



# *CMOS* **BULLETIN**

*Canadian Meteorological  
and Oceanographic Society*

***SCMO***

*La Société canadienne de  
météorologie et d'océanographie*

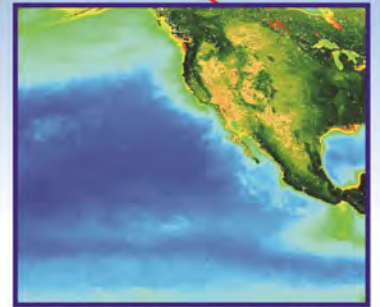
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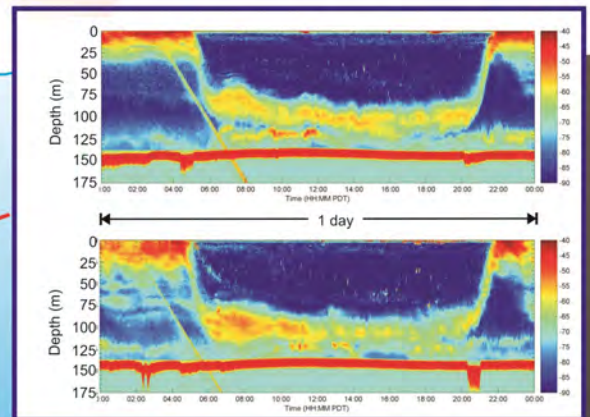
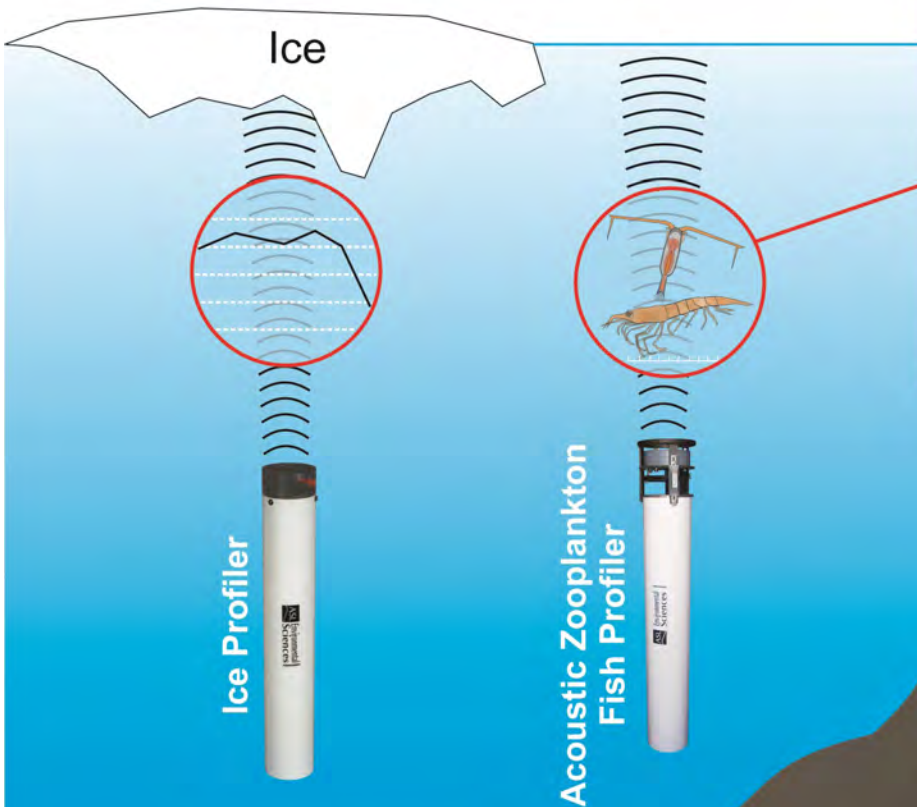


“Sunset Waves Nite” by CMOS member Phil Chadwick  
“Une nuit d’ondes crépusculaire” par Phil Chadwick, membre de la SCMO

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**CMOS Bulletin SCMO**

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

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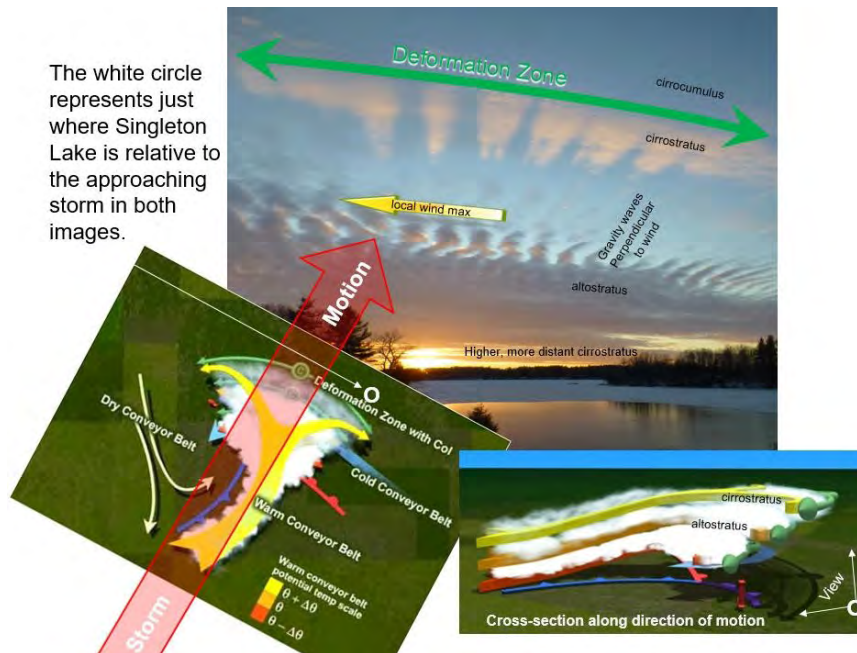
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*CMOS exists for the advancement of meteorology and oceanography in Canada. Le but de la SCMO est de promouvoir l'avancement de la météorologie et l'océanographie au Canada.*

# Cover Page o Page couverture

## “Sunset Waves Nite” by Phil The Forecaster Chadwick

A winter storm was approaching Singleton Lake as revealed by the large arch of the deformation zone advancing steadily from the western horizon. Even though the storm was steadily advancing northeastward, the winds in the atmosphere frame of reference where the clouds live were perpendicular to this motion and the gravity wave clouds. The clouds looked like a zipper, unzipping. These clouds were moving from the northwest meaning that the col of the deformation zone was thus further to the northwest as well, implicating that the thrust of the system would be over northeastern Ontario and not over Singleton Lake. This diagnosis was also consistent with the thinner cloud layers in the warm conveyor belt of the approaching system.



The zipper pattern in the gravity waves was caused by a slight convergence in the system relative winds with the point of the zipper pointing to the convergence line and slightly strong winds. The reverse is also true when the zipper is pointing upwind or upstream. The setting sun was illuminating higher and more distant cirrostratus along the horizon. The setting sun was reflected in the open water of Jim Day Rapids. The snow on the ice of Singleton Lake was not nearly as good a mirror as the still water.

These are the kind of thoughts you can have when you have time to sit and reflect, so to speak, on the stories that the clouds tell. The bottom line was that Singleton Lake was going to get into the warm sector of the approaching storm. A bit of a thaw was on the way. Meanwhile, northeastern Ontario would receive the brunt of the storm with freezing rain, snow and otherwise wintry weather. The cold front would come through in a day or two and bring winter back to Singleton - as it should be.

Note that the bands of cirrostratus convert to cirrocumulus on the opposite side of the deformation zone. It is a different air mass with different characteristics on the other side of the deformation zone. The drier air was more unstable. Note also that in the atmosphere everything happens in waves at regular intervals. The meteorological processes are more of a ballet than a battle with everything in perfect balance.

Une tempête hivernale s’approchait du lac Singleton, comme le révélait le grand arc de la zone de déformation qui se détachait résolument de l’horizon ouest. Même si la tempête progressait inévitablement vers le nord-est, les vents, dans le référentiel atmosphérique, où habitent les nuages, restaient perpendiculaires à ce mouvement et aux nuages sculptés par les ondes de gravité. Les nuages ressemblaient à une fermeture éclair qui s’ouvre. Ces nuages provenaient du nord-ouest et indiquaient que le col de la zone de déformation se situait aussi plus loin vers le nord-ouest. Ces conditions laissaient croire que le moteur du système se trouverait au-dessus du nord-est de l’Ontario et non pas au-dessus du lac Singleton. Ce diagnostic concordait aussi avec les couches minces de nuages de la ceinture de transport chaude du système imminent.

Le motif de fermeture éclair dans les ondes de gravité provenait d’une faible convergence dans les vents relatifs du système. La pointe de la fermeture éclair pointait vers la ligne de convergence et des vents un peu

# Cover Page ◦ Page couverture

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plus forts. Le contraire s'avère aussi quand la fermeture éclair pointe vers l'amont. Le long de l'horizon, le soleil couchant illuminait les cirrostratus situés haut et loin. Le soleil se reflétait sur les eaux ouvertes des rapides Jim Day. La neige couvrant la glace du lac Singleton n'offrait pas une aussi bonne réflexion que l'eau calme.

Voici le genre de pensées qui germent quand vous avez le temps de vous asseoir et de réfléchir aux histoires que racontent les nuages. En fin de compte, le lac Singleton allait se retrouver dans le secteur chaud de la tempête. Il fallait s'attendre à une légère fonte. Tandis que le nord-est de l'Ontario recevrait le gros de la tempête : pluie verglaçante, neige et autres conditions d'hiver. Le front froid passerait dans un jour ou deux et ramènerait l'hiver avec lui au lac Singleton, comme il se doit.

Notez que les bandes de cirrostratus deviennent des cirrocumulus du côté opposé de la zone de déformation. Il s'agit d'une masse d'air différente, avec des caractéristiques différentes, de l'autre côté de la zone de déformation. L'air sec était plus instable. Notez aussi que dans l'atmosphère tout est ondulation et arrive à intervalles réguliers. Les processus météorologiques ressemblent plutôt à un ballet qu'à une bataille, tout s'y déroule en parfait équilibre.



Taken by **Andrew Bell**, from his temporary office in Ottobrunn, near Munich, Germany, on January 20th 2016, this photo shows a (partial) complex halo. A **halo** is an optical phenomenon produced by light interacting with ice crystals suspended in the atmosphere, resulting in rings, arcs and spots in the sky. The photo was taken at 10:30 am, shortly after sun rise. The ice cloud was quite thick, and the bright central disc is looking straight into the sun. The cloud thickened more to the left of the picture blocking the complete halo from forming. The phenomena lasted for over 30 mins until the ice cloud started to disperse.

**Note from the Editor:** Apologies to **Majid Fekri**, whose name was spelled incorrectly in the August 2015 issue of the Bulletin (p. 147, Issue 43, no. 4).

## Letter from the Editor ◦ Mot de la rédactrice

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With any change comes the opportunity for growth in new ways. Paul-André Bolduc, the previous editor of the CMOS Bulletin, put in a lot of work over the 20 years that he managed this responsibility, and his departure from the role of editor left a space where questions needed to be asked. More than 200 of you responded to the survey that I put out seeking your opinions on what was working, what could work better, and what changes you might be interested in seeing.

