



CMOS **BULLETIN**

Canadian Meteorological
and Oceanographic Society

SCMO

La Société canadienne de
météorologie et d'océanographie

June / juin 2019

Vol. 47 No. 3



News on the **DOT**

DEPARTMENT OF TRANSPORT STAFF PUBLICATION - SEPTEMBER - OCTOBER 1961

Story Inside: Women in Meteorology: The Early Years. p 6



Reliable. Compatible. Customizable.

Take advantage of 40 years of experience in the field and create a monitoring system that fits your data collection requirements.

Reliable measurement systems supported by world class tech support to save you time and money.

Multiple communication and software options to choose from to help you collect your data anytime, anywhere.



SDMS40
Multipoint Scanning Snowfall Sensor

*Ideal for snow depth or water depth measurements

campbellsci.ca/sdms40



ClimaVUE™50
All-In-One Meteorological Sensor
*Cost effective and easy to deploy
campbellsci.ca/climavue-50



SP Lite2
Silicon Pyranometer

*Designed for routine measurement of solar radiation

campbellsci.ca/splite2



CR6
Measurement and Control Datalogger
with countless applications
campbellsci.ca/cr6

For our full product line please visit www.campbellsci.ca

[Words from the President / Mot du président](#)

4

Articles and Reports

[Article: Women in Meteorology: The Early Days](#)

8

by Rebeca Milo

[Article: Seasonal Forecast for Summer 2019 \(JJA\) / Prévission saisonnière pour l'été 2019 \(JJA\)](#)

14

by M. Markovic and M. Alarie

[Article: CMOS at the IUGG General Assembly in Montreal, July 9-14](#)

16

CMOS Business and News

[Book Review: The Ice at the End of the World, by Jon Gertner. Review by Phil Chadwick](#)

21

[CMOS News: Books for review](#)

23

CMOS Bulletin SCMO

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

Editor / Rédactrice: Sarah Knight

Director of Publications /

Directeur des publications: Douw Steyn

Canadian Meteorological and Oceanographic Society / Société canadienne de météorologie et d'océanographie

E-mail: bulletin@cmos.ca

Courriel: bulletin@scmo.ca

CMOS Office / Bureau de la SCMO

P.O. Box 3211, Station D

Ottawa, Ontario, Canada, K1P 6H7

Homepage: <http://www.cmos.ca>

Page d'accueil: <http://www.scmo.ca>

Gordon Griffith, Ing., P. Eng., FEC
Executive Director - Directeur général

Tel/Tél.: 613-990-0300

E-mail/Courriel: cmos@cmos.ca

Ms. Qing Liao

Office Manager - Chef de bureau

Tel/Tél.: 613-990-0077

E-mail/Courriel: accounts@cmos.ca

CMOS Accredited Consultant Expert-Conseil accrédité de la SCMO

Douw G. Steyn

Air Pollution Meteorology

Boundary Layer & Meso-Scale Meteorology

4064 West 19th Avenue Vancouver,

British Columbia

V6S 1E3 Canada

Tel: 604-364-1266; Home: 604-222-1266

Email: dsteyn@eoas.ubc.ca

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.

Words from the President

Changing of the Guard: Paul Kushner Hands CMOS Presidency Over to Kim Strong

Message from the Outgoing President, Paul Kushner:

It's hard to believe that my time as CMOS President is coming so quickly to a close and that these will be my final 'Words' to this great community. Thank you for entrusting me with this leadership role and for all the support I've received from CMOS's staff, Executive, Council and volunteers. Your dedication makes leadership of this Society truly rewarding.

In my [introductory 'Words' last year I outlined my priorities for 2019-2020](#): 'tightening up' to improve CMOS's financial position; 'speaking up' to strengthen the research environment in Canada in atmosphere, ocean, and climate science; and 'greening up' to make sure CMOS speaks effectively about the risks and reality of anthropogenic global warming and improve its sustainable practice. I believe we have made good progress in these areas, as I've outlined in previous words to you. But it's clear there is much more CMOS needs to pursue to address climate change in a manner that serves our members and Canadian society. So, in other words, there's lots of good work left to do!

At the end of my term I am looking forward in particular by the upcoming [IUGG General Assembly](#) and our chance to highlight the contributions of the CMOS community there. Please take a look at Sarah Knight's nice write up in the CMOS Bulletin to [learn more](#). An enormous thanks, in advance of the meeting, goes to Dominique Paquin, CMOS liaison on the IUGG LAC, and Montréal Centre Executive Chair Louis Lefavre, for all their hard work in making this Congress a success for CMOS and for the earth science community in Canada. Merci!

My final duties as President include passing the mantle to my successor for next year. Next year's CMOS President is Professor Kimberly Strong of the Department of Physics at the University of Toronto (which is also my home department). Kim brings to the role deep scientific knowledge of atmospheric composition and humanity's role in determining it, outstanding dedication to service our profession, and enthusiasm for CMOS and a deep belief in its potential. Based on her excellent contributions as CMOS VP, I am sure we'll all benefit from her serving as President in the coming year. Kim, thank you, and over to you!



Paul

Paul Kushner, Professor, Department of Physics, University of Toronto and Outgoing CMOS President

Words from the Incoming President, Kimberly Strong:

It gives me very great pleasure to write my first "Words from the President" for the CMOS Bulletin. It is a great honour to have been invited to serve as CMOS President and in this role, I look forward to meeting and working with many of you over the next year.

CMOS is Canada's national society dedicated to advancing atmospheric and oceanic sciences and related environmental disciplines, and as Vice-President, I have had a front-row seat to observe this in action. In addition to holding the annual scientific Congress and publishing 'Atmosphere-Ocean' and the 'CMOS Bulletin', CMOS awards prizes and scholarships, endorses weathercasters and accredits consultants, supports participation of teachers in Project Atmosphere and Project Maury, and issues scientific position statements. Many CMOS activities take place at the local level, at the 14 Centres across the country. Our Centres organize local events such as science and policy talks, tours, and luncheons, host talks by the CMOS Tour Speakers, provide judges for science fairs, visit schools, and award travel bursaries to students.

All of these CMOS activities rely on the participation of our members and volunteers, who come from universities, government, the private sector, and the public. I encourage all members to get involved in CMOS, whether in your local Centre, on a CMOS committee, attending the AGM, or in other ways. Having been a CMOS member for 23



Words from the President

years, I whole-heartedly believe that our society is vital to the promotion of atmospheric and oceanic science in Canada and that engagement in its activities can be deeply meaningful and highly rewarding.

As Vice-President, I was responsible for oversight of CMOS committees and chaired the bi-monthly meetings of the CMOS Centre Chairs and Membership Committee. This gave me the opportunity to learn about the inner workings of the society and to hear about all the great things happening at the local Centres. As President, building on this experience, I would like to focus on three themes that tie in with the goal areas (members, outreach, education) articulated in the CMOS Strategic Plan.

(1) CMOS Membership and Student Involvement:

Recruitment and engagement of new members is essential to the future of CMOS. This in turn requires clear articulation of the role of the society, its relevance and importance in a changing world, and the benefits of membership, which is currently free for students. I would like to encourage greater interaction between the National Office and the Student Committee to develop new ideas and foster more student involvement. It is also important to keep in mind issues of equity, diversity, and inclusion, and like many scientific societies, we are developing a Membership Code of Conduct and will be inviting feedback over the coming year.

(2) CMOS Outreach and Visibility:

Both the National Office and the Centres can play a role in increasing the visibility of CMOS, promoting meteorological and oceanographic science, and increasing the understanding of climate change among Canadians. We will continue, and expand on, efforts begun this year, sharing ideas, resources, and best practices. Initiatives include the development of promotional materials, an update of our website, the release of scientific position statements, providing experts for media inquiries, and partnerships with sister organizations such as the [Australian Meteorological and Oceanographic Society](#).

(3) CMOS Education and Mentorship:

CMOS has a long history of encouraging and fostering an interest in meteorology and oceanography amongst young people from kindergarten through university. I would like to strengthen our current activities in this area by revitalizing our education committees and increasing mentorship opportunities in partnerships with universities, the private sector, and government.

The success of CMOS and its ability to achieve these goals and others relies on careful financial stewardship. We will continue to work on strengthening the financial position of the society, with the objective of being in a balanced budget position by 2021 and returning to regular surplus positions thereafter.

A huge amount of work goes on behind the scenes at CMOS, and so I would like to thank CMOS staff, Council, Executive, Centre Chairs, and Committee Chairs and members for all that they do on behalf of our society and for the support they have given me as Vice-President. The Centres who are hosting CMOS Congresses in Montreal (IUGG 2019), Ottawa (2020), Victoria (2021), and Saskatoon (2022) have also been busy planning. I would particularly like to thank everyone who has been involved in organizing this year's IUGG General Assembly, as both the attendance and logistics were an order of magnitude greater than those for our usual Congress!

