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CMOS BULLETIN SCMO

Canadian Meteorological and Oceanographic Society

La Société canadienne de météorologie et d'océanographie

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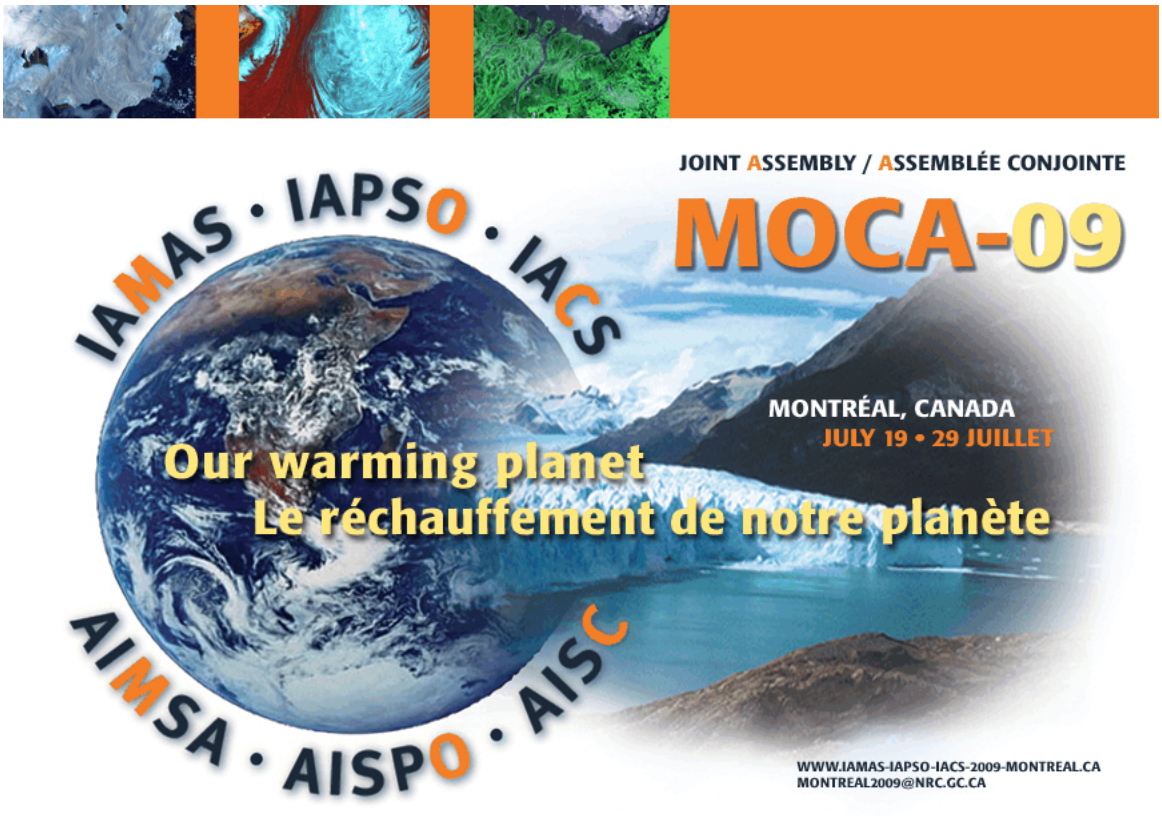

A Meteorological – Oceanographic – Cryospheric Assembly of researchers from around the world

…how are changes in atmospheric circulation, land and sea ice cover, and ocean currents linked to one another?

Venant des quatre coins du monde, des spécialistes de la Météorologie, de l'Océanographie et de la Cryosphère se réunissent en Assemblée conjointe de leurs trois associations internationales

…comment les changements de circulation atmosphérique, l'étendue de glace marine et terrestre et les courants océaniques interagissent-ils?

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....from the President's Desk

Friends and colleagues:

Andy Bush
President of CMOS / Président de la SCMO

I trust that everybody had a good and restful holiday season. For many of us, classes are now back in action so it's the usual start of term chaos.