There will be changes in how the Bulletin is formatted and delivered. For this issue, the first one under my responsibility, I focused on content. An email was sent out to you all seeking stories, and suggesting new headlines (**field stories, outreach, opinion pieces**, and more) under which articles could fall. What you will notice as you read on is that some of these headlines were filled, and others were not. What I discovered in this process is that change will be gradual.

If you have an idea for a story or an interesting photo of the sea, sky or laboratory, do send it on. Photos always have a story to tell. Of course the usual articles and reports are essential. The intention with broadening the scope of how your work could be written up is to make the Bulletin even more inclusive, and to allow the reader to have an experience that suits their needs. As we move into the process of making significant changes in how the Bulletin looks, and in how effectively we use our virtual platform, the content will always be the foundation for success.

As well as your story ideas I welcome your feedback, which you can send to me at [bulletin@cmos.ca](mailto:bulletin@cmos.ca). I look forward to working with you all, and I thank you for your patience as I learn how best to do this job. I can never hope to fill Paul-André's shoes, so instead my goal is to make my own shoes walk the path as well as his did!

Sarah Knight  
CMOS Bulletin Editor



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Tout changement apporte une occasion de croître en abordant la tâche autrement. Paul-André Bolduc, le rédacteur en chef précédent du Bulletin de la SCMO, a travaillé d'arrache-pied au cours des vingt dernières années à ce poste, et le départ de l'ancien rédacteur en chef ouvre un espace propice au questionnement. En ce sens, plus de 200 personnes ont répondu au sondage que j'ai envoyé pour connaître l'opinion des membres sur ce qui fonctionne, ce qui nécessite amélioration et ce qui leur plairait de retrouver dans le *Bulletin*.

Vous noterez des changements dans le format et la livraison du Bulletin. Néanmoins, pour ce numéro, le premier sous ma responsabilité, je me suis concentrée sur le contenu. Vous avez reçu un courriel sollicitant des histoires et des suggestions de nouvelles chroniques (**récits de campagne, sensibilisation, lettres d'opinion** et plus). Vous remarquerez en lisant le Bulletin que certaines de ces chroniques ont paru et d'autres, pas. J'ai découvert au cours de cette entreprise que les changements s'opéreront graduellement.

Si vous avez une idée de récit ou une photo captivante de la mer, du ciel ou d'un laboratoire, n'hésitez pas à nous l'envoyer. Les images nous racontent toujours une histoire. Bien entendu, les articles habituels et les rapports restent fondamentaux. L'intention derrière l'élargissement du contenu et la façon renouvelée de transmettre les nouvelles de vos travaux demeure de rendre le *Bulletin* plus inclusif qu'avant et d'offrir au lecteur une expérience qui correspond à ses besoins. À mesure que nous entreprenons les changements visuels considérables du Bulletin et que nous utilisons la plateforme virtuelle de plus en plus efficacement, le contenu, lui, demeurera toujours à la base de notre succès.

Tout comme pour vos idées d'articles, j'attends vos commentaires à l'adresse [bulletin@scmo.ca](mailto:bulletin@scmo.ca). Je me réjouis de collaborer avec vous tous et vous remercie de votre patience, tandis que je cherche la meilleure façon d'accomplir ce travail. Je ne tenterai pas de marcher dans les pas de Paul-André, je tracerai plutôt ma propre voie, qui sera, je l'espère, aussi fructueuse que la sienne!

Sarah Knight  
Rédactrice du Bulletin SCMO



## Friends and Colleagues

In June of this year at the 50<sup>th</sup> CMOS Congress in Fredericton, New Brunswick, I accepted the nomination as President of CMOS for the year 2016 to 2017 leading up to the 50<sup>th</sup> Anniversary of the Society that will be celebrated at the next Congress in Toronto, June 2017. First and foremost, a special thanks needs to be expressed to the excellent work of the Chair of the Local Arrangements Committee in Fredericton, Professor William Ward, the Chair of the Scientific Program Committee, Paul Yang, and all the volunteers of the Fredericton LAC, who executed an excellent annual congress. Bravo Zulu!

I have been involved in CMOS for many years now, working through many different functions, including as Chair of the Ottawa Centre for the three years and as part of the National executive for the past couple years. I am grateful and honoured to have the opportunity to serve this prestigious society. But the Canadian landscape of atmospheric and oceanographic science is changing, and changing fast, and so should this society in order to meet these challenges. As a Society we need to evolve and grow, or else we risk becoming irrelevant to Canadians. In the past couple years the Society was challenged by Harinder Ahluwalia with his important intervention to create a broad survey to assess the needs of our society. He urged the Society to understand that in order to move forward we need to prioritise our collective efforts, as documented in “A Roadmap for Future of CMOS”. However, I want to emphasize that CMOS is a volunteer organisation which limits our growth capabilities. For those who know me well in CMOS, know that I am adamant that a society needs to be well sustained and well managed financially, with proper resources. Hence, by taking the vision and initiatives of Harinder, the Executive Director, Gordon Griffiths, and I, will engage in building a Strategic and Business Plan for CMOS that will help pave the way for a prosperous and sustainable future. To put in place mechanisms to reduce losses and stimulate growth. This means that we need to grow our corps of volunteers, and also to accept that we may need to spend money and to be more “corporate-like” in how we operate. Re-building the national office after a flurry of retirements, and bolstering its effectiveness, is a priority that I hope I will be able to lead. Peter Bartello recognised a few years back that the CMOS headquarters is composed of a small number of people doing a large amount of work. “A redistribution of the tasks, succession planning and how to finance them are important topics of current discussion” (sic).

At a meeting of the CMOS Centres in Fredericton, I was reminded of the importance of the 14 Centres across the country being the grassroots of our society. Yet, by the same token, I am reminding the membership that the branding and strength of CMOS are the Congresses themselves. We meet each year, we share our science and fellowship, and hopefully build our value-chain and networks of scientists, managers and friends. But the Congresses also need to change. With that said, we are looking at enhancing the Congress technologies where delegates will download an App to promote communication and ease of access to Congress information. This will allow Congress participants to be active and an important component of the organisation infrastructure. We may even move from the standard parallel science sessions every day to one that incorporates workshops, panels and plenaries all in parallel with the scientific talks. This will add to the flavouring and variety of our Congresses like never before. Furthermore, we are exploring at becoming paperless and using electronic media to its fullest extent – not only are we significantly reducing printing, postage and handling costs for publications like the CMOS Bulletin, but we are following our own commitment to inspire environmental stewardship. I also believe that we need to be more strategic in how we choose Congresses. At this time the CMOS Executives and Council are in negotiation with CGU to co-host the next General Assembly of the International Union of Geodesy and Geophysics (IUGG) in Montreal in 2019

# ***Words from the President***

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(est. 5000 delegates and the potential for major global recognition of Canadian Science & CMOS). In addition, I discussed with Paul Myers from Alberta that we need to have a Congress in Alberta and I would like it to be in Fort McMurray – perhaps the theme of that Congress can be Emergency Management in Meteorology and Oceanography.

For four years in a row CMOS membership declined, but in 2015 we turned a corner and saw an increase of over 100 members. This is a trend we need to continue. We can inject all kinds of programs within CMOS, but if we are not relevant to Canadian Society then who will care what programs we have in place? So ... how do we become relevant? In my view we need to be front and centre with any if not all environment issues – we, as some of the best meteorologists, oceanographers and scientists in the world, need to express and share our expert opinions on behalf of CMOS. This is where the CMOS Special Interest Groups (SIGs) come in as the proactive arms of the Society. Today we have two SIGs (The Arctic and Aviation SIGs) – by the end of this year I hope to stand up a Marine Science SIG that addresses the shortfall of Oceanography in CMOS and a Space Agency Earth Observation SIG to embrace environmental science from space.

As we approach the 50th anniversary of this Society, and as our executives grow longer in the teeth, we need to harness the talent and energy of the Canadian student populations. In Fredericton, students formed a strong percentage of the attendees to this Congress. Yet how do we attract and retain their participation in CMOS? How do we support them as they strive to have careers in meteorology and oceanography? In my view, student membership fees for CMOS should be waived in order to encourage greater participation. After much debate in Council and at the AGM this year, and to coincide with the 50th Anniversary of CMOS, Student membership to CMOS will be FREE. But let's be clear – while it may seem like a free ride, we as a community are also looking to the students to give back to the Society. I guarantee that as you contribute to CMOS you will also reap the dividends. I hope the students will embrace this opportunity so that we can swell the ranks of the CMOS student membership. It may be hard to express a value proposition for students - but this is a much needed start.

Finally, the Toronto Congress that will celebrate the 50th Anniversary of CMOS, promises to be a big one, with many new opportunities for members and the Society. Martha Anderson, our past President, will be leading the coordination along with the Chair of the Toronto Local Arrangement Committee, Ron Bianchi. Arrangements are already well under way for what promises to be another important and productive scientific meeting.

I hope to see you many of you there. Once again thank you for allowing me to serve this important community and society. Fair winds and a following Sea.

*Martin L. Taillefer, CMOS President*



# Allocution du président

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## Amis et collègues

En juin dernier, au 50<sup>e</sup> Congrès de la SCMO à Fredericton (Nouveau-Brunswick), j'ai accepté le poste de président de la SCMO pour l'année 2016-2017, ce qui nous amène au 50<sup>e</sup> anniversaire de la Société, que nous célébrerons au prochain congrès, à Toronto, en juin 2017. Tout d'abord, je remercie expressément le professeur William Ward, le président du comité local d'organisation, pour son excellent travail à Fredericton; ainsi que Paul Yang, le président du comité du programme scientifique; et tous les bénévoles du comité local d'organisation, qui ont produit un excellent congrès annuel. Bravo Zulu!

Je participe activement à la SCMO depuis nombre d'années. J'y ai assumé diverses fonctions, y compris président du centre d'Ottawa pendant trois ans et membre de l'exécutif national depuis ces quelques dernières années. Je suis reconnaissant et honoré d'avoir la possibilité de servir au sein de cette prestigieuse organisation. Mais le portrait canadien des sciences atmosphériques et océanographiques change, et très rapidement. Notre société doit suivre de près, afin de rester dans le coup. En tant qu'organisation, nous devons évoluer et croître. Sinon, nous risquons de perdre notre pertinence auprès de la société canadienne. Au cours des dernières années, Harinder Ahluwalia a mis la SCMO sur la sellette en créant un important sondage, qui couvrait plusieurs aspects de la Société, afin d'en révéler les besoins. Il a enjoint à la Société de comprendre que pour avancer, nous devons prioriser nos efforts collectifs, comme indiqué dans le document sur le futur de la SCMO : *A Roadmap for the Future of CMOS*. Toutefois, je souligne que la SCMO est une organisation de bénévoles, ce qui limite notre capacité de croissance. Ceux qui me connaissent bien savent que je suis fermement convaincu qu'une société nécessite une gestion et un soutien financiers adéquats, et des ressources suffisantes. En ce sens, en tenant compte de la vision et des initiatives d'Harinder, Gordon Griffiths (directeur général), et moi-même élaborerons pour la SCMO un plan stratégique et d'affaires, qui ouvrira la voie à un futur prospère et durable et qui mettra en place des mécanismes permettant de réduire les pertes et de stimuler la croissance. Ces projets nécessiteront l'agrandissement de notre groupe de bénévoles, ainsi que l'acceptation que nous devons dépenser davantage et être plus « commercial » qu'avant dans notre façon de fonctionner. Remettre sur pied le bureau national après la vague de retraites et renforcer son efficacité est une priorité que je compte mener à bien. Peter Bartello a perçu il y a quelques années que l'administration de la SCMO se composait de peu de gens qui effectuaient une grande quantité de travail. « Une redistribution des tâches, la planification de la succession et la manière de les financer sont d'importants sujets de discussion. »

