; and the Water Environment Federation (WEF). Members of these organizations are offered a special co-sponsorship registration rate.

For additional information please contact the Annual Meeting Web site at
http://annual.ametsoc.org/2017/

Other CMOS News

People of a Feather - a Video Recommendation:

I found this documentary to be an excellent and compelling depiction of life in the Arctic and how it has changed in the past century. It depicts the dependence of the people of the Belcher Islands on the Eider Duck, and provides moving depictions of how changes in the sea ice and currents have affected the birds, which in turn affected the hunters and their way of life. In the end the stark conclusion is that the demands of southerners can impact the way of life of northern communities in ways we would not imagine, in this case due to hydroelectric dams in Quebec changing the currents of Hudson Bay. This documentary has won many awards over the last 5 years since being released in 2011. See http://www.peopleofafeather.com/ to purchase. Available on DVD at the Ottawa Public Library and maybe in other cities too.

by Martha Anderson, Past-President CMOS

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

(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.

(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

(2016-4) *A Canadian Environmental Chronicle (1954-2015)*, by James P. Bruce, Canadian Water Resources Association (CWRA), ISBN 978-1-896513-39-3, $19.00 (distributed by CWRA, membership@cwra.org)

You review it, yours to keep!

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

Disparate acidification and calcium carbonate desaturation of deep and shallow waters of the Arctic Ocean (Condensed Version) Yiming Luo[1] , Bernard P. Boudreau[1]* and Alfonso Mucci[2]
[1]Department of Oceanography, Dalhousie University, 1355 Oxford Street, Halifax, NS B3H4J1, Canada
[2]Department of Earth and Planetary Sciences, McGill University, Montreal, QC H3A 0E8, Canada

and

Tidal turbine placed in Upper Bay of Fundy

Photo courtesy of Dan Weaver

Atmosphere-Ocean 54-5 Paper Order

Applied Research / Recherche appliquée

Occurrence, durée et intensité des précipitations simulées par deux modèles régionaux canadiens du climat sur la région du Maghreb
Mariem Jelassi, Philippe Gachon, and René Laprise

Fundamental Research/Recherche fondamentale

Statistical Evidence for Asymmetry in ENSO–IOD Interactions
R. Kartika Lestari and Tieh-Yong Koh

Long-Term Variability of the Wind Field over the Indian Ocean Based on ERA-Interim Reanalysis
R. Rashmi, V. Polnikov, F. Pogarskii, I. Gomorev, V. Samiksha, and P. Vethamony

A Review of Thunderstorm Trends across Southern Ontario, Canada
Steven M. Huryn, William A. Gough, and Ken Butler

Distributions of Downwelling Radiance at 10 and 20 µm in the High Arctic
Zen Mariani, K. Strong, and J. R. Drummond

Evaluation of Total Precipitable Water from CRCM4 using the NVAP-MEaSUREs Dataset and ERA-Interim Reanalysis Data
D. Paquin, A. Frigon, and K. E. Kunkel

Next Issue CMOS Bulletin SCMO

The next issue of the CMOS Bulletin SCMO will be published in February 2017. Please send your articles, notes, workshop reports or news items before January 6th, 2017, 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.

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Prochain numéro du CMOS Bulletin SCMO

Le prochain numéro du CMOS Bulletin SCMO paraîtra en février 2017. Prière de nous faire parvenir avant le 6 janvier 2017 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.

Council / Conseil d'administration

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51st CMOS Congress | 51e Congrès de la SCMO

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