Finally, a big thank-you to our outgoing President Paul Kushner for his outstanding service to CMOS; the society has greatly benefitted from Paul's vision, leadership, organizational skills, new initiatives, and scientific expertise. I also thank several other dedicated volunteers who have made substantive contributions and whose terms are ending: Past-President Wayne Richardson, Corresponding Secretary Alanna Mackenzie, and Councillor-at-Large Nadja Steiner. As we transition to a new 'CMOS year', I am delighted to welcome Marek Stastna as our incoming Vice-President, Diane Pendlebury as the new Corresponding Secretary, three new Councillors-at-Large: Laura Bianucci, Bruce Sutherland, and Aldona Wiacek, and all new members and chairs of CMOS Centres and committees.

In closing, I again emphasize how important volunteers are to the success of our society. I encourage CMOS members to contact me if you would like to get involved in any area of CMOS activities.

Kim

Kimberly Strong, Professor & Chair, Department of Physics, University of Toronto and Incoming CMOS President
Email: president@cmos.ca

Changement de la garde : Paul Kushner remet la présidence du SCMO à Kim Strong

Mot du président sortant, Paul Kushner :

Il m'est difficile de croire que mon mandat de président de la SCMO tire à sa fin si rapidement et que ce sont là mes derniers « mots » destinés à cette formidable communauté. Merci de m'avoir confié ce poste de direction et de tout le soutien que m'ont apporté le personnel, le comité exécutif, le conseil d'administration et les bénévoles de la SCMO. Votre dévouement est ce qui rend la gestion de cette société vraiment gratifiante.



Dans mon premier « [Mot du président](#) » l'an passé, j'ai exposé mes priorités pour 2019-2020 : resserrer les finances de la SCMO pour les améliorer; prendre la parole pour renforcer le milieu de la recherche au Canada, dans les domaines de l'atmosphère, des océans et de la science du climat; « verdir » la SCMO pour être en mesure de transmettre efficacement les risques et la réalité du réchauffement planétaire anthropique, et d'améliorer nos pratiques durables. Je crois que nous avons bien progressé de ce côté, comme mentionné dans mes messages précédents. Mais il y a encore beaucoup à faire pour que la SCMO s'attaque aux changements climatiques d'une manière qui profite à nos membres et à la société canadienne. En d'autres termes, il reste beaucoup de travail utile à faire!

Mon mandat tire à sa fin, et je me prépare avec impatience à la prochaine [Assemblée générale de l'UGGI](#) et à y souligner la contribution des membres de la SCMO. Pour de [plus amples renseignements](#), veuillez jeter un coup d'œil à l'article informatif du Bulletin de la SCMO qu'a rédigé Sarah Knight. Un grand merci, avant le congrès, à Dominique Paquin, agent de liaison de la SCMO auprès du comité local d'organisation de l'UGGI, et à Louis Lefavre, président du centre de Montréal, qui ont travaillé d'arrache-pied pour que ce congrès s'avère une réussite pour la SCMO et pour le milieu canadien des sciences de la terre. Merci!

Mon dernier geste en tant que président consiste à passer le flambeau à mon successeur. L'an prochain, la professeure Kimberly Strong du département de physique de l'Université de Toronto (qui est aussi mon département d'attache) présidera la SCMO. Kim apporte à ce poste des connaissances scientifiques approfondies sur la composition de l'atmosphère et l'influence de l'humanité sur celle-ci, un dévouement exceptionnel au service de notre profession, un enthousiasme pour la SCMO et une confiance profonde dans le potentiel de l'organisation. Étant donné son excellente contribution à titre de vice-présidente de la SCMO, Kim, j'en suis persuadé, nous fera tous profiter de son mandat de présidente au cours de la prochaine année. Kim, un grand merci, c'est à ton tour!

Paul

Paul Kushner Professeur, Département de physique, Université de Toronto et Président sortant de la SCMO

Mot de la présidente élue, Kimberly Strong

C'est avec grand plaisir que j'écris mon premier « Mot de la présidente » pour le Bulletin de la SCMO. C'est un grand honneur d'avoir été invitée à présider la Société canadienne de météorologie et d'océanographie. À ce titre, je suis impatiente de vous rencontrer et de travailler avec vous au cours de la prochaine année.



La SCMO est la société nationale vouée à l'avancement des sciences atmosphériques, océaniques et environnementales connexes au Canada. En tant que vice-présidente, j'ai été aux premières loges pour observer son dévouement en action. En plus d'organiser un congrès scientifique annuel, et de publier Atmosphere-Ocean et le Bulletin de la SCMO, la Société décerne des prix et des bourses d'études, agrège les présentateurs météo et les consultants, subventionne la participation d'enseignants au Projet Atmosphère et au projet Maury, et publie des prises de position scientifiques. De nombreuses activités de la SCMO se déroulent à l'échelle locale, dans les 14 centres du pays. Nos centres organisent des événements locaux, comme des conférences sur les sciences et les politiques, des visites et des dîners, accueillent les conférenciers itinérants de la SCMO, fournissent des juges aux expo-sciences, visitent les écoles et accordent des bourses de voyage aux étudiants.

Toutes ces activités de la SCMO reposent sur la participation de ses membres et de ses bénévoles, qui proviennent des universités, des gouvernements, du secteur privé et du public. J'encourage tous les membres à s'impliquer dans

Mot du président

les activités de la SCMO, que ce soit au sein de centres locaux ou d'un comité de la SCMO, en assistant à l'AGA ou autrement. Étant membre de notre organisation depuis 23 ans, je crois de tout cœur que la SCMO est essentielle à la promotion des sciences de l'atmosphère et des océans au Canada, et que la participation à ses activités est très enrichissante et d'une grande pertinence.

En tant que vice-présidente, j'étais responsable de la surveillance des comités de la SCMO et j'ai présidé les réunions bimestrielles du comité des centres et de l'adhésion. J'ai donc eu l'occasion d'en apprendre davantage sur le fonctionnement interne de la Société et de rester au fait de tout ce qui se passait de formidable dans les centres. En tant que présidente, en m'appuyant sur mon expérience précédente, je souhaite me concentrer sur trois objectifs (les membres, la sensibilisation, l'éducation) que contient le plan stratégique de la SCMO.

1) L'adhésion à la SCMO et la participation des étudiants

Le recrutement et la mobilisation de nouveaux membres demeurent essentiels à l'avenir de la SCMO. Cet objectif exige une conception claire de la fonction de la Société, de sa pertinence et de son importance dans un monde en mutation, ainsi que des avantages de l'adhésion, qui est actuellement gratuite pour les étudiants. Je souhaite renforcer les interactions entre le bureau national et le comité des étudiants afin de développer de nouvelles idées et de favoriser une participation accrue des étudiants. Il faut aussi garder à l'esprit les questions d'équité, de diversité et d'inclusion. En outre, comme le font plusieurs sociétés scientifiques, nous en sommes à rédiger un code de conduite des membres. Nous solliciterons vos commentaires au cours de l'année qui vient.

2) La sensibilisation et la visibilité de la SCMO

Le bureau national et les centres peuvent tous accroître la visibilité de la SCMO, promouvoir les sciences météorologiques et océanographiques, et enrichir la compréhension des Canadiens en matière de changements climatiques. Nous poursuivrons et renforcerons les activités entreprises cette année, en partageant des idées, des ressources et des pratiques exemplaires. Les initiatives comprennent la production de matériel promotionnel, la mise à jour de notre site Web, la publication de positions scientifiques, l'offre d'expertise pour les requêtes des médias, et des partenariats avec des organisations connexes comme l'[Australian Meteorological and Oceanographic Society](#).

3) L'éducation et le mentorat au sein de la SCMO

Depuis longtemps, la SCMO encourage les jeunes de la maternelle à l'université à s'intéresser à la météorologie et à l'océanographie. J'aimerais renforcer nos activités actuelles dans ce domaine en revitalisant nos comités d'éducation et en augmentant les occasions de mentorat, en partenariat avec les universités, le secteur privé et les gouvernements.

Le succès de la SCMO et sa capacité d'atteindre ces objectifs et autres dépendent d'une saine gestion financière. Nous continuerons de renforcer notre position financière, afin d'atteindre l'équilibre budgétaire d'ici 2021, puis de revenir par la suite à des excédents réguliers.

Beaucoup de travail se déroule en coulisse. Je remercie donc le personnel de la SCMO, le conseil d'administration, le comité exécutif, les présidents des centres, les présidents des comités et les membres pour tout ce qu'ils accomplissent au nom de notre organisation, et pour le soutien qu'ils m'ont apporté en tant que vice-présidente. Les centres qui accueilleront les congrès de la SCMO, à Montréal (UGGI 2019), Ottawa (2020), Victoria (2021) et Saskatoon (2022), travaillent également d'arrache-pied à leur planification. Je remercie tout particulièrement les gens qui cette année ont participé à l'organisation de l'Assemblée générale de l'UGGI. Le nombre de participants et la logistique de cet événement sont d'un ordre de grandeur supérieur à ceux de nos congrès habituels!

Enfin, un grand merci au nouveau président sortant Paul Kushner pour sa contribution exceptionnelle. La SCMO a grandement profité de la vision, du leadership, des aptitudes organisationnelles, des nouvelles initiatives et de l'expertise scientifique de Paul. Je remercie également plusieurs autres bénévoles dévoués, qui ont grandement contribué à la SCMO et dont le mandat prend fin : le président sortant précédent Wayne Richardson, la secrétaire correspondante Alanna Mackenzie et la conseillère Nadja Steiner. Tandis que la SCMO entame une nouvelle année, je suis ravie d'accueillir Marek Stastna, à titre de nouveau vice-président; Diane Pendlebury, à titre de nouvelle secrétaire correspondante; trois nouveaux conseillers, Laura Bianucci, Bruce Sutherland et Aldona Wiacek; et tous les nouveaux membres et présidents des centres et des comités de la SCMO.