The Canadian Foundation for Climate and Atmospheric Sciences hosted a symposium on Arctic climate entitled "The Lowdown on the Meltdown" on November 25th in Ottawa. The event was well attended with 4 MPs and many scientists from across the country. Our new Minister of the Environment, Jim Prentice, met with Gordon McBean before the symposium and we have some reason to hope that he is sympathetic to the looming crisis in terms of funding for climate science in Canada. However, the rather unstable situation with the federal government means we will have to wait and see what happens over the next month or two.

Many of you attended the AGU meeting in San Francisco this December. Patrick Cummins and I attended a meeting that had as many international geophysical societies/unions represented as possible. Russia, Mexico, Europe, Finland, Canada, the USA (amongst others) were all represented. The idea was to design and establish a "one-stop shopping" website for everything related to geophysical science being done around the world. This way, scientists, students, politicians, etc. can go to this website to see what is being done globally by the various societies/unions. The AGU volunteered to maintain it (with no advertisement anywhere about the AGU). Ian Rutherford will be attending something similar in January during the AMS congress, and I'm happy that CMOS is a participant in this initiative.

Our Vice-President, Bill Crawford, has done an excellent job in securing the executive committee for the coming year; thank you Bill. And as always many thanks to Paul-André Bolduc and Dorothy Neale for keeping the *CMOS Bulletin SCMO* maintained consistently at its extremely high quality.

Andy Bush
President / Président
CMOS / SCMO

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Inside / En Bref

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

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Cover page : Shown on cover page are the three winning photos from the 2008 CMOS photo contest. This is to remember that the 2009 contest will soon be underway and to get your camera ready. Top photograph (first prize) is from Dave Sills and is entitled *Supercell Panorama*. Left photograph (second prize), *Awesome Lightning*, is from John Anesiak and right photograph (third prize), *Advection Fog, Icebergs and Seagulls*, is from Geoff Strong.

Page couverture : Nous illustrons en page couverture les trois photos gagnantes du concours de photographie 2008 de la SCMO. C'est pour vous rappeler que le concours 2009 sera annoncé sous peu et qu'il est temps de préparer votre caméra. La photo du haut (premier prix) est de Dave Sills et s'intitule *Supercell Panorama*. Celle de gauche (deuxième prix), *Awesome Lightning*, est de John Anesiak et celle de droite (troisième prix), *Advection Fog, Icebergs and Seagulls*, est de Geoff Strong.

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Highlights of Recent CMOS Meetings

- Patrick Cummins and I both met with many international presidents of geophysical societies while at the AGU meeting in December. Coordinated efforts are under way to integrate international societies / unions globally.
- Organization of the 2009 Halifax congress, **"Sea and Sky Come to Life**" is proceeding well, and I extend my thanks to the LAC for their continuing efforts.
- The theme for the joint CMOS-CGU 2010 Ottawa congress has, after protracted discussion, been settled (grammar and punctuation aside) to be similar to: ***"Our air, water and Earth: our home".***
- Developments continue regarding the accreditation procedure for Flight Service Specialist.
- Dick Stoddart has generously agreed to stay on another year as Secretary of CNC/SCOR.
- ATMOSPHERE-OCEAN continues smoothly with a number of special issues lined up through 2011. We will see some changes in publication policy that are for the better, particularly if one wishes to publish colour figures; many thanks to Richard Asselin for his efforts in this.

Andy Bush,
CMOS President
Président de la SCMO

URGENT - URGENT - URGENT - URGENT

Next Issue *CMOS Bulletin SCMO*

Next issue of the *CMOS Bulletin SCMO* will be published in **April 2009.** Please send your articles, notes, workshop reports or news items before **March 6, 2009** to the address given on page ii. We have an URGENT need for your written contributions.

Prochain numéro du *CMOS Bulletin SCMO*

Le prochain numéro du *CMOS Bulletin SCMO* paraîtra en **avril 2009.** Prière de nous faire parvenir avant le **6 mars 2009** vos articles, notes, rapports d'atelier ou nouvelles à l'adresse indiquée à la page ii. Nous avons un besoin URGENT de vos contributions écrites.