Au cours d'une réunion des centres de la SCMO à Fredericton, on m'a rappelé l'importance des 14 centres dispersés dans tout le pays et représentant la base de la Société. Toutefois, en même temps, je rappelle aux membres que la marque et la force de la SCMO sont ses congrès. Nous nous rencontrons chaque année, nous partageons nos travaux scientifiques et renforçons notre camaraderie, nous construisons notre chaîne de valeur et nos réseaux de scientifiques, de gestionnaires et d'amis. Mais le Congrès aussi doit changer. Cela étant dit, nous comptons nous appuyer davantage sur la technologie dans le cadre des congrès. Les participants pourraient télécharger une application qui faciliterait la communication et l'accès aux renseignements sur le Congrès. Cette mesure permettra aux congressistes d'être actifs et s'avérera une importante composante de l'infrastructure de l'organisation. Nous pourrions même nous éloigner de la structure habituelle des séances scientifiques quotidiennes parallèles pour incorporer ateliers, panels et plénières, parallèlement aux présentations scientifiques. De cette façon, nous ajouterons comme jamais avant de la saveur et de la variété à notre Congrès. De plus, nous explorons la possibilité d'organiser un

# Allocution du président

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congrès « sans papier » et d'utiliser les médias électroniques à leur plein potentiel. Non seulement sommes-nous en voie de réduire considérablement nos coûts d'impression et d'envois postaux relativement aux publications comme le *Bulletin de la SCMO*, mais nous tenons notre propre engagement à présenter un modèle de gestion écologique. Je pense que nous devrions être plus « stratégiques » dans notre choix de congrès. En ce moment, l'exécutif et le conseil de la SCMO poursuivent leurs négociations avec l'UGC pour organiser conjointement la prochaine assemblée générale de l'Union géodésique et géophysique internationale (UGGI), à Montréal, en 2019 (environ 5000 participants et la reconnaissance mondiale des sciences canadiennes et de la SCMO). De plus, j'ai discuté avec Paul Myers de l'Alberta de la possibilité de tenir un congrès dans cette province. J'aimerais qu'il se déroule à Fort McMurray, possiblement sous le thème de la gestion des urgences en météorologie et en océanographie.

Le nombre de membres de la SCMO a décliné durant quatre années de suite, mais en 2015 nous avons pris un virage et vu une augmentation de plus de 100 membres. Cette tendance doit se poursuivre. Nous pouvons démarrer toute sorte de programmes au sein de la SCMO, mais si nous ne sommes pas pertinents aux yeux de la société canadienne, qui se souciera de ces programmes? Alors, comment augmenterons-nous notre pertinence? Selon moi, nous devons prendre part à tous les débats environnementaux. Nous devons exprimer et partager, en tant que meilleurs météorologistes et océanographes de la planète, nos opinions d'experts au nom de la SCMO. C'est ici qu'entrent en scène les groupes d'intérêts spéciaux de la SCMO, en tant qu'organes proactifs de la Société. Nous avons deux de ces groupes (un pour l'Arctique et l'autre pour l'aviation). À la fin de l'année, j'espère mettre en place un groupe d'intérêts spéciaux relatif aux sciences de la mer, qui travaillerait sur les lacunes de l'océanographie au sein de la SCMO, ainsi qu'un groupe d'intérêts spéciaux relatif aux observations de la Terre de l'Agence spatiale, afin d'inclure la perspective spatiale des sciences environnementales.

À mesure que le 50<sup>e</sup> anniversaire de la Société devient réalité et que nos dirigeants s'approchent de la retraite, nous devons exploiter le talent et l'énergie de la population étudiante canadienne. À Fredericton, les étudiants formaient un fort pourcentage des congressistes. Comment, alors, les attirer et les retenir au sein de la SCMO? Comment pouvons-nous les soutenir tandis qu'ils s'efforcent de se bâtir une carrière en météorologie et en océanographie? À mon avis, nous devrions dispenser les étudiants des frais d'adhésion à la SCMO, afin d'encourager leur participation. Après bien des débats au sein du conseil et durant la dernière AGA, et de concert avec le 50<sup>e</sup> anniversaire de la SCMO, l'adhésion des étudiants sera gratuite. Mais soyons clairs! Même si cette mesure ressemble à un traitement de faveur, nous, en tant que communauté, nous tournerons vers les étudiants pour qu'ils participent activement à la Société. Je vous garantis que tandis que vous contribuerez à la SCMO vous en retirerez des dividendes. J'espère que les étudiants profiteront de cette occasion visant à grossir leurs rangs au sein de la SCMO. Il sera peut-être difficile de définir une proposition de valeur pour les étudiants, mais il était grand temps de se tourner vers eux.

Finalement, le Congrès de Toronto, où nous célébrerons notre 50<sup>e</sup> anniversaire, promet d'être grandiose, avec des occasions nouvelles destinées aux membres et à la Société. Martha Anderson, notre présidente sortante, sera responsable de sa coordination avec le président du comité local d'organisation de Toronto, Ron Bianchi. Les préparations vont déjà bon train pour ce qui promet d'être une autre rencontre scientifique importante et fructueuse.

Je compte vous y voir en grand nombre. Laissez-moi à nouveau vous remercier de me permettre de servir cette importante communauté et société. Bon vent, bonne mer!

*Martin L. Taillefer, président de la SCMO*

# C4 2017

CatIQ's Canadian Catastrophe Conference


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## Events, Prediction and Performance Measurement:

Finally! A Way to Measure if the Weather Forecasts are Really Getting Better

By Phil "The Forecaster" Chadwick



The problem is really quite simple. Forecast accuracy could be any number between perfection and pitiful. I could generate these quantities and with a straight face, show that the calculated quantities were accurate. Just not very informative or helpful. At the seasonal and spatial scales of the Farmer's Almanac, Environment Canada (EC) provides excellent service. At the scales where people live and farmers make important decisions, that accuracy can be lacking.

The proposed solution developed gradually over years, beginning in the mid 1980's. It required a revamping of the way that EC provided services. It was time for a change from the 1950's teletype approach! The spatial and temporal scales of both the event and the prediction had to be explicitly stated along with the lead time. Only then could definitive performance measurement calculations be made. The system was immune to gaming and it provided valuable information on both the event, and the prediction. Time and space could be incrementally stepped, over all possibilities, creating a performance measurement surface in addition to the simple, single number of the volume under that surface. The system was indeed everything for everyone.

By 2001 I had built a working prototype on my home computer using visual basic and the data from Ontario Region. Performance measurement calculations took only a few hours to complete as the system was largely automated. Give me the data and I could deliver the results. In 2004 I started to incorporate remote sensing data into the event database. "Radar Events" promised to fill the huge data voids where good forecasts turned bad just because of a lack of infrastructure. Man-made structures are good detectors for storm damage. Trees falling in a forest required to verify severe weather events seldom get reported. I wanted to include satellite and lightning data as the next steps towards more complete utilization of remote sensing information.

During these years as an active CMOS member, I promoted these approaches at every opportunity. It has been maybe three decades since I first presented these ideas, and progress within EC in regards to weather forecasting performance measurement can be best described as glacial. I tried describing these concepts in different ways with the hopes that one of the metaphors would connect. I even stooped to use a partitioned liquor box. Bean bags tossed into boxes of various temporal and spatial sizes was another attempt. Humour and presentations that pushed the PowerPoint envelope were also employed but without undermining the importance of the material. Writing this piece in the Bulletin is another attempt... persistence can be viewed as both a positive and a negative.

Simultaneously, the PhD team at COMET carefully reviewed my research papers and approaches. There are many papers and these can all be found on the COMET-NorLat site. The research paper simply called "Verification" is a summary of the approaches and is a good place to start. [COMET Publications can be found at: <http://www.comet.ucar.edu/index.php>]\*

My hope and goal was to completely modernize the messaging and performance measurement systems so that the time, space and lead-time characteristics of any prediction were explicitly included. With a proper performance measurement system, the value of weather services could have been unequivocally estimated and demonstrated to the decision makers. Resources allocated to weather services could have been more than justified. It could have been great... but maybe it is not too late...

\*[http://www.meted.ucar.edu/norlat/cases/results.php?location=%25&author01=Chadwick%2C+Phil&event\\_type01=%25&lang=%25&tools=%25&submit=Submit](http://www.meted.ucar.edu/norlat/cases/results.php?location=%25&author01=Chadwick%2C+Phil&event_type01=%25&lang=%25&tools=%25&submit=Submit)

# As I See It

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## **About Phil:**

Trained at Queen's University as a nuclear physicist, "Phil the Forecaster" has been a professional meteorologist since 1976. However, painting has always been his passion. Phil is an avid "plein air" painter when he's not doing severe weather prediction for Environment Canada or looking after nature on Singleton Lake. Phil paints strong, colourful panels of Canadiana with a passion for visually expressing the effects of weather on water, land and light.

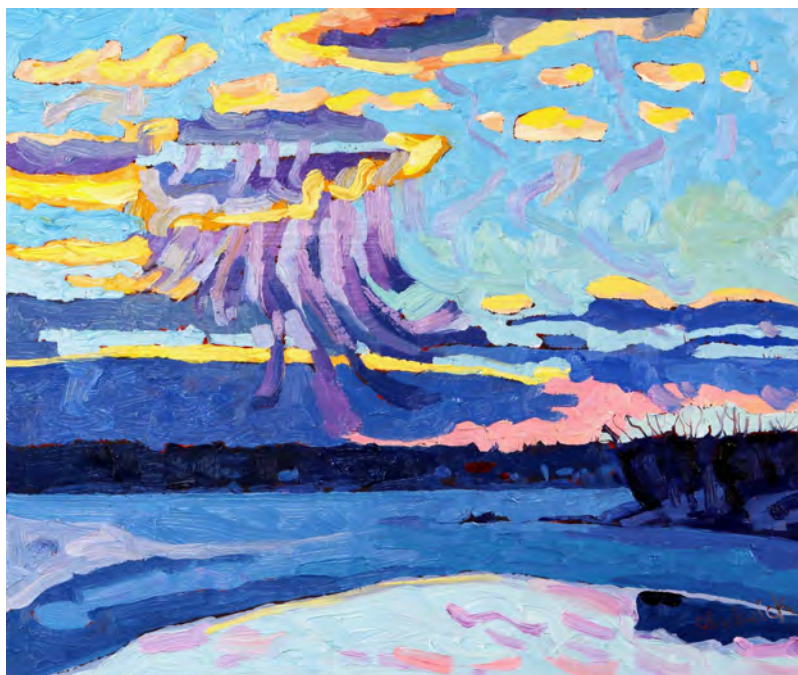
Phil became the first Southampton Art School Artist in Residence in 2006. His work was also accepted to hang along side the work of some big name Canadian artists in the Algonquin Arts Centre and other galleries in Ontario. He also toured across Canada as the 2006 Tour Speaker for the Canadian Meteorological and Oceanographic Society. Phil's work now hangs around the world... life is good!

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## **"Sunset Snow Virga"**

There is no virga like snow virga. Wafts of ice crystals can fall from a minimal thickness of cloud. Falling at only one metre per second, it could take an hour to make the trek to the ground. If the cloud is based between eight and ten thousand feet high, as I estimated in this case, it would take about 50 minutes for the snow flakes to reach the ground. A lot of things can happen in that hour. In this situation the ice crystals were mainly sublimating back into vapour as they fell into the drier, cloud free air mass. The cloud on the horizon was the deformation zone cirrostratus announcing the approach of the next winter precipitation event

Sunsets are always interesting and I try to take a few minutes every day to appreciate the light show.