En terminant, j'insiste encore une fois sur l'importance des bénévoles pour le succès de notre société. J'encourage les membres de la SCMO à communiquer avec moi s'ils souhaitent apporter leur aide à n'importe quelle activité de la Société.

Kim

Kimberly Strong, Présidente de la SCMO, professeure au département de physique de l'Université de Toronto
Courriel : president@scmo.ca

Article: Women in Meteorology

Women in Meteorology: The Early Years

By Rebecca Milo

In 2017, the Canadian Meteorological and Oceanographic Society (CMOS) celebrated its 50th anniversary. Spurred by that, CMOS decided to look back at the early days of women in meteorology. Their history is tied to the advancement of women in the workforce and their achievement of equal status in the workplace. With regard to gender equality in general, it was only the 1929 decision of the Judicial Council of Britain's Privy Council, Canada's highest court at the time, when women were legally recognized as "persons" under British common law.

Women's involvement in the profession of meteorology had its beginnings near the start of World War II when the study of meteorology became a wartime priority. When men were called up to serve in the Canadian Armed Forces, women replaced them in many fields including meteorology.

Canada had been building its meteorological capability for observing and forecasting during the late 1930s recognizing the need for improved aviation weather services, primarily for civil aviation. By 1938, aviation services had become a major component of the newly formed Meteorological Division in the Department of Transport. The Meteorological Division was led by John Patterson and housed at the University of Toronto. Patterson was a well-known physicist and because of this was able to work with the university to develop post-graduate courses in meteorology in an effort to meet the new demand.

With the outbreak of war, the demand for meteorological services increased exponentially. Not only did the Meteorological Division have to provide support to the Canadian Armed Forces in addition to civil aviation, but in 1938/39 Canada made a decision that would have a tremendous impact on the Meteorological Division in terms of increased demand. Canada agreed to take on a major portion of the British Commonwealth Air Training Plan (BCATP). All the training bases in Canada, which reached 100 by the end of the war, required meteorological support. In response, the Department of Transport's Meteorological Division hired hundreds of university graduates and trained them to serve as Meteorological Officers within the Royal Canadian Air Force (RCAF). Initially these hires were all male, most without post-graduate degrees, and in some cases only limited mathematics and physics courses. Nonetheless, following a "Short Course in Meteorology" given at the University of Toronto they were hired as Meteorological Assistants Grade 3 or dependent forecasters and were deployed to various military bases and became known as metmen within the military environment. Some went on to take an advanced meteorology course offered by the University of Toronto and became meteorologists or independent forecasters even though these courses were not at the post-graduate level, which had been a non-wartime requirement.

Well into the war, meteorology remained an almost completely male profession. It appears that no thought was given to hiring women into the Meteorological Division until about 1943. About a year earlier, the RCAF had formed a Women's Division (WD) to meet the need for observers and plotters, for which a university degree was not required. The WD comprised in-uniform members of the RCAF and they were the pioneer Meteorological Technicians. The success of this program may have influenced Patterson to hire a few qualified women to fill the growing demand for Meteorological Officers to support the war effort. Or it may have simply been the fact that qualified men were in scarce supply. In any event, the Short Course in Meteorology #9 in 1943 included three female university graduates. As were their male counterparts, these women were hired on a temporary basis because the wheels of government bureaucracy turned too slowly to meet the demand. This meant that they were given no assurances of ongoing employment when the war ended. In 1941 the salary for Meteorological Assistant Grade 3 was \$1620.00 which was substantially less than non-flying officers within the RCAF.



Figure 1. Short course in Meteorology #9 1943. Front row, far right: L-R Frances Carson (Sutherland), Joan E Griffiths and Patricia Ball (Powe).

Article: Women in Meteorology

The three women on course #9 were Frances Carson (Sutherland), Joan E. Griffiths, and Patricia Ball (Powe) (figure 1). Joan Griffiths and Frances Carson did well enough on the Short Course in Meteorology to be chosen to go on to the advanced course given by the University of Toronto that took place during the winter of 1943/44.

Frances Carson was posted to the Moncton District Aviation Forecast Office (DAFO). She married another meteorologist, Con Sutherland, and resigned in 1945. Patricia Ball married Norm Powe, an experienced observer, who was also at the Moncton DAFO. She resigned, never having worked in a meteorological office. Joan Griffith was posted (1944/45) to Jericho Beach, Vancouver, which was the Western Command Headquarters for the RCAF and went on to have a long career that included directing the training of the WD for a period.

These initial three were followed by two women who completed short course #10 (1943/44). One of these, Joan O'Brien, was believed to have had the longest career of the first five women. She was posted to Winnipeg and remained there for 27 years. Her obituary notes that she provided excellent support as the Administrative Assistant and Technical Advisor to the Officer-in-Charge. Her classmate, Mary (Mona) Pirie (Ninnes), worked at Meteorological Division Headquarters at 315 Bloor Street in Toronto before resigning to raise a family. She returned to the Meteorological Service some years later to work in informatics and retired around 1980. Ms. Ninnes passed away March 20, 2019 at the age of 101.

Although, as noted earlier, these first five women graduates were generally assigned to civilian meteorological sections or DAFOs, other women were engaged in meteorology with the RCAF as part of the RCAF's WD (figure 2). Many of these women assisted the metmen at their meteorological stations, and around 1942 these airwomen began to replace metmen as observers and map plotters. One of these women, Frances Halpenny, who was on the WD course #5 worked as an observer during the war but returned to her pre-war employer, the University of Toronto Press, and went on to become the Associate Director from 1979 to 1984. She was named an Officer of the Order of Canada in 1979 and Companion in 1984 among many other honours. Ms. Halpenny died in 2018 at the age of 98.



Figure 2. A look at the RCAF WD and Frances Halpenny is seen in this 1942 photo. Frances Halpenny is number five in the front row, second from the right.

Article: Women in Meteorology

Following the war, many metmen, including many of the women, left the Meteorological Division because the number of bases had been significantly reduced, and the demand for services dropped. Many returned to their pre-war professions, such as teaching, and many of the married women decided to remain at home and raise their families. It is interesting to note that of the approximately 125 meteorologists (advanced course or master's degree graduates) who were trained in wartime, 90 or so remained for their entire career. Of the 220 metmen (and women) trained, only about 110 remained employed in the weather service at the end of the war. Two of the women who trained under these wartime programs, Joan Griffith and Joan O'Brien, spent their careers in the field and could certainly be called trailblazers.

Although the Meteorological Service was reduced in numbers after the war, John Patterson felt that world events might lead to another war and, therefore, expected the need for another expansion of the Meteorological Service in the future. Following his retirement in 1946, John Patterson made a number of recommendations on how to address an increased requirement. One of these recommendations was *"Women had proved to be competent and should be employed wherever possible and given the same opportunity for training as men."*

Despite this endorsement, with limited hiring after the war, the next time a new graduate female employee is encountered is in 1949, when the first female to obtain a master's degree in meteorology joined the Division.

Armelda McCulloch (Buchanan) worked in the Moncton DAFO (seen in figure 3 on the forecast desk) and was married in 1950.

In the sixties, Armelda, or Melda as she was known, returned to the Comox Valley and became involved in political and environmental issues. Her first love was always nature, and it became her passion in life to protect the natural paradise in which she lived. To that end she co-founded the Comox Valley Society for the Prevention of Cruelty to Animals (SPCA), helped fund the North Island Wildlife Centre, became involved in the creation and expansion of Sealbay Park (a commemorative plaque in her name can now be seen there), and supported the protection of the Macdonald Woods in Comox. She participated in the blockade at Strathcona Park, later becoming a board member and financial supporter, to ensure the maximum protection of the park lands. Before her death in 2004, Melda made a significant bequest to The Land Conservancy of British Columbia. Melda did not make meteorology her career, but her legacy was environmental activism.

In the following year (1950) after Melda's graduation, three more women participated in the master's course, however little is known of their careers. They were Fran Dawes, Lillian M Dunn later Flint) and Gloria Logan (Ellenton).

As far as we can tell, no other women were hired as meteorologists until 1957 when four women, Violet McLaughlin, Patricia Finlay (Murray), Nancy Brown, and Elizabeth Charnly attended meteorology course #13. We see them here (figure 4) in the class photo, Meteorological Officers Course #13 Phase I 1957.



Figure 3. Armelda McCulloch (Buchanan).



Figure 4. Meteorological Officers Course #13 Phase I 1957. Front row: L-R Elizabeth Charnly, Violet McLaughlin, Patricia Finlay (Murray), Nancy Brown.

Article: Women in Meteorology

However, as Pat Finlay Murray recalls:

“...by the time I was married in 1962, I was the only one left and I resigned to have a baby. Then I decided to try and get back into the Weather Service. I ran into a problem as they still wouldn’t accept women, but by that time we had some equal rights legislation and I was hired for the weather office in Winnipeg. Anyway, to make a long story short, I spent the next 30 years in the Winnipeg Weather Office and retired in 1992.”