The Timothy R. Parsons Award for Excellence in Ocean Sciences

Fisheries and Oceans Canada (DFO) has established the Timothy R. Parsons Award for excellence in Ocean Sciences to recognize a Canadian scientist for outstanding lifetime contributions to multidisciplinary facets of ocean sciences or for a recent exceptional achievement, while working within a Canadian institution. This award is named after Dr. Timothy R. Parsons, and honours his distinguished career as a Fisheries Research Board of Canada researcher, university professor, broadly-read author and recipient of the 2001 Japan Prize. For more information on Dr. Timothy R. Parsons, please visit:

http://www.dfo-mpo.gc.ca/science/award-prix/parsons/index-eng.htm

Eligibility Criteria

The Timothy R. Parsons Medal is:

- Awarded to a Canadian for distinguished accomplishments in multidisciplinary facets of ocean sciences;
- Awarded for excellence during the lifetime of the recipient or for a recent outstanding achievement, both being equally eligible;
- Awarded for accomplishments while working for Canadian institutions for the benefit of Canadian science;
- No posthumous nominations are considered.

To make a nomination, please complete the appropriate nomination form on the Parsons Award website at:

http://www.dfo-mpo.gc.ca/science/award-prix/parsons/about-apropos-eng.htm

Nominations should be received no later than **February 28** of every year at:

Timothy R. Parsons Medal Committee
Strategic Science Outreach
Stn. 8W135 – 200 Kent Street
Ottawa, Ontario, K1A 0E6
Tel: (613) 991-1021
FAX: (613) 990-5113
Email: sciencebulletin@dfo-mpo.gc.ca

Mise en candidature pour le prix Timothy R. Parsons pour l'excellence en sciences de la mer

Pêches et Océans Canada a créé un prix visant à rendre hommage à l'excellence dans le domaine des sciences de la mer au Canada. Ce prix porte le nom de Timothy R. Parsons, en l'honneur de la carrière remarquable de ce chercheur du Conseil de recherches sur les pêcheries du Canada, professeur d'université, auteur de publications prestigieuses et lauréat du Prix du Japon en 2001. La médaille Timothy R. Parsons est décernées à des scientifiques canadiens qui se sont distingués dans un domaine pluridisciplinaire lié aux sciences de la mer et souligne l'ensemble de leur carrière ou une réalisation récente exceptionnelle au sein d'un établissement canadien. Pour plus d'information au sujet de Timothy R. Parsons, visitez le site web au :

http://www.dfo-mpo.gc.ca/science/award-prix/parsons/index-fra.htm

Critères d'admissibilité

Le prix Timothy R. Parsons est :

- Décernée à des scientifiques canadiens qui se sont distingués par leur contribution remarquable dans un domaine multidisciplinaire lié aux sciences de la mer.
- Décernée pour souligner l'ensemble de la carrière ou une réalisation exceptionnelle récente, les deux étant également admissibles.
- Décernée pour souligner les réalisations de candidats œuvrant au sein d'une institution canadienne ou au profit de la science canadienne.
- Aucune mise en candidature posthume ne sera acceptée.

Pour soumettre une mise en candidature, veuillez compléter le formulaire sur le site web pour le prix Timothy R. Parsons au :

http://www.dfo-mpo.gc.ca/science/award-prix/parsons/about-apropos-fra.htm

Les mises en candidature doivent être reçues au plus tard le **28 février** de chaque année et être adressées à :

Comité de la médaille Timothy R. Parsons
Promotion stratégique des sciences
200, rue Kent, poste 8W135
Ottawa (Ontario) K1A 0E6
Tél. : 613-991-1021
Fax : 613-990-5113
Courriel : sciencebulletin@dfo-mpo.gc.ca

McGill

Tenure-Track Faculty Position in Satellite Remote Sensing

The Department of Atmospheric and Oceanic Sciences at McGill University is seeking outstanding applicants for a tenure-track Assistant Professor position in the area of Satellite Remote Sensing. The successful applicant will be expected to develop an active research program, supervise graduate students, and teach a variety of undergraduate and graduate courses.

Candidates whose research interests are in the global or regional scales will be considered. They should also have a strong disciplinary expertise in physical meteorology and/or dynamics.

A Ph. D. in atmospheric or oceanic sciences or a closely-related field is required.