## **"August Sunset"**

This is the summer, sunset sky of August 1st, 2015 around 9 pm. The towering cumulus in the unstable summer air mass in the wake of a cold front were decaying with the setting sun. The lake was getting quiet again after a full day of boating and swimming.

Northwesterly breezes were sculpting the remains of these convective towers. I doubt that the cumulus were ever tall enough to deliver any precipitation. These winds carved tropical angel fish - actually an entire school. There are other things in the clouds like the USS Enterprise but I will leave them for you to discover

## Modelling Uncertainty without Assuming a Probability Distribution

By David Collins, University of Victoria

Uncertainty shines its mischievous smile many times in our areas of science: on the land, in the air, and in the water; in our observations, when we measure, and in the models we use. We have developed a novel approach to accurately and efficiently model uncertainty that does not require the assumption of any probability distribution. What are the areas of climate modelling or numerical weather prediction (NWP—sea ice, glacier melt, etc?) where this approach could be applied and any errors associated with assuming an a priori probability distribution then be eliminated?

Whether uncertainty arises from the finite precision of measurement instruments when we acquire in-situ data in a world of infinite possibilities or the truncation associated with discretizing a continuous function on a computer, we must account for it in the models we design, construct, and employ. Cloud microphysicists typically use a probability distribution when handling the uncertainty in the number of water droplets of any possible size. Probability distributions such as gamma or log-normal have been used, and the zeroth moment gives number concentration, while the first moment gives mass. The parameters associated with these distributions become tuning parameters for a collision and coalescence model.

Contrary to assuming a probability distribution of droplet sizes, our method assumes that a distribution of droplet sizes exists and that it has a mean. We represent the distribution as a mean density and a set of fluctuations, and essentially use physical laws such as conservation of mass to reshape uncertainty which resides in the state space (droplets sizes) into uncertainty in stochastic processes, and use well-known operations on stochastic processes to produce an efficient parameterization (fig 1).

To which areas of climate modelling (e.g. sea ice, glacial melt) or NWP could we apply this same approach? What areas of research could benefit from eliminating any errors associated with assuming an a priori probability distribution? How many components of climate models rely on a probability distribution which could then be represented as mean and a set of fluctuations from that mean?

### Future Potential Application #1

Other areas of cloud microphysics that contain uncertainty include entrainment/detrainment and the evolution of ice particles. Previous efforts to model entrainment/detrainment include assigning probability distributions to the plume size and plume frequency (Kerstein (1991), Kreuger (1997), Dawe and Austin (2013)). We plan to augment the stochastic model of warm cloud collision and coalescence with the inclusion of stochastic entrainment by representing plume size as a mean and a fluctuation from that mean, and representing plume frequency similarly. Not only will this eliminate any need for a priori probability distributions for plume size and frequency, but it removes the restriction that any single distribution be applied to all cases regardless of differences in macroscopic attributes such as cloud age, cloud type, or turbulent intensity.

### Future Potential Application #2

The uncertainty associated with solid water particles in clouds may be able to be represented without the ad-hoc assumption of probability distributions. Following the path laid out by Morrison and Milbrandt (2015, 2016), consider frozen water particles (snow, ice, graupel, and hail) to exist in a 2-D space constructed by two continuum defined characteristics that these four objects share. Could the space defined by these two continuum be represented as two means and corresponding sets of fluctuations from those means?

**What other areas of climate modelling could benefit from replacing a probability distribution with a mean and a set of fluctuations from that mean? If you're interested in collaborating and applying this new method of modelling uncertainty to your area of research, please contact David Collins at davidc@uvic.ca.**

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### **About David**

David has recently defended his Ph.D. dissertation at the University of Victoria. He'll teach at Vancouver Island University for the coming year and is looking for research opportunities to apply the new model of uncertainty in other areas of climate modelling. David is pictured here giving public demonstrations on how evacuated tubes in domestic solar water heaters work.



We accomplish this by representing droplet density  $n(x, t)$  as the sum of a mean density and a random fluctuation from that density. Equations 1 and 2, and the manner in which they are reshaped into a stochastic process (Equation 3) are depicted in a cartoon in Figure 1.

$$n(x, t) = \begin{cases} \frac{N_c(t)}{x^* - 0} + \delta_c(x, t), & x \leq x^* \\ \frac{N_r(t)}{x_m - x^*} + \delta_r(x, t), & x < x^* \end{cases} \quad (1)$$

where  $x$  is the droplet mass,  $\delta_c, \delta_r$  are random variables (fluctuations from the mean),  $x^*$  is the separation mass acting as a threshold between cloud (buoyant) droplets and rain (precipitating) droplets, and  $x_m$  is largest drop s.t.  $n(x, t) = 0$  for all  $x > x_m$  and for all  $t$ . Here, the mean cloud number density  $N_c(t)/x^*$  is given by the ratio of the aggregate cloud number  $N_c(t)$  to the length of the interval on the droplet size spectrum that represents cloud droplets. The mean rain number density is similarly constructed.

We make corresponding approximations for cloud and rain mixing ratios:

$$q(x, t) = \begin{cases} \frac{q_c(t)}{x^* - 0} + \gamma_c(x, t), & x \leq x^* \\ \frac{q_r(t)}{x_m - x^*} + \gamma_r(x, t), & x < x^* \end{cases} \quad (2)$$

where  $\gamma_c$ , and  $\gamma_r$  are random variables (fluctuations from the mean).

The kinetic collection equation is used to simulate the collision and coalescence of water droplets in clouds:

$$\frac{\partial n(x, t)}{\partial t} = \frac{1}{2} \int_0^x n(x - x', t)n(x', t)K(x - x', x)dx' - \int_0^\infty n(x, t)n(x', t)K(x, x')dx'$$

where  $n(x, t)$  is a number density function and  $K(x, x')$  is a collision rate function. Equations 1 and 2 are substituted into the zeroth and first moments of the kinetic collection equation using the relationship between number concentration and mixing ratio:  $xn(x, t) = q(x, t)$ , and a zeroth order truncation of the 2-D Taylor expansion of kernel about the centroids of the cloud and rain aggregates.

Each integral contains two occurrences of the number density function, thereby causing terms containing product fluctuations. The integrals containing product fluctuations are intractable. We these represent instantaneous, aggregate product fluctuations as points in stochastic processes. An example from the parameterization of the evolution of cloud mixing ratio is shown:

$$X(t) := \frac{1}{q_c N_c} \iint_{\Omega_1} \delta_c(y, t)\gamma_c(z, t)d\Omega_1 \quad (3)$$

where  $\Omega_1$  is a region in the 2-D pre-collision droplet space. Now,  $X(t)$  can be represented as the sum of a mean and a fluctuation scaled by the standard deviation:

$$X(t) \approx \mu + \sigma\xi \quad (4)$$

Data shows us that the standard deviations are at least two orders of magnitude smaller than the means which permits the elimination of the terms containing the fluctuations of the stochastic processes. The remaining terms form a parameterization of collision and coalescence of warm water droplets where the parameters of the model are the means of the stochastic processes, and they all have physical meanings. The details of the derivations and the validation can be found on ArXiv: <http://arxiv.org/abs/1512.08517> and <http://arxiv.org/abs/1605.02724>.

**Figure 1.** We essentially use physical laws such as conservation of mass to reshape uncertainty in the state space (droplet sizes) into uncertainty in a stochastic process, and use well-known operations on stochastic processes to produce an efficient parameterization.

## Breaking Barriers with Live Dives

By Maeva Gauthier

If people protect what they love, like Jacques Cousteau suggested, how do you make people love something that is far away and inaccessible for most? Over 4,000 students online and five venues from across Canada joined a unique event in June for World Oceans Day. During a special interactive 40 minute show, people were able to send their questions to a dive team live and get answers in real-time.

Fish Eye Project is an organization based in British Columbia. Their mission is to revolutionize ocean education by offering live underwater broadcasting for ocean education and outreach purposes. People can see, hear, talk and share in the discovery of spectacular marine environments with scuba divers, in real time, all without ever getting wet. June 8th, 2016 was the first time a Live Dive was streamed on an IMAX screen and the team has bigger projects planned for this year to expand programs in other languages for an international audience.

Fish Eye's next live underwater adventures will take us on both sides of the Pacific Ocean, in September for *Running Wild*, to follow wild salmon to their final destination before the cycle begins anew. In November, journey to the South Pacific for a live underwater expedition on the coral gardens of New Caledonia to discover the Spirit of the Reef. For more information visit the website [www.fisheyeproject.org](http://www.fisheyeproject.org).



### About Maeva

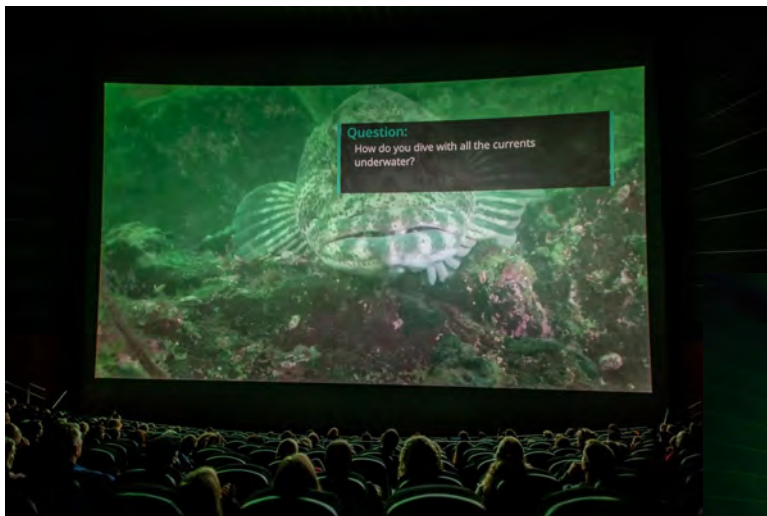
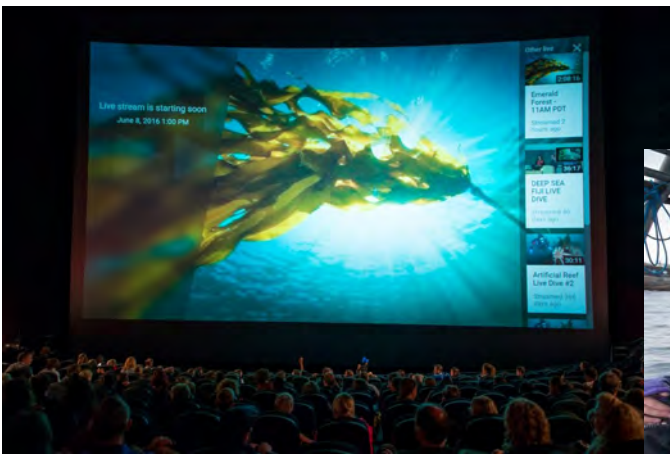
Maeva Gauthier is a marine biologist and filmmaker working on the West coast of Canada. Her interest is in bridging the gap between ocean sciences and the public.

She co-founded Fish Eye Project, a non-profit organization using live underwater broadcasting, which aims to connect people with the ocean in an entertaining, engaging, and educational way.