This not only highlights the difficulty in retaining women after the war but also the challenges facing women leaving and then wishing to return to the workplace after raising children.

About 10 years after the first female master’s program graduate, Patricia Grossmith (Gladis) joined the Meteorological Service. She obtained her degree on the 1960 master’s course but left in 1962 to pursue a career in the field of physics of liquid crystals. Despite her brief meteorological career she became a poster girl for the Department of Transport, which highlighted an unusual phenomenon — a “weather women” on the cover of their magazine in 1961 (figure 5). Ms. Grossmith is another example of a women trained in meteorology who went on to achieve remarkable success and make a name for herself in another field. She held various professorships and research positions and went on to work in Paris for three years. There, she conducted research at the University of Paris (Orsay) in her field of specialty, the physics of liquid crystals. During that time she worked with the Orsay Liquid Crystal Group, whose founder, Professor [Pierre-Gilles de Gennes](#), won the Nobel Prize in physics in 1991 for his work on liquid crystals and polymers.

After her research position in Paris, she worked at Bell Labs as a research physicist to continue her work on liquid crystals. She held various positions and professorships and received several awards during her career including the Edith Kreeger Wolf Distinguished Professor award, an endowment given by the Gender and Sexuality Studies department of Northwestern University to recognize women who have made major contributions to their fields. She was appointed a fellow of the [American Physical Society](#) in 1983 and later received a Guggenheim Fellowship in 1993. She also received the [Humboldt Prize](#), an award that “recognizes lifetime achievements and facilitates international scientific collaboration.”

Had she stayed in meteorology, Patricia would undoubtedly have won the Patterson Medal among other awards.

Speaking of the Patterson Medal (the highest award for Canadians in distinguished service to meteorology), Nancy Cutler is the first and only woman to win this award in its 63 years of existence (figure 6).

The first woman to obtain a PhD in meteorology was Marianne English (née Weiss) who attended McGill after graduating from the master’s course in 1964. In that year she was quoted in the Winnipeg Free Press saying,

“...her chosen field of meteorology is a good one for women. There are few women in Canada in the field and there will be a need for more and more.”



Figure 5. Patricia Grossmith pictured on the cover of a Department of Transport magazine in 1961.



Figure 6. The photo shows Nancy Cutler receiving the Patterson Medal in 1997 from Gordon McBean, then Head of the Meteorological Service of Canada.

Article: Women in Meteorology

Following her PhD, Dr. Weiss worked for the Alberta Research Council in their work on hailstorms and rainfall, as well as with the Clean Air Strategic Alliance (CASA). Later she worked in many parts of the world including Denver Colorado, Johannesburg South Africa, and London England.

Although the history of women in meteorology started some 80 years ago, even as late as 1967, the field was still dominated by men. That year the attendees at the Canadian Meteorological Society (CMS) Congress were all male, as illustrated in the photo of about 100 delegates (top photo, figure 7).

The 51st CMOS Anniversary Congress, held in Toronto in 2017, tells a different story, with many women participating and serving in roles such as session chairs (bottom photo, figure 7).

Readers of electronic versions of this article may zoom the following photo to several hundred percent to see the many women now participating. The CMOS Archivist was consulted and kindly did the numbers, based on those who came for the 2017 photo. The total number of delegates was 245 of which 81 were women!

Although we cannot positively identify the first female meteorologist in Canada, in the first 20 years of women in meteorology in Canada, there were a number, as mentioned above, who were trailblazers for the many women who followed. The careers of many of these women were rather brief because they left to pursue other

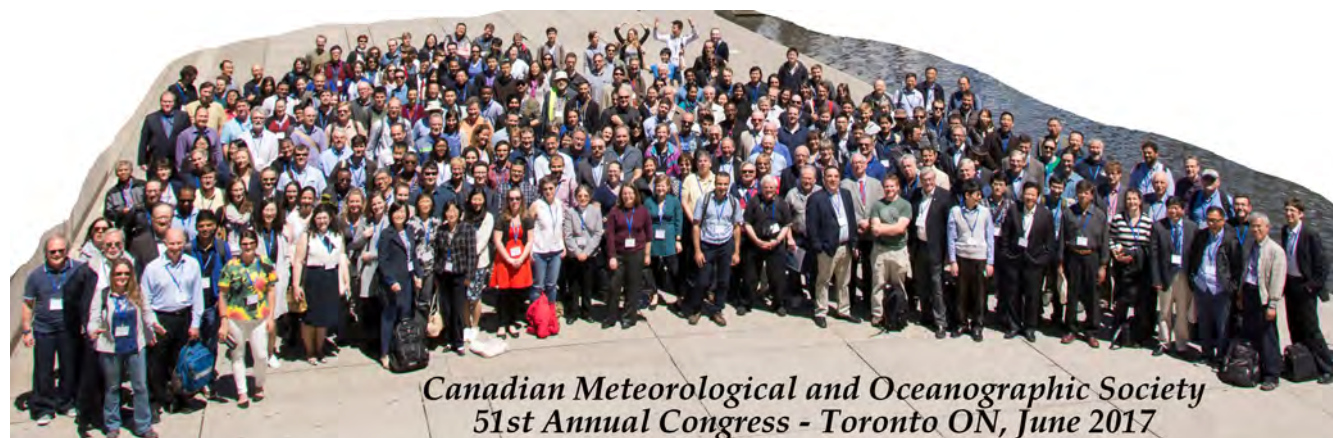


Figure 7.

Article: Women in Meteorology

endeavours or decided to resign and raise families. Things began to change in the 1970s when the number of women in the Meteorological Service increased significantly, in step with an increase in hiring throughout the Public Service and the recognition that women can raise a family and have a career.

During subsequent years there were many firsts for women in the Meteorological Service. For example, in the early 1970s Doris Quinn was the first female to be posted to the Arctic. Carol Klaponski was the first woman to serve on a Canadian Military base, and Mary Regan the first woman to serve overseas in uniform with the RCAF. Before this there had been some apprehension about unchaperoned single women working the graveyard shift in such locations. During that period, there was also a dress code for women. Skirts were not allowed to be short, and more than one woman was denied access to the Officers Mess when wearing the newly introduced pant suit. Needless to say, these ideas changed substantially in the following decades.

In more recent times, women trained in meteorology have made the most of opportunities and been promoted to senior positions within the Meteorological Service, as well as in other science-based departments. These achievements bode well for current and future women graduates of the meteorology programs and for the organizations employing them.

Despite the advances made in recent years, women remain less likely to choose a career in Science, Technology, Engineering, and Mathematics. This stands in contrast to many other fields of study, in which women now represent the majority of graduates. We can see from the makeup of our intake programs over the last decade or so that our recruitment of women is not yet 50%, but women are increasingly represented.

In conclusion, two of the trailblazing women who joined during the war years went on to have a full career in meteorology. In the following years, we had our first female with a master's degree in meteorology and ten years later, for the first time, a woman obtained a PhD in meteorology. Although these women were clearly pioneers in their own way, the women entering the field during the 1970s also led the way for the many women to follow. They all contributed to the current state of meteorology in Canada where, for the most part, men and women are now treated equally. Although many more women have ascended to the senior ranks of the Meteorological Service, and one even won the Patterson Medal, we have yet to have a female meteorologist become the Assistant Deputy Minister. There remain more goals for women to achieve.

Editor's Note: *Women in meteorology have come a long way since those early days! These successful women meteorologists, pictured below left, reunited in July 2012. left to right: Leslie (Taylor) Malone, Anne O'Toole, Sheila (Bain) Bourque, Debbie MacDonald-McGee, and article author Rebecca L (Wall) Milo.*



About the Author

Rebecca (Becky) Milo is a retired meteorologist living in Ottawa. She has been an active CMOS member since 1981, including serving as Chair of the Ottawa Centre in 1993.

References

1. Encyclopædia Britannica, web site. Article Persons Case, published October 11, 2018. Retrieved from

<https://www.britannica.com/event/Persons-Case>

2. Morley Thomas, *Metmen in Wartime, Meteorology in Canada 1939–1945* (pp. 309–310). 2001. Toronto: ECW Press.
3. Morley Thomas, *Metmen in Wartime, Meteorology in Canada 1939–1945* (p. 48). 2001. Toronto: ECW Press.
4. Morley Thomas, *Metmen in Wartime, Meteorology in Canada 1939–1945* (p. 310). 2001. Toronto: ECW Press.
5. Morley Thomas, *Metmen in Wartime, Meteorology in Canada 1939–1945* (p. 316). 2001. Toronto: ECW Press.
6. P. Finlay, email to R. Jones, October 9, 2017
7. *City's Rainy Days Earn Woman Degree*. (July 9, 1964) *Winnipeg Free Press* (p. 16).

Pictures courtesy CMOS archives:

Fig 1. *Short course in Meteorology #9 1943, Frances Carson (Sutherland), Joan E Griffiths and Patricia Ball (Powe)*

Fig 2. *Armelda (Melda) McCulloch (Buchanan) on the desk in the Moncton DAFO, 1949*

Fig 3. *Weather Course for RCAF Airwomen (WD), 1942*

Fig 4. *Meteorological Officer Course #13 Phase I, Elizabeth Charnly, Violet McLaughlin, Patricia Finlay (Murray), and Nancy Brown*

Fig 5. *Pat Grossmith on the cover of the Department of Transport magazine, "News on the DOT" 1961*

Fig 6. *Patterson Medal, Nancy Cutler and Gordon McBean*

Fig 7. *CMS Congress 1967 and CMOS Congress 2017*

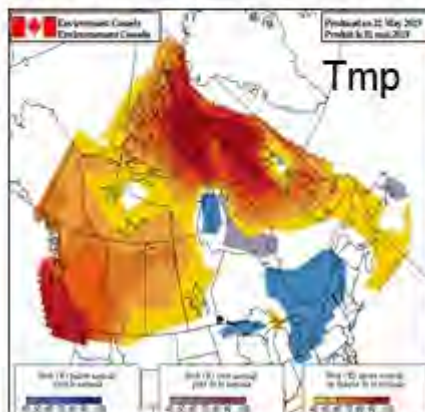


Seasonal Outlook for the summer 2019 (JJA) based on CanSIPS forecast issued on the 31st May 2019

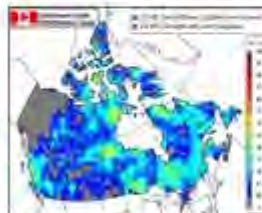
Marko Markovic and Marielle Alarie

Above normal summer is expected across western and Northern Canada. The highest probabilities for this results are over the BC and Canadian Archipelago (>70%). Canadian Prairies have 40-60% chance for an above normal summer. Southern QC, Eastern ON and southernmost ON have >40% of probability for below normal summer. NS, western ON and central QC expect equal probability chances for this summer.

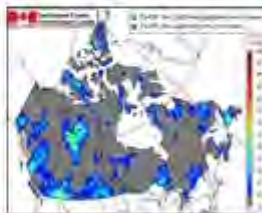
Equal probability chances for precipitation across Canada? Southern parts of AB, SK and Atlantic provinces are expected to have above than normal precipitation with >40% probability. Below normal probabilities of >40% are expected over Northern AB and Eastern BC. Over Canada, the **summer season has the least historical skill** due to the dominant convective-precipitation regime.



Historical Skill, Tmp



Historical Skill, Pcp



CanSIPS JJA16 forecasted Indices:
Nino3.4 = 0.9 (moderate El Nino!!)
PDO = 0.2 (weak index)
NAO = 0.1 (weak index)

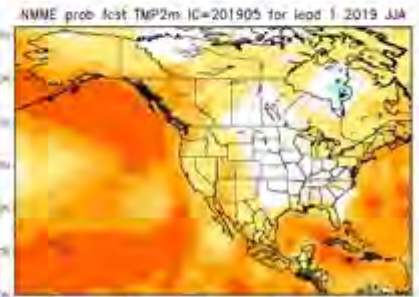
What will influence the next season? SST anomalies in the equatorial pacific are currently indicating a mild El Nino. According to the CanSIPS system these warm SST anomalies will remain in JJA19. This forecast is in accord with the International research Institute forecasting a 70% chance that the El Nino conditions will remain during JJA and more than 50% chance in autumn.

Current, weak, PDO index is likely to remain positive in JJA19. Weakly positive NAO is forecasted for JJA19, mainly in June, after which skill is low. Although positive NAO is historically connected with above normal temps. over E. Canada in JJA, its influence is weaker than in winter.

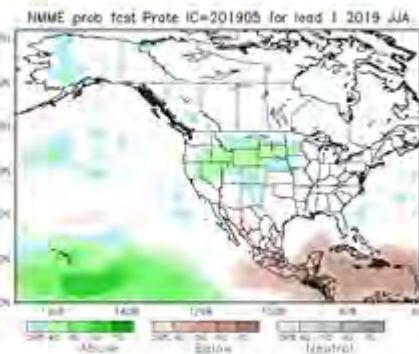
PNA index will likely stay positive (until early-June, according to the CPC).

Comment: There is *little El Nino impact over Canada during summer.*

Other Centers: Temperature: according to the NMME (lead 1 month), probability of above normal temperatures are expected across Canada with an exception of the central SK, MT and Eastern ON where the equal probability chances are expected. There is a difference between the NMME and CanSIPS summer forecast for Southern QC, eastern and southernmost ON. Over these region the CanSIPS system is forecasting below normal temperatures for JJA19.

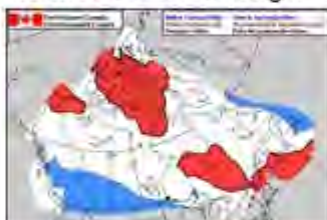


Precipitation: The longer lead (1month) NMME forecast is showing mostly equal precipitation chances over entire Canada for this summer. There are some scattered exceptions over the central and Southern BC with a very low probability expectancy of >36% for an above normal precipitation.



MAM19 Obs. Categories

MAM19 CanSIPS Catgs.



Verification MAM 2019, Temperature: Eastern and Western Canada were missed by the MAM19 forecast. Central Canadian regions had a correct spring forecast.

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



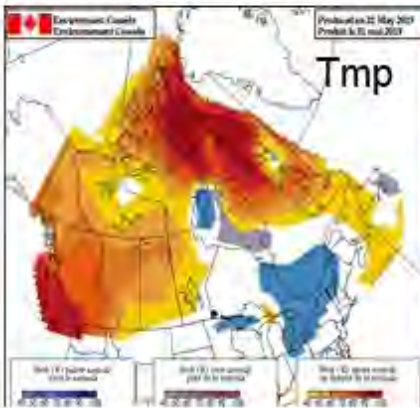
Prévision saisonnière pour l'été 2019 (JJA) basée sur la prévision officielle de SPISCan, émise le 31 mai 2019

Marko Markovic et Marielle Alarie

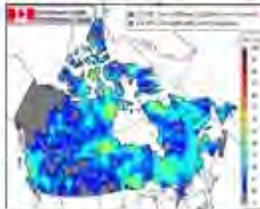


Températures: Un été au-dessus de la normale sur l'ouest et le nord du Canada. Les probabilités les plus élevées se trouvent en C.-B. et sur l'archipel Arctique (> 70 %). Les Prairies canadiennes ont 40 à 60 % de chances de connaître un été au-dessus de la normale. L'ouest, le sud et centre du QC, l'est et le sud de l'Ontario ont plus de 40 % de probabilité que l'été soit sous la normale. La N.-É., N.B. l'est du Québec et l'extrême nord de l'Ontario s'attendent à des chances égales de probabilité pour cet été.

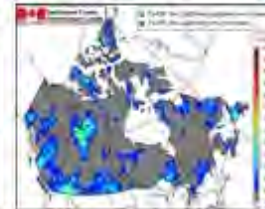
Chances égales d'observer des précipitations inférieures, près ou au-dessus des normales au Canada? On s'attend à ce que le sud de l'AB et de la SK, les provinces de l'Atlantique et le Labrador reçoivent des précipitations supérieures à la normale avec une probabilité >40 %. Des précipitations sous la normale sont anticipées sur le nord de l'Alberta, le sud et le centre de la C.-B. avec une probabilité >40 %. Au Canada, la saison estivale est celle où l'habileté historique est la plus faible en raison du régime convectif des précipitations.



Habileté historique, tmp



Habileté historique, pcp

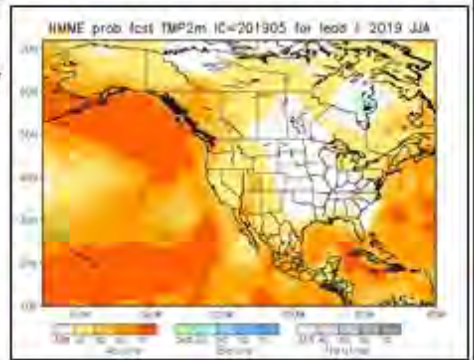


Indices climatiques prévus par SPISCan Pour JJA19
Nino3.4 = 0.9 (faible El Niño)
PDO = 0.2 (indice faible)
NAO = 0.1 (indice faible)

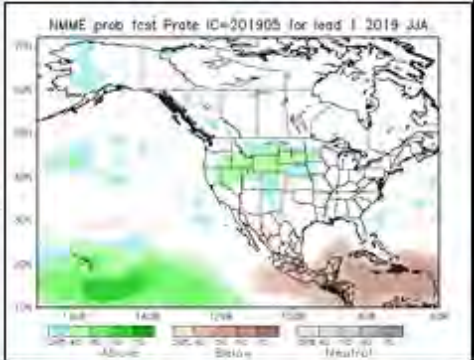
Qu'est-ce qui influencera notre saison? Les anomalies de la TSM sur les eaux équatoriales du Pacifique indiquent présentement un faible El Niño. Selon le système de prévision SPISCan, ces anomalies chaudes demeureront cet été JJA19. Cette prévision est en accord avec celle émise par l'*International Research Institute*, qui prévoit une probabilité de 70% que les conditions d'El Niño se maintiennent pendant l'été, et à plus de 50% à l'automne. L'indice PDO actuel, faible, devrait rester positif cet été. On prévoit un NAO faiblement positif pour JJA19, principalement en juin, après quoi l'habileté à prévoir est faible. Bien que le NAO positif soit historiquement liée à des températures au-dessus de la normale l'été sur l'Est du Canada, son influence est plus faible qu'en hiver. L'indice PNA restera probablement positif (jusqu'au début juin, selon le CPC).