Maeva is pictured here, with her son, at a recent Live Dive event.



# Outreach



## Results of an Expert Forum on Ocean Data Management in Canada

By Lee Wilson<sup>1</sup>, Mike Smit<sup>1</sup>, and Douglas W.R. Wallace<sup>2</sup>

<sup>1</sup>Dalhousie University; Marine Environmental Observation Prediction and Response Network (MEOPAR)

Sound knowledge and understanding of the world's oceans is essential for mitigating human impacts on the global environment and for promoting sustainable economic use of the marine environment (CCA, 2012). Knowledge and understanding, in turn, depends on access to accurate, rich, available, open, and integrated ocean data by end-users, including academic researchers, policy- and decision-makers, private enterprise, and the general public (Gallagher et al., 2015; Hall, Harrison, & Stammer, 2010; Wallace et al., 2013). Recent reports suggest that strong regional actors capable of collecting and managing their own data, delivering benefits that are tailored to the specific needs of their communities, and pioneering innovative technologies and data management practices is one of the strengths of the Canadian ocean data management (ODM) community (CCA, 2013; OSTP, DFO, & CSA, 2011; Wallace et al., 2013). Despite this, the absence of a cohesive national network has resulted in a fragmented ocean sciences sector in Canada (OSTP, 2011). This so-called "coordination gap" has made access to data by end-users difficult, with data and forecasts collected by various programs, organizations, and agencies being scattered across a range of web-pages that can be difficult to find and hard to access – or not available at all (CCA, 2013; OSTP, 2011). A careful re-examination of our data management practices, including how we share, access, and use data, is necessary to ensure we are leveraging Canada's ocean data to best support scientific excellence, foster collaboration and innovation across sectors, and harness ocean data to inform decision-makers and other stakeholders.

To that end, an Expert Forum on Ocean Data Management (November 18-19, 2015 in Montreal, Canada) was held to bring together national and international experts and stakeholders to present and evaluate international best practices in managing data from ocean observations, the current state of ocean data collected and managed in Canada, and goals and visions for the future of ocean data management in Canada. Members of Canada's Community of Practice on Ocean Data Management (CoP ODM; oceansdata.ca), many of whom have been trying to increase coordination and data sharing for years, informed the agenda and identified guest speakers. Organized and sponsored by the Marine Environmental Observation Prediction and Response (MEOPAR) network, this forum built on previous events including a national Data Management Workshop (March, 2014) and a joint DFO-MEOPAR Workshop on Ocean Data Management in the Atlantic Canada Region (July, 2015). Over fifty participants from government, academia, and the private sector attended. The results are documented in a vision paper (Wilson, Smit, and Wallace, 2016) and summarized briefly here.

Representatives from the Integrated Ocean Observing System (IOOS; www.ioos.noaa.gov) in the United States and the European Marine Observation and Data Network (EMODnet; www.emodnet.eu) and MARUM (www.marum.de/en) in Europe presented at the Expert Forum. Each described the lessons learned in the development of their respective organizations. Both Europe and the United States, like Canada, must work within dispersed and geographically and politically diverse climates, but the system that resonated the most with Canadian participants was the U.S. IOOS, for several reasons. IOOS operates within a national, rather than international, framework, and four out of the eleven regional associations in IOOS directly share waters with Canada (BC/Alaska; BC/Washington; the Great Lakes; and Maine/Nova Scotia/New Brunswick) which has led to various Canada-US collaborations.

The Expert Forum was designed to not only inform attendees, but also to actively engage the audience – who collectively brought substantial expertise in ODM and the Canadian context – as participants in the conversation about how to advance the state of ODM in Canada. During facilitated breakout sessions, participants (including representatives from every member of the CoP) were asked to describe what they envisioned for the future of ODM in Canada and what they would be willing to commit towards the realization of this vision. There was a clear consensus: we need to take action; Canada needs a national integrated ocean observing system, funded and



supported with appropriate long-term resources, and it needs to be done sooner rather than later. More importantly, there was a willingness to work together, and with the government and private sector, to realize this goal.

The vision that emerged from the discussion was the formation of a Canadian Integrated Ocean Observing System (CIOOS): an integrated OOS for Canada that would bring together and leverage existing Canadian and international ocean observation data, programs, and projects to generate value-added data products on an open web-based platform that maximizes utility to end-users (e.g., government, science partners, industry, and the public). The system as described would include a national coordinating body that would federate the data currently collected by the diverse regional groups across Canada into a publically-accessible web-based platform, without altering ownership of the data. A sustainable funding model would provide stability to existing regional OOSs, incentivizing sharing. The proposed system would also include several regional OOSs with areas of responsibility to be defined. Regional nodes would have the mandate to engage smaller groups within their region, ranging from academic research projects and regional science networks to indigenous and local communities. Such a system would also ensure that international standards for data collection, storage, and documentation are followed while allowing regional self-management. CIOOS would provide a common system for government, scientists, and partner organizations to integrate, access, share, and preserve data, thereby granting access to a wider breadth of information to make predictions and inform decision-making.

Results from the Expert Forum revealed that: 1) despite being on the cutting-edge of ocean observation with many mature OOS projects currently in operation, Canada is one of the few developed coastal nations in the world that does not have a national integrated OOS; 2) there is a unanimous desire among the ODM CoP for more national coordination and integration, particularly when attached to committed resources; and, 3) the CoP is willing to work together and with the government, committing time, energy, and resources towards this initiative. Canada's world-renowned scientific experts, extensive science infrastructure, and thriving ocean technology industry are amongst its most valuable resources. The time has come for national science leadership, cooperation, and efficient coordination of regional efforts towards a cohesive CIOOS. Progress will rely on an extensive engagement process, including consultations with the CoP, and a phased approach, allowing for stakeholder input and user feedback to be incorporated at each level. While this system will be the first of its kind in Canada, we have access to a wealth of experience internationally. A continued willingness to collaborate, sensible organization and governance decisions, sufficient resources, and innovative technical solutions will pave the road to a national ocean data infrastructure that will provide ongoing value to researchers, governments, industry, and the general public for generations.

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# 50th Anniversary: Historical Highlights of CMOS

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## Excerpts from: Atmosphere Volume 2, 1964

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

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### Comment on ATMOSPHERE, by a member from USA

*"I honestly feel that if Canadians' major research efforts continue to be published in the Royal and American Meteorological Societies' publications, the stature of the Canadian meteorologist will remain obscure.*

*It seems to me that there are enough weather problems and weather research in Canada today that are unique to Canada to justify a "Canadian Journal of Meteorology" devoted to scientific reports on those problems and results of that research. I am sure that most Canadian readers in time will tire of a bulletin consisting exclusively of editorials, reports of meetings, other Canadian Centers' activities, and reviews of other nations' work. A little of this goes a long way and tends to become sterile and somewhat stereotyped quickly. The most interesting thing about Vol. 1, No. 1 of ATMOSPHERE, aside from it being the first of a new publication, was the article "Arctic Winter". That article, though interesting to a meteorologist anywhere, certainly belongs in a Canadian Journal."*

### 5<sup>th</sup> Annual Congress - Halifax, June 11-12, 1964

*"The National Meteorological Congress will be held this year at Dalhousie University, Halifax, N. S., on June 11 and 12. The Canadian Association of Physicists will hold its annual meeting at Dalhousie during the same period, and a joint session is planned for June 11.*

*Accommodation for all participants will be available in the University at a cost of \$6.00 per day for room and breakfast. The road distance from Montreal is 830 miles travelling via Bangor, Maine. The meeting dates being Thursday and Friday permit rail travel with "bargain" fares which are, from Montreal, \$28.00 one way including meals and lower berth. The time is about 22 hours. T. C. A. [Trans Canada Airlines] operate some 8 flights per day and the one-way fare, economy, is \$ 48.00 from Toronto. The flying time is 3-5 hours depending upon the particular flight."*

The initial session was joint with the Canadian Association of Physicists. The main paper was "The General Circulation", followed by "Wave Forecasting" and "Measurement of Ozone Production by Solar Ultraviolet Radiation in the Stratosphere". Other sessions were: Physical and Dynamical Meteorology, Analysis and Prediction, and The Troposphere. 19 papers were presented to a total attendance of 65 people.

### Questionnaire on a possible Canadian Meteorological Society

Êtes-vous en faveur d'une société canadienne de météorologie? Are you in favor of a Canadian meteorological Society? Oui (114) Non (19)

Êtes-vous présentement membre de la Société Américaine de Météorologie? Are you presently a member of the American Meteorological Society? Oui (55) Non (83)

Si une société canadienne de météorologie existait, à quelles sociétés vous joindriez-vous? If a Canadian meteorological society were constituted, with which societies would you personally associate? RMS (97) AMS (100) Aucune/Other (5)

La Société Canadienne de Météorologie devrait-elle être une société professionnelle ou savante? Should the Canadian meteorological society be a professional or a learned society? P (48) S (82)

Êtes-vous en faveur d'un plan de réorganisation d' une société canadienne de météorologie? Are you in favour of a plan for organization of a Canadian meteorological society? Oui (119) Non (18)

### More thoughts on CMS

The originators felt that a contribution would be made to the welfare of Meteorology on an international basis through the exchange of publications so that multiple membership in a number of societies would not be necessary in order to receive the publications.

### Planning for next National Meteorological Congress

*"It was stated that the meetings of the Royal Society were to be held at Charlottetown next year and doubt was expressed that a satisfactory NMC and Annual Meeting of the Branch could be held there due to the distance and travelling costs involved. Professor Marshall recommended that a National Meeting be held next year but at a point nearer the "centre of gravity"."*

# 50th Anniversary: Golden Jubilee Fund



Canadian  
Meteorological and  
Oceanographic Society

La Société Canadienne  
de Météorologie et  
d'Océanographie

## Turning CMOS 50<sup>th</sup> Anniversary Celebrations into Action

January 1, 2017 is the 50<sup>th</sup> anniversary of the creation of the Canadian Meteorological Society (CMS) and the 40<sup>th</sup> anniversary of the addition of the oceanographic disciplines to create the Canadian Meteorological and Oceanographic Society (CMOS). During this period, 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 lecture tour by prominent scientists or spokespersons, 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 50th Anniversary edition of Atmosphere-Ocean highlighting the most crucial submissions from past years. This edition may be also reproduced as a hard cover book.

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.

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](http://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 50<sup>th</sup> anniversary activities.

**Martha Anderson, Past President, CMOS**

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## Concrétiser les célébrations du 50<sup>e</sup> anniversaire de la SCMO

Le 1<sup>er</sup> janvier 2017 est le 50<sup>e</sup> anniversaire de la création de la Société canadienne de météorologie (SCM) et le 40<sup>e</sup> anniversaire de l'ajout des sciences de la mer afin de créer la Société canadienne de météorologie et d'océanographie (SCMO). Au cours de cette période, 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 :

- Une tournée de conférences publiques données par d'éminents scientifiques ou porte-paroles, afin de fournir 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 cartonnée dans laquelle des chercheurs éminents et des responsables de programmes illustreront la fine pointe de nos domaines et leur vision de l'avenir.

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.

Vous pouvez faire un don dès aujourd'hui dans l'Espace Membres du site web du CMOS (méthode préférée), ou en cliquant sur le bouton DON EN LIGNE sur la page d'accueil de la SCMO ([www.scmo.ca](http://www.scmo.ca)). Nous accepterons les dons tout au long de l'année, mais la planification des projets se déroulera à l'automne 2016 et sera tributaire des fonds amassés, en conséquence, les dons hâtifs s'avéreront les plus utiles.