Commentaire : Il y a peu d'impact de l'El Niño sur le Canada pendant l'été.

Prévisions saisonnières des autres centres. Températures: Selon le NMME (délai 1 mois), il est possible d'observer des températures au-dessus des normales sur tout le Canada à l'exception du sud et centre de la SK, le MB et l'ouest de l'ON où la chance d'observer des températures au-dessus, près ou sous les normales sont égales. Il y a une différence entre les prévisions estivales de NMME et de SPISCan pour l'ouest, le sud et centre du QC, ainsi que l'est et le sud de l'ON. Sur ces régions, SPISCan prévoit des températures sous les normales pour JJA19.



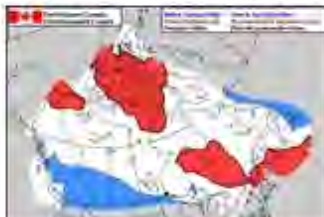
Précipitations: Le NMME montre des chances de précipitations à peu près égales sur l'ensemble du Canada cet été. Il y a quelques exceptions sur quelques régions dispersées de la C.-B. avec une faible probabilité >36% pour des précipitations supérieures à la normale.



MAM19 Catégories obs.



MAM19 SPISCan categories



Vérification MAM 2019, Températures: la prévision de MAM19 a été manquée sur l'est et l'ouest du Canada. Sur le centre, la prévision a bien vérifié.

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

Article: IUGG General Assembly

CMOS at the IUGG General Assembly in Montreal, July 9th to 14th

By Bulletin Editor Sarah Knight

Formed in 1919, the [International Union of Geodesy and Geophysics \(IUGG\)](#) this year celebrates 100 years, and CMOS gets to be a part of it, as our congress coincides with their general assembly in Montreal in July.

Read on to get the lowdown on what's what for CMOS members at this year's IUGG general assembly:

How is IUGG 2019 organized?

The IUGG is made up of eight different associations, each association representing one of the main research areas of the organization. The two associations that most closely align with CMOS interests are the [International Association for the Physical Sciences of the Ocean \(IAPSO\)](#) and the [International Association of Meteorology and Atmospheric Sciences \(IAMAS\)](#). Some CMOS members may also find links with the [International Association of Cryospheric Sciences \(IACS\)](#) and the [International Association of Hydrological Sciences \(IAHS\)](#).

Each association will have its own symposia at the general assembly, and some of the associations will combine to offer joint sessions (called inter-association symposia), where lots of interdisciplinary topics will be explored – CMOS members may find the inter-association symposia that feature meteorology and oceanography of particular interest. There are also 9 different union symposia organized that will bring everyone together.

Where does CMOS fit in?

CMOS was invited to help shape some of the inter-association symposia, and you will find CMOS members convening and co-convening a variety of these. Here's just a few worth checking out –

- *Hydrometeorologic and Coastal Extremes in Current and Future Climates* (JM04a) convened by Laxmi Sushama on Tuesday July 9th at 8:30
- *Satellite Remote Sensing: Vital Information on the Health of our Planet* (JM09d) convened by Kaley Walker on Tuesday July 9th at 4:30
- *The North Atlantic-Arctic System: State, Process, and Change* (JP02d) convened by Paul Myers on Thursday July 11th at 1:30
- *The Arctic in the 21st Century: A Hotbed of Global Change* (M09a) convened by Jim Drummond on Saturday July 13th at 1:30

CMOS members will also find themselves feeling well at home in any of the IAHS, IAPSO, IAMAS or IACS association symposia.

The CMOS portion of the IUGG General Assembly runs from July 9th to the 14th.

How can you find out what is happening for you?

The IUGG 2019 website is the place to begin iugg2019montreal.com.

Start by checking out the symposia that the association that you most closely align with are organizing, by following the Association Symposia link under the Programme tab. Inter-association symposia are organized by a listing of the convening associations, and you can see all of these options by following the Inter-Association Symposia link under the Programme tab.

Article: IUGG General Assembly

There are also a great suite of Union Lectures that will appeal to any and all of the 3,600+ people in attendance. Long-time CMOS member and WMO President David Grimes will give the first of these with a talk titled *Earth Sciences as the Underlying Pillars to Meet Societal Challenges in the next Century* on Thursday July 11th, at 10:30.

There is also a [searchable programme available](#), just follow the IUGG Programme link under the Programme tab on the website.

What are some of the highlights for CMOS members at IUGG 2019?

The public lecture, featuring a documentary film and a bilingual panel discussion on the subject of Canada's three oceans should not be missed. July 9th, at 7 pm.

The associations have lined up some very high-impact speakers for the Union Lectures. There are nine of these in total, with three on the 11th, three on the 13th, and two on the 16th. As well as David Grimes' talk on the 11th, CMOS members may be particularly interested in attending Canada's Karen Kohfeld's talk *The Ocean's Role in Atmospheric Carbon Dioxide Changes During Ice Age Cycles*, also on the 11th at 11:30 am.

The opening ceremony on July 10th at 4 pm, attended by the President of the Royal Society of Canada and the Chief Scientist of Quebec amongst others, will be a great place to meet and mingle. The CMOS Banquet on July 11th will be our chance to spend time with some more familiar faces! Tickets are in addition to the registration fee. If you have already registered you can still get your banquet ticket [here](#).

The Union Symposia are going to be fascinating, and with subjects like *Achieving Sustainable Development: The Role for Earth Sciences* and *Data-driven Science for Earth and Space Exploration* as well as an *Early Career Scientists' Symposium*, they will appeal to any scientist.

Still need convincing?

With over 3,600 people attending the IUGG general assembly, this is a great opportunity to branch out, to see what people from different countries are working on, and maybe even pave the way for new collaborations. You'll get to see how atmospheric and oceanographic research can fit in with other research domains – for example there is a session on tsunamis where oceanographers will speak alongside seismologists and volcanologists.

You will have the unique opportunity to take the occasional break from attending sessions that are focused on your own research area to sit in on others that address areas outside of your field. With symposium titles like *Planetary Magnetic Fields and Secular Variations*, *Genesis of Devastating Continental Earthquakes*, and *Experimental Volcanology Approach to Investigate Magma Generation, Ascent and Eruption*, how could your curiosity not be tempted?

More information and registration at iugg2019montreal.com.





54

th
CONGRESS
e
CONGRÈS

Canadian Meteorological and Oceanographic Society (CMOS) Annual Congress

Congrès annuel de la Société canadienne de météorologie et d'océanographie (SCMO)



**BUILDING
SOCIETAL
RESILIENCE**

to Changing Weather, Climate,
Oceans and Environment

**BÂTIR UNE
RÉSILIENCE
SOCIÉTALE**

face aux changements
de la météo, du climat,
des océans et de
l'environnement

Sunday May 24, 2020 to Thursday May 28, 2020 at the Delta Hotel, 101 Lyon St., Ottawa
Dimanche le 24 mai 2020 au jeudi le 28 mai 2020 à l'hôtel Delta, 101, rue Lyon, Ottawa

cmos.ca / scmo.ca

In case you missed it...

From CMOS Bulletin Volume 47, Number 2:



[Extreme 2014 Wildfire Season in the Northwest Territories](#)
by Bob Kochtubajda et al.

[Canada's Changing Climate Report \(CCCR\)](#)



[Canadian Weathercasters as Climate Change Communicators](#)
by Bronwyn McIlroy-Young

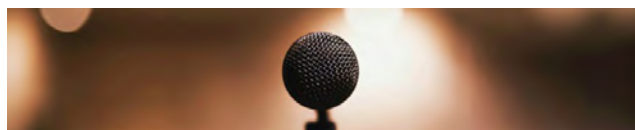
[In Memoriam: Wayne Evans](#)



[Message from the President: Building Resilience to Climate Change, with Grace Under Pressure](#)
by Paul Kushner

[Members Updates](#)

Meeting Notifications, Books for Review, and more



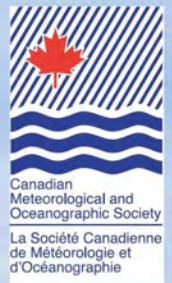
These articles, and more, in the new, online CMOS BULLETIN.

<http://bulletin.cmos.ca> (english)

<http://bulletin.scmo.ca> (français)

[Subscribe here](#) to receive your bi-monthly e-update.

ONLINE / EN LIGNE



CMOS BULLETIN SCMO

Weather - Climate - Ocean - Atmosphere
Météo - Climat - Océan - Atmosphère

After 45 years in print, the Bulletin of the Canadian Meteorological and Oceanographic Society (CMOS) has gone virtual. See bulletin.cmos.ca for articles, news, events and updates from Canada's top meteorologists, climatologists and oceanographers.