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

**Martha Anderson, Présidente Sordante de la SCMO**



Photo: Lance Blakney, UNB Media Services

## The 2016 Joint Scientific Congress of CMOS and CGU

The 50<sup>th</sup> Canadian Meteorological Congress was held jointly with the Canadian Geophysical Union at the Fredericton Convention Centre in Fredericton New Brunswick from May 29 to June 2, 2016. In total 550 people attended the meeting and there were several visits by local politicians. The over 470 abstracts were presented in 72 sessions. Paul Yang, the Scientific Program Committee Chair and his committee efficiently and effectively organized the scientific program. There were 13 exhibitors. The Congress included an Educator's Day, several events for students and early career scientists, specialist workshops, a public lecture and eight plenary lectures, in addition to the traditional Ice breaker, Patterson Parson's Lunch and Congress banquets. As this was the 50<sup>th</sup> CMOS Congress a special photograph of the luncheon attendees was taken.

This year's theme was "Monitoring of and Adapting to Extreme Events and Long-Term Variations". The public lecture was given by George Porter (B.Sc., B.Eng., MBA), Director of the Mactaquac project, on the future of the Mactaquac dam (a major dam on the Saint John River whose projected functional lifetime is approaching), a topic relevant to this theme and of local interest. The eight plenary talks provided interesting insights into: the Earth's energy imbalance, Big Data for meteorology, ocean acidification and consequences, science requirements for a sustainable Earth, greenhouse gas production in the high Arctic, geophysical insights from seismology networks, underwater remote sensing and wave forced seabed dynamics. The scientific activities were balanced with a walking tour of Fredericton led by an impersonation of Lord Beaverbrook, and tours of the Mactaquac Dam and Joint Meteorological Centre at Canadian Forces Base Gagetown. The Calithumpians, a local entertainment troop, provided a splash of local humour and music after the banquet.

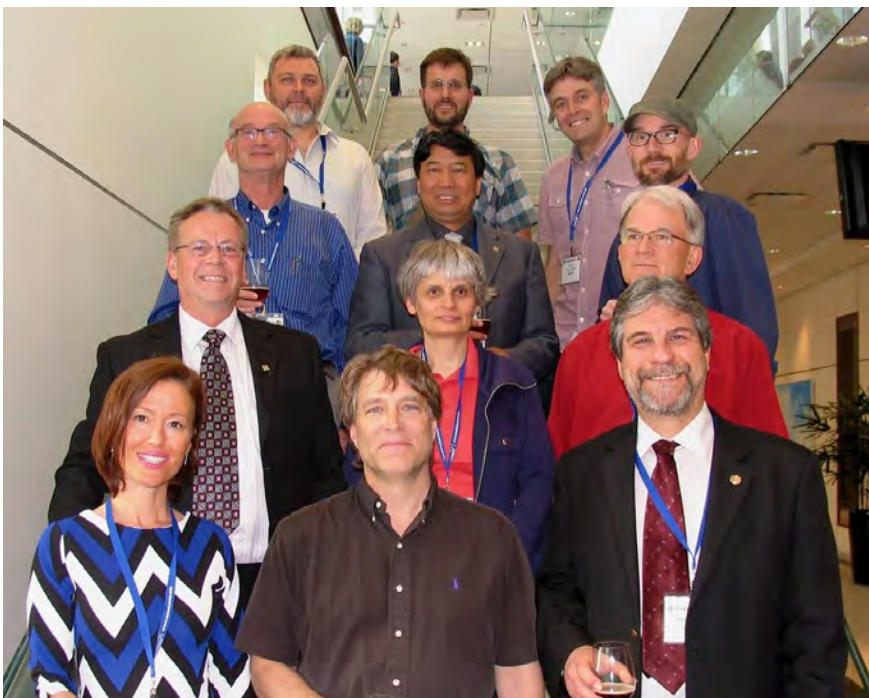
This year's congress was supported by a very able and committed Local Arrangements Committee (LAC). LAC Chair William Ward and Co-Chair Marcelo Santos guided the meeting preparations but much of the credit for the smoothness and success of the congress rests on the shoulders of the various leads. Rick Fleetwood was meticulous in support of the web page development, facilities organization and timetable development. William Richards provided steady and detailed support of the social events and Karl Butler looked after the finances. Claude Côté supported the publicity, communications and sponsorship activities and Carolyn McCafferty organized and supported the volunteers. Eric Ouellet supported the registration activities and mastered the CMOS registration software. Laura Gillard and Dustin Fraser developed the student/early career scientist events. Steve Miller organized the awarding of the student bursaries and Serge Desjardins organized the judging of the posters. David Themens produced the program book and Jon Hoyt-Hallet organized the Educators Day. David Degardin helped with the facilities and translation and Brigitte Leblon supported the social committee events. Together, the team provided the appropriate amount of energy and suitable cross checks to ensure that all worked out. Additionally, Jennifer Phillips and her team at the Fredericton Convention Centre, provided excellent support and advice and the Audio-visual services of Alex Green of PSAV were invaluable.

As is always the case, support from CMOS central was invaluable. Thanks to Qing Liao, Farida Dehghan, Gordon Griffith and Oscar Koren for their help and guidance.

# CMOS Congress 2016



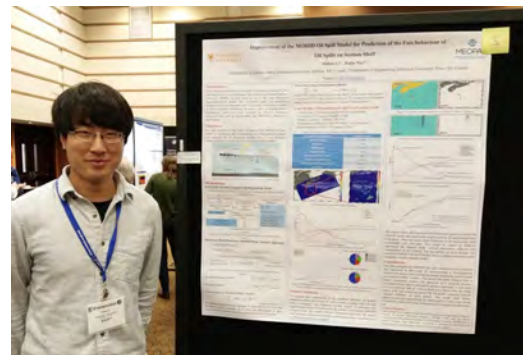
The Honorable Stephen Horsman, Deputy Premier, Minister of Public Safety and Solicitor General, Minister of Justice, and Minister responsible for Military Affairs (second from right). From the right the others are: William Ward (LAC Chair), Michel Jean (MCCC), Jim Abraham (CBC Meteorologist), and Martha Anderson (CMOS President - at that time).



Some members of the LAC and SPC: From top (L to R): Dave Degardin, Erick Ouellette, Karl Butler, Hal Ritchie, Paul Yang, Clark Richards, Claude Côté, Brigitte Leblon, William Richards, Carolyn McCafferty, Rick Fleetwood and Marcelo Santos

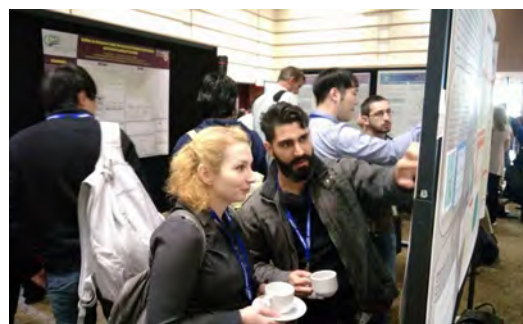


Public lecturer: George Porter flanked by Marcelo Santos (LAC co-Chair - on the right) and William Ward (LAC Chair - on the left)



**ASL Environmental Sciences Best Student Poster Prize in Oceanography: Shihan Li, Dalhousie University** (pictured here) for his poster *Improvement of the MOHID Oil Spill Model for Prediction of the Fate/Behaviour of Oil Spills on the Scotian Shelf*.

Two other poster prizes were also awarded—**The Campbell Scientific Best Student Poster Prize in Meteorology to Ludovick S. Pelletier of UQAM; The Best Poster Prize in Other Disciplines to Aminul Haque of the University of Manitoba**. Each student received a generous prize of \$1,000. Congratulations to them and thank you to the prize sponsors ASL and Campbell Scientific.



# CMOS Congress 2016

CMOS/SCMO Awards Presented at the 50th CMOS Congress, Fredericton NB



**CMOS Fellow Announced: M.K. Peter Yau**, McGill University, for his innovative contributions to the modelling of tropical storms, his parameterization of cloud processes and his major role in the training of the future generation of atmospheric scientists.



**President's Prize: Susan E. Allen**, University of British Columbia, for her 2010 paper (co-authored with B. M. Hickey) published in the *Journal of Geophysical Research, Oceans* entitled *Dynamics of advection-driven upwelling over a submarine canyon*, which is meritorious because it provides long-needed, useful and robust-to-environmental-change estimates of the flux of water across the shelf-break.



**J.P. Tully Medal in Oceanography: William R. (Bill) Crawford**, Institute of Ocean Sciences, for his numerous significant contributions to physical oceanography, and in particular, to eddy research. His work demonstrated the strong biological/chemical implications of eddies and quantified many of their impacts.



**François J. Saucier Prize in Applied Oceanography: Johannes J. Gemmrich**, University of Victoria, for his contributions to the understanding of ocean waves and upper ocean processes.



**Andrew Thomson Prize in Applied Meteorology  
Prix du Andrew Thomson en météorologie appliquée: René Laprise**, Université du Québec à Montréal, en reconnaissance de son leadership et de sa contribution de longue date au développement de modèles régionaux de climat. For his long-standing leadership and contributions to the development of regional climate modelling.



**Neil J. Campbell Medal for Exceptional Volunteer Service: Richard Asselin** for his dedicated service as Director of Publications for CMOS. His leadership and management of the numerous changes in the society's publication and business-related activities have strengthened CMOS publications as well as the Society.



# CMOS Congress 2016



**Tertia M.C. Hughes Memorial Graduate Student Prizes:** **Michael Optis**, Research Scientist, AWS Truepower, and **Siraj ul Islam** (pictured here), Postdoctoral Fellow, University of Northern British Columbia, for his thesis at the University of Northern British Columbia entitled *Ensemble simulation and forecasting of South Asian Monsoon*



**Citations for outstanding contribution towards promoting public awareness of meteorology or oceanography in Canada:** **CoCoRaHS Canada**, (Community Collaborative Rain, Hail & Snow Network accepted by **Rick Fleetwood**), for promoting public awareness of meteorology and the water cycle.



**CMOS - The Weather Research House NSERC Scholarship Supplement in Atmospheric or Ocean Sciences/Le supplément SCMO:** **Stefanie Mellon**, Dalhousie University, for her Masters studies *Determining natural variations in ocean acidification along the Nova Scotian margin during the last 1000-2000 years*.



**CMOS - The Daniel G. Wright Undergraduate Scholarship for academic excellence:** **Lara Gemrich**, University of Victoria, and **Gabin Urbancic** (pictured here), University of Waterloo.



**Undergraduate Scholarships for academic excellence:** **Kai Melamed-Turkish** (pictured here), McGill University, and **Supriya Singh**, McMaster University.



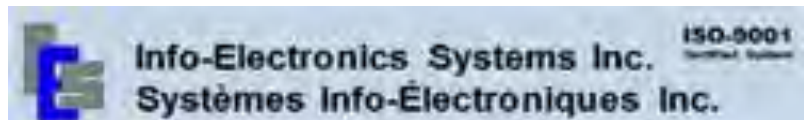
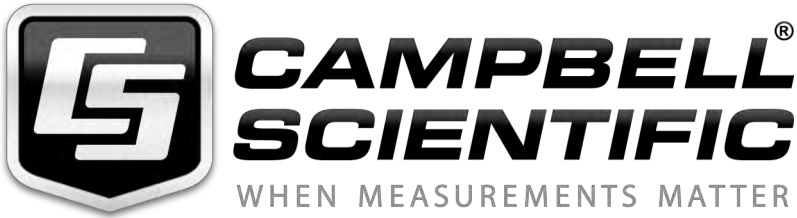
**CNC-SCOR Early Career Ocean Scientist Award:** **Stephanie Waterman**.