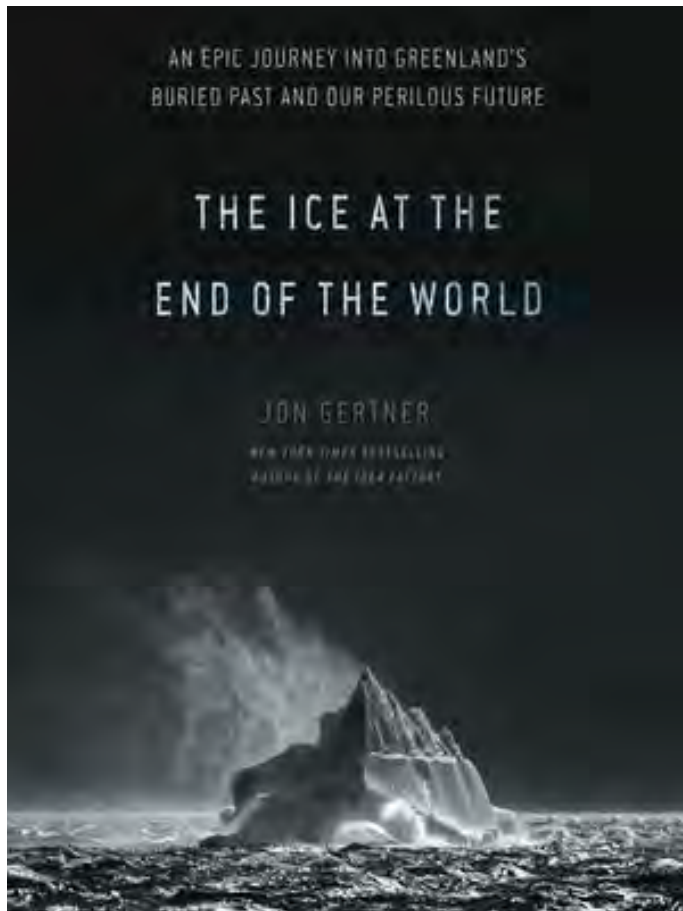
Après 45 années de publication papier, le Bulletin de la Société canadienne de météorologie et d'océanographie (SCMO) passe en mode virtuel. Consultez le site bulletin.scmo.ca pour lire des articles, des nouvelles, des annonces d'événements et des faits nouveaux que partagent les éminents météorologues, climatologues et océanographes du Canada.

<http://bulletin.cmos.ca>
<http://bulletin.scmo.ca>

Book Review

The Ice at the End of the World

Review by Phil Chadwick, Meteorologist and EcoArtist



By Jon Gertner

Published by Penguin Random House
Hardcover, 448 pages, \$ 28.00 (USD)
ISBN: 9780812996623

You can't make this stuff up! In fact, hard data and science might be the best things to really believe. ["The Ice at the End of the World"](#) is a terrific read. Historians and scientists, as well as anyone concerned about the future of the planet, would find this book fascinating. There is indeed something for everyone. The research to put this work together may have been made easier by the Web but it is still exhaustive and must have been exhausting. The notes pages add the details about where the facts originate as well.

The ice sheet of Greenland may look empty but it hides many secrets. The book chronicles the adventures and hardships of those who unlocked those mysteries. The Inuit who called coastal regions of Greenland home but feared to go into the interior, as it was a place of emptiness and death. The Inuit were instrumental though in teaching the early explorers how to travel across, and survive in, the harsh reality of Greenland.

In the 1800's everything about Greenland was unknown. What was in the middle? A fabled oasis as

envisioned by Jules Verne? Or more ice? No one knew. Early polar explorers like Fridtjof Nansen (1888), Robert Peary, Knud Rasmussen and Peter Freuchen found a high dome of ice after they traversed the deadly crevasses on the edge of the ice sheet.

The polar explorers who evolved into scientists, such as Alfred Wegener, were in awe of the Greenland ice sheet. They asked more questions. What was the temperature of the ice? Was the ice sheet growing or shrinking? These questions required the evolving sciences of glaciology, meteorology and climatology to unravel. Science involved digging pits seven metres deep all around the ice sheet – arduous science indeed. Through the pages of this book Jon Gertner turns these historical giants into real people – some of whom you would like to call friends.

The Cold War turned Greenland into a strategic location for the United States. This interest resulted in funds for ice research. Science on the Greenland sheet boomed.

The technology of drilling ice cores thousands of feet in depth evolved. The Dye-3 ice core reached bedrock through 6,683 feet of ice. The longest ice cores would go through 400,000 years of climate history. Specific events became obvious, like the Caesar volcano that occurred close to 42 B.C. "Plinius the Elder wrote that when Caesar was killed the gods were so ashamed of what Rome did that they hid the sun behind a red veil for an entire year." The scientists had to invent the technology and science to unlock those secrets hidden in the ancient ice.

Glaciologists turned their attention to the "big gun glaciers" that were calving ice at alarming rates. The Jakobshavn glacier of western Greenland is "perhaps faster and more productive, in fact, than any glacier in the world". Icebergs from Jakobshavn were credited with sinking the Titanic.

Book Review

Satellite technology developed so that scientists no longer had to cross the Greenland ice sheet. One pair of satellites called GRACE use variations in gravity to actually measure changes in the mass that they fly over. One really big and basic question remained. Was the ice sheet in equilibrium? If not, was it gaining or losing volume? GRACE helped answer by constantly weighing the ice sheet. Between 2002 and 2009 “Greenland had gone from losing about 137 billion tons of ice per year to losing about 286 billion tons a year”.

The Greenland ice sheet and the western Antarctic sheets are in collapse. The water has to go somewhere. As Jon Gertner writes in Note 34 “Political denials regarding the evidence of climate change seem even more absurd in light of sea level change data. A reliable tidal gauge record showing a steady upward progression goes back to about 1870; satellite readings go back to the mid-1990s. There is close agreement. See <https://sealevel.nasa.gov/news/108/new-study-finds-sea-level-rise-accelerating>. The rate of sea level rise has risen from 2.5 mm per year in the 1990s to 3.4 mm per year in 2018.”

Simply, the world is warming, the ice is melting, and sea levels are rising. Kurt Wolcken, a seismologist on Wegener’s 1930 expedition calculated that if the Greenland ice sheet was to melt “the oceans all over the world would rise by more than 25 feet...” new research suggests that his estimates might be 8 inches too high...

There is no explanation of the title to be found in this book but the double entendre seems pretty clear. Greenland might be thought to be so remote that it is at the end of the world and the melting of its ice sheet will end the world as we know it.

Any review cannot do this book justice... you will need to read it yourself. A few weeks after reading this book I thought that it needed to be brought to the attention of CMOS. I searched for some of the memorable phrases that I enjoyed in its reading... but mainly came up empty. Specific phrases can be hard to find in 400 pages. You will need to find them for yourself.



AirMet
SCIENCE
aer scientia

Richard Leduc, Ph.D.
Meteorologist

*Research
and consulting
Meteorology
and air quality*

4071, rue des Villas
Québec, QC, Canada G1Y 1V5
418-657-4054 • 418-930-4054
rleduc@airmetscience.com

www.airmetscience.com



AirMet
SCIENCE
aer scientia

Richard Leduc, Ph.D.
Météorologiste

*Recherche
et services conseils
Météorologie
et qualité de l'air*

4071, rue des Villas
Québec, QC, Canada G1Y 1V5
418-657-4054 • 418-930-4054
rleduc@airmetscience.com

www.airmetscience.com

[Books Available for Review](#)

18 Miles: The Epic Drama of Our Atmosphere and Its Weather, 2018. By Christopher Dewdney, ECW Press, ISBN 978-1-77041-346-7 (Paperback), 251 page, \$21.95. (2019-1)

Other recent titles still available for review by a CMOS member:

- **A Bright Future: How Some Countries Have Solved Climate Change and the Rest Can Follow**, 2019. By Joshua S. Goldstein and Staffan A. Qvist, Hachette Book Group, ISBNs 978-1-5417-2410-5 (hardcover), 978-1-5417-2409-9 (e-book), 288 pages, \$34.00. (2018-9)
- **Trends and Changes in Hydroclimatic Variables: Links to Climate Variability and Change**, 2019. Edited by Ramesh Teegavarapu, Elsevier Inc., ISBN 978-0-12-810985-4, 400 pages, US\$127 (2017-10)
- **Tropical Extremes: Natural Variabilities and Trends**, 2019. Edited by V. Venugopal, Jai Sukhatme, Raghu Murtugudde, Remy Roca, Elsevier Inc. ISBN 978-0-12-809248-4, 333 pages, US\$110 (2018-11)
- **World Seas, An Environmental Evaluation. VOLUME III: Ecological Issues and Environmental Impacts**, Second Edition, 2019. Edited by Charles Sheppard, Elsevier Inc. ISBN 978-0-12-805052-1, 633 pages, US\$250. (2018-12)
- **Synoptic Analysis and Forecasting, An Introductory Toolkit**, 2017. By Shawn Milrad, Elsevier, ISBN 9780128092477, 246 pages, US\$125.00 (2018-1)
- **Ice Caves**, 2017. Edited by Aurel Persoiu, Elsevier, ISBN 9780128117392, 752 pages, \$225.00 (2018-2)
- **Rainbows: Nature and Culture**, 2018. By Daniel MacCannell, The University of Chicago Press and Reaktion Books Ltd, ISBN 9781780239200, 208 pages, US\$24.95 (2018-4)
- **Verner Suomi: The Life and Work of the Founder of Satellite Meteorology**, 2018. By John M. Lewis, The University of Chicago Press and the American Meteorological Society, ISBN 9781944970222, paperback, 168 pages, US\$30.00. (2018-5)
- **The Deep Pull: A Major Advance in the Science of Ocean Tides**, 2018. By Walter Hayduk, FriesenPress, ISBN 9781525518706 (hardcover) \$35.49, 9781525518713 (softcover) \$27.49, 9781525517820 (eBook) \$11.99, 251 pages. (2018-7)

Never reviewed a book before? No problem! Check out some of these past reviews for ideas: [Ice: Nature and Culture](#); [Weather in the Courtroom](#); [Convenient Mistruths: A Novel of Intrigue, Danger and Global Warming](#); [Weather, A Very Short Introduction](#); [Nonlinear and Stochastic Climate Dynamics](#).

If you a review a book it is yours to keep! [Contact the Editor](#) to get involved.

[The Subtle Art of Weather Diplomacy](#)

A great article in the Globe and Mail (July 6, 2019; Andrew Blum) based in large part on interviews with leading CMOS member and assistant deputy Minister of Environment and Climate Change Canada, David Grimes.

Weather diplomacy is a subtle art, combining a technical knowledge of infrastructure and a political ear to its effects. "It's not like you're herding people, but you're listening, and then you want to capture all of the diversity of what's said," Mr. Grimes explains, in an interview between sessions at congress. "Is there something they're all saying that is the same?"

It is well worth a read!

Link to the full article in the Globe and Mail is here: <https://www.theglobeandmail.com/opinion/article-the-subtle-art-of-weather-diplomacy/>



DATA, MODELS AND ANALYSIS

The Highest Impact Articles
in Atmosphere-Ocean

Available from CMOS for \$40 CDN
(taxes included) + shipping.



Edited by
GUOQI HAN, HAI LIN and DOUW STEYN



Council / Conseil d'administration

President / Président

Paul Kushner
Department of Physics, University of Toronto, Toronto, ON
Tel.: 416-946-3683; E-mail/Courriel: president@cmos.ca

Vice-President / Vice-président

Kimberly Strong
E-mail/Courriel: vice-president@cmos.ca

Past-President / Président Sortant

Wayne Richardson
Tel.: 613-729-6757; Cel.: 613-851-7071; E-mail/Courriel: past-president@cmos.ca

Treasurer / Trésorier

Amir Shabbar
E-mail/Courriel: treasurer@cmos.ca

Corresponding Secretary / Secrétaire-correspondante

Alanna MacKenzie
E-mail/Courriel: corsec@cmos.ca

Recording Secretary / Secrétaire d'assemblée

Fred Conway
E-mail/Courriel: recsec@cmos.ca

Councillors-at-large / Conseillers

1) Iain Russell
Director, Meteorological R&D, Pelmorex Media Inc.
Tel.: 905-829-1159 x1405; E-mail/Courriel: irussell@pelmorex.com

2) Robert Sica
University of Western Ontario, London, ON
Tel.: 519-661-3521; E-mail/Courriel: bobsica@purplecrowlidar.ca

3) Nadja Steiner
Department of Fisheries and Oceans, CCCma, Environment Canada
E-mail/Courriel: nadja.steiner@canada.ca

4) Felicia Kolonjari
Ph.D. student
E-mail/Courriel: Felicia.kolonjari@gmail.com

CMOS Bulletin SCMO @ bulletin.cmos.ca

The CMOS Bulletin has moved on-line to <http://bulletin.cmos.ca>. Please continue to send articles, notes, workshop reports and news items to bulletin@cmos.ca. We will be accepting, reviewing, and publishing content on an on-going basis.

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.

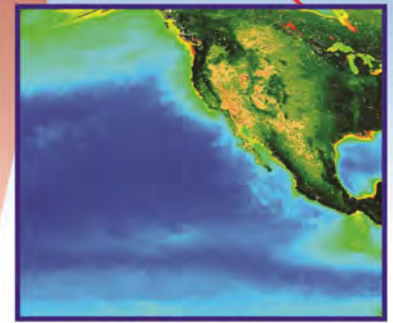
CMOS Bulletin SCMO @ bulletin.scmo.ca

Le *Bulletin de la SCMO* se trouve maintenant en ligne à <http://bulletin.scmo.ca/>. N'hésitez pas à soumettre notes, rapports d'atelier et nouvelles à l'adresse bulletin@scmo.ca. Nous accepterons, réviserons et publierons vos contenus sur une base continue.

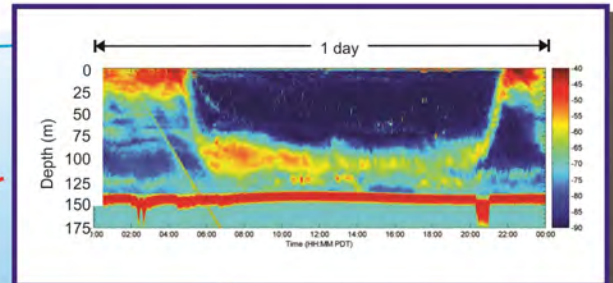
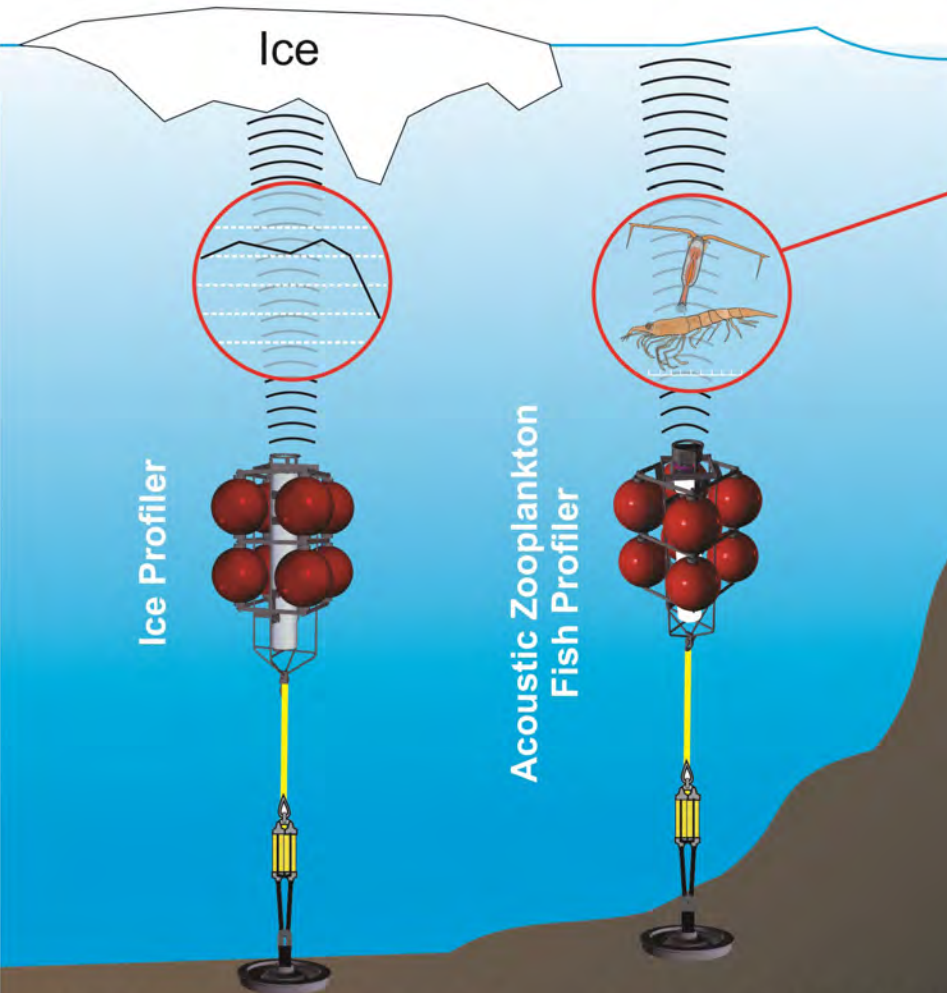
Cette publication est produite sous la responsabilité de la Société canadienne de météorologie et d'océanographie. À moins d'avis contraire, les opinions exprimées sont celles des auteurs et ne reflètent pas nécessairement celles de la Société.

Thank you to Bob Jones and Paul-André Bolduc, for their continued editorial assistance and guidance.

Oceanographic specialists/
Spécialistes océanographiques



Ocean colours are chlorophyll concentrations and land colours are NDVI



ASL offers:

- Ice Profiler and SWIP
- Acoustic Zooplankton Fish Profiler
- Teledyne RD Instruments
- Teledyne Oceanscience
- Teledyne Benthos
- WERA NorthernRadar
- Airborne/Spaceborne Remote Sensing



ASL offers an extensive equipment lease pool

ASL Environmental Sciences Inc.
#1-6703 Rajpur Place
Victoria, British Columbia
V8M 1Z5 Canada

Toll-free: 1-877-656-0177
Fax: +1 250 656-2162
email: aslenv@aslenv.com
website: www.aslenv.com