**Other award recipients included:** **David Jones**, Environment and Climate Change Canada, who received the **Rube Hornstein Medal in Operational Meteorology** for his dedication in the provision of weather and outreach services to media and the emergency management community across British Columbia; **Nicole Chisolm**, Dalhousie University, who received the **CMOS - The Weather Network** scholarship for undergraduate student academic excellence; **Roger François**, who received the **DFO Timothy R. Parsons Medal**; **Tom McElroy**, Professor and Industrial Research Chair in Atmospheric Remote Sounding at York University, received the **2015 MSC Patterson Medal** for early research into the measurements of nitrogen dioxide in the stratosphere evolved into cross-disciplinary contributions that have expanded both the fundamental understanding of atmospheric chemistry and have provided practical applications in global environment and public health monitoring and meteorology.

# CMOS Congress 2016

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Thank you to Congress Exhibitors:



# Celebrating Success

## Environment and Climate Change Canada-Geoff Howell Citation of Excellence for Innovation

Members of the team of the Canadian Operational Network of Coupled Environmental Prediction Systems (CONCEPTS) initiative were awarded the Geoff Howell Citation of Excellence for Innovation at a 2016 Departmental Awards Ceremony, held by Environment and Climate Change Canada (ECCC) on 16 June 2016. Numerous recipients from ECCC, Department of National Defence (DND) and the Department of Fisheries and Oceans (DFO) shared this award in simultaneous videoconference presentations in several national locations. Presentations were made by senior managers of the department at each location.

CONCEPTS is an innovative initiative which is establishing an operational atmosphere-ocean-ice forecast system. This collaborative effort by ECCC, DFO and DND uses highly sophisticated data assimilation. The team has developed a suite of oceanographic models that significantly improve the analysis and forecasting of a wide variety of ocean features such as waves, currents, temperature, pollutant transport and ice conditions. The collaboration has allowed the Government of Canada to capitalize on the expertise of each department, avoid duplication and efficiently developing operational capability and applications for Canadians. This innovation will allow ECCC to upgrade the meteorological and environmental services offered by the Meteorological Service of Canada, and the quality of the products created makes Canada one of the top operational centres in the world.

The Geoff Howell Citation of Excellence for Innovation is named in honour of a former ECCC staff member who contained a passion for knowledge and had the desire and ability to make a difference to both the environment and the people living within it. Mr. Howell was a giving leader and mentor, focused more on promoting the achievements of those around him rather than his own. He was well known for his ability to take an idea, mold it, promote it and consistently deliver.



**Dartmouth presentations** (L to R): ECCC Regional Director-General Geoff Mercer, Jean-Philippe Paquin, Sarah Dyck, Hal Ritchie, Li Zhai, Youyu Lu, Major Norm Scantland (Absent: Serge Deschamps, Simon Higginson, Ji Lei)



**Gatineau presentations** (L to R): Deputy Minister Michael Martin, Fraser Davidson, Terry Fanning, Martha Anderson, Major David Rolston, Paul Pestieau. (Absent: Tom Carrieres, Mathieu Ouellett, Michael Ott)

### Award recipients from the other locations:

**Mount Pearl:** Vanessa Sutton Pande and Jinshan Xu

**Vancouver:** Patricia Wong and Charles Hannah

**Downsview:** Lilly Fung, Gerie Lynn Lavigne, Chris Marshall

**Dorval:** Christiane Beaudoin, Natacha Bernier, Nicole Bois, Mark Buehner, Alain Caya, Julie Couët, Daniel Deacu, Vincent Fortin, André Giguère, Denis Gilbert, Manon Lajoie, Denis Lefavre, Jean-François Lemieux, Yimin Liu, Yosvany Martinez, Kristjan Onu, Pierre Pellerin, Mat Reszka, Gregory Smith, Vartan Soukian, Christopher Subich, Dorina Surcel-Colan, Barbara Winter, Wei Yu, François Roy, Frédéric Dupont, Jean-Marc Bélanger, Benoit Archambault.

# In Memoriam

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## Dorothy Jean Neale (1927 - 2016)

With the death in Ottawa of Dorothy Jean Neale on Monday 27 June 2016, CMOS lost one of its longest-serving and most dedicated volunteers. Following her retirement from the federal government in early 1994 Dorothy served as the Society Executive Secretary, primarily to assist in the diverse range of administrative tasks facing the Executive Director. Her ability to multi-task, and especially to ensure no document left the organization without having been the subject of professional technical editing, were legendary. Having previously worked in both the departments of Environment and of Fisheries and Oceans she brought an excellent network of CMOS member contacts nurtured by a gentle personality, concern for others and winning smile.

In 2007, she was the third recipient of the Neil J. Campbell Medal for Exceptional Volunteer Service for "her dedication and her meticulous editorial and administrative skill, all applied in support of so many executives and members alike during her years in the CMOS National Office, and for her role as an *ambassador* to and for the Society at the CMOS Congress booths."

When failing health forced her to withdraw from many of those functions, and she was named Executive Secretary Emeritus, Dorothy continued to review drafts of the CMOS Bulletin as Associate Editor until two years ago.

Dorothy was born in Larbert, Sterling, Scotland. After training and work experience as a legal secretary she emigrated to Canada on the Empress of Australia in 1954. Dorothy worked in Montreal with Mr. R.F. (Bob) Shaw, P. Eng., in his varied career as President, The Foundation Company of Canada, Deputy Commissioner General of EXPO '67 and Vice-Principal (Administration), McGill University. On his appointment as Deputy Minister of the newly-created Department of the Environment in 1971, Dorothy joined the Public Service in Ottawa and provided administrative support, including at the 1982 United Nations Conference on the Human Environment, the Stockholm Conference.

Following Shaw's retirement at the end of 1974, she joined the office of Dr. A.E. Collin in his capacity as Assistant Deputy Minister, Ocean and Aquatic Sciences, Dept. of Fisheries and Oceans. Dr. Collin was appointed Assistant Deputy Minister, Atmospheric Environment Service in 1977. Dorothy followed him and provided administrative support and served in this capacity to a succession of Assistant Deputy Ministers: Mr. J.P. Bruce, Mr. H.L. Ferguson and Ms. E. Dowdeswell.

Dorothy enjoyed bridge, bowling, swimming and Scottish country dancing in Montreal & Ottawa and loved to travel. Her memory was sharp and her curiosity boundless. Spending time getting to really know her many friends and family members was her passion. She attended social events with colleagues and especially enjoyed the DFO Tarts & Farts luncheons.

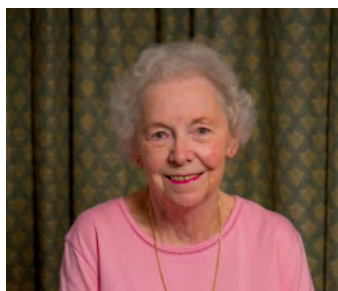
A large group of friends gathered on 8 July for a Celebration of Life with tributes paid by former CMOS colleagues.

Ian Rutherford remembers that "he once dared to give Dorothy a copy of *Eats Shoots and Leaves*, a small treatise on the use of commas in written English that he thought would amuse her. She had read it already and was armed with criticisms!"

Richard Asselin remarked that "Dorothy had a personal knowledge of many members and she always inquired kindly about their circumstances, health, children, and job changes."

Paul-André Bolduc remembered Dorothy as "one of the best ambassadors of CMOS. Having worked in key positions in both DOE and DFO she knew personally many members. She has attended numerous congresses with a renewed enthusiasm each time. While minding the CMOS kiosk, she greeted people with a gentle smile that will not be forgotten. She is a big loss for our Society."

A group of photographs reflecting Dorothy's life is posted for a short while at <http://tinyurl.com/DorothyNeale/>.

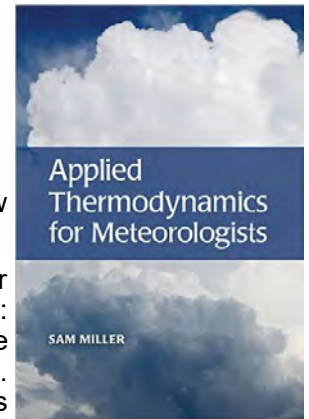


# Book Review

## Applied Thermodynamics for Meteorologists

Author: Sam Miller, Plymouth State University

Cambridge University Press, 2015, 385 pages, ISBN 978-1-107-10071-8, Hardcover  
Available at Amazon.ca or from the publisher, \$97.95 (new)



The title of this book grabbed my attention right away and motivated me to write a review for the Bulletin's readers.

The author sets the tone right from the first page, as his work is dedicated to “weather forecasters everywhere”. To this effect, he organized everything towards his main goal: to offer a reference book to operational forecasters and meteorology students. Let's be frank, a book on atmospheric thermodynamics will not gather a huge crowd of readers. The topic can seem somewhat off-putting and the books on the matter are not always visually appealing, at least not the older ones.

My bookshelf still holds Godson's course notes from 1953, which were used for training in Downsview (44 years ago, in my case). It also holds Iribarne and Godson's textbook from 1973 — a genuine progress over the “notes”—, a book from the famous Van Mieghem (1975) featuring a robust formalism, and the more modern Tsonis from 2007, also published by Cambridge Press. These books cover the same topics, but each from its own point of view. Let's see how Miller structured his work.

The book contains twelve chapters with exercises. It also includes eight appendices, notes on each chapter to supplement the text or provide extra explanations, a bibliography, and an index. All 99 figures, PowerPoint presentations (ppt) and the answers to the questions (for teachers) are available on the publisher's website.

The chapters are:

- Basic concepts and terminology
- Equations of state
- Work, heat and temperature
- The first law of thermodynamics
- Adiabatic processes
- The second law of thermodynamics

- Water vapor and phase transitions
- Moisture consideration: effects on temperature
- Atmospheric statics
- Model and standard atmosphere
- Stability
- Severe weather applications

The appendices contain values for constants, data, complementary information, and more advanced notions or derivations. Topics discussed in the various chapters echo topics found in other reference books. However, the author, and this is where the difference shines, takes great care to present each notion in detail. He clearly shows how each equation came about and how it can be transformed step by step to finally reach the desired formulation, and he then explains its significance. Miller clearly lays out everything. He explains the underlying reasoning for transforming each equation, including the physical or meteorological aspects. It is interesting to note that the important equations are put in separate boxes to highlight their significance, giving the page a pleasing look.

Also of note, for some of the results, the author directs the reader back to notions or equations discussed earlier. These steps back do help. However, some may find the detailed derivations overdone. This, of course, takes nothing away from the academic value of the book and students will certainly benefit from it.

The illustrations are plenty and well made. Chapters 11 and 12 are particularly engaging. They feature case studies (with maps and tephigrams) that illustrate the topics discussed earlier. These topics are well presented and defined again, and their applications are clearly demonstrated. These chapters are a pleasure to read and this is where the author's experience really shows. While reading, other than the author's experience, you can feel his passion for teaching, operational meteorology, and of course thermodynamics.

This book caters to students but also to operational forecasters who wish to brush up on the old thermodynamics concepts. I recommend Miller's book to anyone interested in atmospheric thermodynamics or wanting to revisit this important part of meteorology. In my opinion, this textbook would make an excellent addition to your atmospheric science bookshelf.

### Review By:

Richard Leduc, Ph.D,  
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rleduc@airmetscience.com

# Critique de Livre

## Applied Thermodynamics for Meteorologists

Auteur: Sam Miller, Plymouth State University

Cambridge University Press, 2015, 385 pages, ISBN 978-1-107-10071-8, Couverture rigide. Disponible chez Amazon.ca ou chez l'éditeur, 97,95 \$ (neuf)

C'est le titre de ce volume m'a intéressé en premier et qui m'a motivé à en faire une revue pour les lecteurs du Bulletin.

Le ton de l'ouvrage est donné dès la première page. En effet l'auteur dédie ce livre à tous les prévisionnistes de partout («to weather forecasters everywhere»). Et effectivement l'auteur a tout organisé en fonction de son objectif à savoir un ouvrage de référence pour les prévisionnistes opérationnels et les étudiants en météorologie. Disons au départ qu'un ouvrage de thermodynamique atmosphérique ne fait pas courir les foules. Le sujet est habituellement rébarbatif et les ouvrages souvent peu attrayant, du moins pour les moins récents.

Dans ma bibliothèque, j'ai les notes de cours de Godson de 1953 que l'on avait lors des formations à Downsview (ça fait tout de même 44 ans dans mon cas), le volume de Iribarne et Godson de 1973 qui est un net progrès sur les Notes, celui du célèbre Van Mieghem de 1975 avec un formalisme à toute épreuve et celui plus moderne de Tsonis de 2007 aussi publié chez Cambridge Press. Ces ouvrages traitent des mêmes sujets et couvrent à peu près la même matière mais chacun à leur façon. Voyons comment celui de Miller est constitué.

Le volume comprend 12 chapitres avec des exercices, 8 Annexes («Appendix»), des Notes pour chaque chapitre qui viennent compléter le texte ou donner des explications supplémentaires, une bibliographie et un index. La maison d'édition rend aussi disponibles sur son site internet toutes les figures (99), des diapositives (ppt) et la réponse aux exercices (pour les enseignants).

Les chapitres sont :

Basic concepts and terminology	Water vapor and phase transitions
Equations of state	Moisture consideration: effects on temperature
Work, heat and temperature	Atmospheric statics
The first law of thermodynamics	Model and standard atmosphere
Adiabatic processes	Stability
The second law of thermodynamics	Severe weather applications

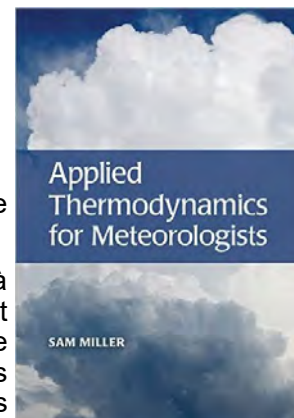
Les Annexes donnent les valeurs de constantes, des données, des informations supplémentaires ou des notions et dérivations plus avancées. Les sujets traités dans les divers chapitres sont semblables à ceux d'autres ouvrages de référence. Cependant, l'auteur, et c'est ce qui le démarque, prend un grand soin de bien présenter chaque notion et montre clairement comment chaque équation est amenée et transformée d'une étape à l'autre en vue d'en arriver à la formulation désirée et sa signification. Tout est très clair, les motifs des transformations des diverses équations sont expliqués sans oublier l'aspect physique ou météorologique. Il est intéressant de voir que les équations importantes sont encadrées pour montrer leur importance, ce qui rend le tout visuellement agréable.

Un autre aspect intéressant est que l'auteur, à l'occasion d'un résultat quelconque, renvoie le lecteur à des notions ou autres formes d'équations vues précédemment; ce retour est assurément pertinent. Notons néanmoins qu'il est très possible que certains trouvent toutes les étapes de dérivation des équations un peu trop simpliste; ceci n'enlève rien à la valeur pédagogique de cet ouvrage et c'est l'étudiant qui en profitera.

Les illustrations sont abondantes et très bien faites. Les chapitres 11 et 12 sont particulièrement intéressants. On y trouve des exemples de cas (avec cartes et téphigrammes) qui illustrent les notions abordées; les concepts sont à nouveau clairement présentés et définis et leur usage est bien démontré. Ce sont deux chapitres très agréables à lire où l'auteur montre le meilleur de son expérience. À la lecture, outre l'expérience de l'auteur, on constate sa passion pour la formation et les opérations mais aussi pour la thermodynamique.

Ce volume intéressera les étudiants mais aussi les prévisionnistes opérationnels qui désirent revoir les concepts de thermodynamique. Je recommande l'ouvrage de Miller à quiconque s'intéresse à la thermodynamique atmosphérique ou à renouer avec cette partie importante de la météorologie. À mon avis, c'est une excellente addition à une bibliothèque de météorologie.

**La revue:** Richard Leduc, Ph.D. AirMet Science Inc.  
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rleduc@airmetscience.com



### **Assistant Professor in Atmospheric Dynamics, University of Quebec at Montreal**

The Department of Earth and Atmospheric Sciences at the University of Quebec at Montreal (UQAM) invites applications for a tenure-track appointment in Atmospheric Dynamics at the assistant professor level with a target hiring date in December 2016.

We seek candidates with expertise in Atmospheric Dynamics, including but not limited to: climate dynamics, synoptic meteorology, model development and evaluation, observational analysis, multi-scale interaction, high impact weather and data assimilation.

The Earth and Atmospheric Sciences Department is a strong, well-supported department that offers BSc, MSc and PhD degree programs. The department houses the Centre ESCER (<http://www.escer.uqam.ca/index.html>), which is internationally renowned for its contributions in the fields of regional climate modelling, data assimilation, remote sensing, radiation, cloud and precipitation physics and the impact of aerosols on climate, land-atmosphere interactions and feedbacks and hydro-meteorological extremes.

#### **Responsibilities**

The position will involve research and teaching at the graduate and undergraduate levels, and service. The successful applicant is expected to develop a vigorous, externally funded research program in Atmospheric Dynamics. The position offers collaborative opportunities with the faculty members of the Centre ESCER working on the modelling and observation of different aspects of weather and climate, particularly those for the high- and mid-latitudes, and with federal government labs.

#### **Qualifications**

Candidates must hold a PhD in Atmospheric Sciences or a related discipline at the time of the appointment. Candidates with postdoctoral experience will be preferred. Candidates should demonstrate research excellence with a strong record of research with publication in high-standing peer-reviewed journals. Previous experience in teaching and supervision of student projects and leading and managing a research group will be definite assets. Candidates must have written and oral communication skills in both English and French.

#### **Contact Information**

All inquiries related to the position may be directed to Dr. Gilles Couture, Department Head, Earth and Atmospheric Sciences Dept, UQAM, Telephone: (514)-987-3000, ext 8905, Email: [couture.gilles@uqam.ca](mailto:couture.gilles@uqam.ca).

#### **How to Apply**

Applicants must submit by e-mail (to [couture.gilles@uqam.ca](mailto:couture.gilles@uqam.ca), with cc to [adelina@sca.uqam.ca](mailto:adelina@sca.uqam.ca)) a single PDF consisting of a cover letter, statement of research interests (2 pages), statement of teaching philosophy (1 page), complete CV, and the names and contact information of three references. Applications will be accepted until August 31<sup>st</sup> 2016.

*UQAM is an equal opportunity institution. Women, natives, members of visible minorities, ethnic minorities and handicapped persons that meet the requirements for this position are encouraged to apply.*

### **Poste de Professeur en Dynamique de l'Atmosphère Université de Québec à Montréal**

Le Département des sciences de la Terre et de l'atmosphère de l'Université du Québec à Montréal (UQAM) sollicite des candidatures pour un poste de professeur, menant à la permanence, en dynamique de l'atmosphère avec la date d'entrée en fonction en décembre 2016.

Nous recherchons des candidat(e)s ayant une expertise en dynamique de l'atmosphère, y compris mais sans s'y limiter, la dynamique du climat, la météorologie synoptique, le développement et l'évaluation des modèles climatiques, l'analyse observationnelle, les interactions multi-échelles, les conditions météorologiques et l'assimilation de données.

Le Département des sciences de la Terre et de l'atmosphère offre des programmes de 1<sup>er</sup>, 2<sup>e</sup> et 3<sup>e</sup> cycles. Le département abrite le Centre ESCER (<http://www.escer.uqam.ca/index.html>) qui est reconnu internationalement pour ses contributions dans le domaine de la modélisation régionale du climat, de l'assimilation de données, de la télédétection, de la physique des nuages et des précipitations, de l'impact des aérosols sur le climat, des interactions et rétroactions terre-atmosphère et des événements hydrométéorologiques extrêmes.

#### **Sommaire de la fonction**

Ce poste implique de la recherche et de l'enseignement aux trois cycles d'études et des services à la collectivité. Le candidat retenu devra développer un programme vigoureux de recherche, financé de l'extérieur, dans la dynamique de l'atmosphère. Le poste offre des possibilités de collaboration avec les membres du corps professoral du Centre ESCER qui œuvrent en modélisation et observation des différents aspects de la météo et du climat, en particulier ceux des latitudes moyennes et hautes, et avec les laboratoires du gouvernement fédéral.

#### **Exigences**

Les candidats doivent être titulaires d'un doctorat en sciences de l'atmosphère ou dans une discipline connexe au moment de la nomination. Les candidats ayant une expérience postdoctorale seront préférés. Les candidats doivent faire preuve d'excellence en recherche ayant un dossier solide de recherche et des publications dans des revues de haut calibre évaluées par des pairs. Une expérience pertinente dans l'enseignement et la supervision des projets d'étudiants ainsi que dans la coordination et la gestion d'un groupe de recherche sera un atout certain. Les candidats doivent posséder de bonnes compétences en communications orale et écrite en français et en anglais.

#### **Pour information**

Toutes les demandes relatives à la position peuvent être adressées à Pr Gilles Couture, Directeur, Département des sciences de la Terre et de l'atmosphère, UQAM, (514) 987-3000, poste 8905, [couture.gilles@uqam.ca](mailto:couture.gilles@uqam.ca)

#### **Dépôt de candidature**

Les candidats intéressés doivent faire parvenir par courriel électronique à [couture.gilles@uqam.ca](mailto:couture.gilles@uqam.ca), avec copie à [adelina@sca.uqam.ca](mailto:adelina@sca.uqam.ca), un seul fichier PDF comprenant une lettre de motivation, un curriculum vitae détaillé, un énoncé d'intérêts de recherche (2 pages), un exposé sur la philosophie de l'enseignement (1 page) ainsi que les noms et les coordonnées de trois références. Les candidatures seront reçues jusqu'au 31 août 2016.

*L'UQAM souscrit à un programme d'accès à l'égalité à l'emploi. De ce fait, elle invite les femmes, les autochtones, les membres des minorités visibles, des minorités ethniques et les personnes en situation de handicap qui répondent aux exigences du poste à soumettre leur candidature.*



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**Next Issue CMOS Bulletin SCMO**

The next issue of the CMOS Bulletin SCMO will be published in October 2016. Please send your articles, notes, workshop reports or news items before September 6th, 2016, to [bulletin@cmos.ca](mailto: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 octobre 2016. Prière de nous faire parvenir avant le 6 septembre 2016 vos articles, notes, rapports d'atelier ou nouvelles à [bulletin@cmos.ca](mailto:bulletin@cmos.ca).

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

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