McGill University is an English-speaking university located in Montreal, one of North America's most cosmopolitan cities. For more information about McGill University and the Department of Atmospheric and Oceanic Sciences please see http://www.mcgill.ca/meteo

Qualified candidates are invited to submit an application, including a curriculum vitae, a research proposal, and a teaching statement to: Dr. M.K. (Peter) Yau, Interim Chair, Department of Atmospheric and Oceanic Sciences, McGill University, 805 Sherbrooke Street West, Room 945, Montreal, QC H3A 2K6, Canada (Telephone: 514-398-3719; fax: 514-398-6115), or by e-mail with pdf format application to: search@meteo.mcgill.ca

Candidates should also arrange to have three letters of reference sent directly to the above address.

The preferred starting date for this position is September 1, 2009.

Review of the applications will begin on **March 2, 2009**, and continue until the position is filled.

McGill University is committed to equity in employment and diversity. It welcomes applications from indigenous peoples, visible minorities, ethnic minorities, persons with disabilities, women, persons of minority sexual orientations and gender identities and others who may contribute to further diversification. All qualified applicants are encouraged to apply; however, in accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada.

Open Letter to Prime Minister Harper

The Right Honourable Stephen Harper, PC, MP
Prime Minister
House of Commons
Ottawa, Ontario, K1A 0A2

Dear Mr. Prime Minister,

In the next few weeks Parliament will be recalled, a Speech from the Throne pronounced and a Budget proposed. These are critical days for the livelihoods of all Canadians. With the right policies Canada's economic prosperity and social well-being can be assured. The membership of the Canadian Meteorological and Oceanographic Society (CMOS) would like to take this opportunity to urge that you take the right decisions to ensure that science can play a central role.

Supporting science is not just about providing adequate resources although this is crucial; it is also about listening to scientists and basing decisions on scientific facts. The highest purpose of science is to search for knowledge and understanding. Scientists have a responsibility to warn when their results indicate a threat to people, their communities and the environment. Meteorologists and oceanographers do this daily by providing Canadians with warning of impending weather and ocean extremes. Climate scientists do this by working to improve the prediction of climate and by helping to put climate change on the political agenda. Continuation of these activities can only be assured however through adequate funding of research, through the maintenance of systematic observations of the environment and through the training of new scientists.

The membership of CMOS has been encouraged by the federal science funding over the recent past through such initiatives as the Canada Foundation for Innovation, Canada Research Chairs, the Canadian Foundation for Climate and Atmospheric Sciences and the International Polar Year. However, the health of the scientific enterprise relies on continued and assured support.

We believe that science, properly supported and used, can be a key ingredient in ensuring our security and prosperity. President-elect Obama has shown through recent appointments to his Administration the importance he attaches to having in key positions scientists of impeccable standing. We believe it is equally important for our government to have access to the many outstanding scientists we have in our universities, industries and governments. The membership of CMOS can contribute to making science an important ingredient in your decision-making.

Sincerely,

Andrew Bush,
President
CMOS

Copies: Minister of the Environment, Minister of Fisheries and Oceans, Leaders of the Opposition Parties, Major Canadian newspapers

Lettre ouverte au Premier Ministre Harper

Le Très Honorable Stephen Harper, CP, député
Premier ministre
Chambre des Communes
Ottawa, Ontario, K1A 0A2

Cher monsieur le Premier ministre,

Dans les prochaines semaines, le Parlement sera rappelé, un discours du Trône sera prononcé et un budget proposé. Ce sont des jours critiques pour le gagne-pain de tous les Canadiens. En adoptant les bonnes politiques, la prospérité économique et le bien-être social du Canada peuvent être assurés. Les membres de la Société canadienne de météorologie et d'océanographie (SCMO) aimeraient profiter de cette occasion pour demander avec insistance que vous preniez les bonnes décisions afin d'assurer que la science puisse jouer un rôle central.

Soutenir la science, ce n'est pas seulement fournir les ressources adéquates même si c'est crucial; c'est aussi écouter les scientifiques et baser ses décisions sur des faits scientifiques. L'objectif le plus important de la science est la recherche de connaissances et la compréhension. Les scientifiques ont la responsabilité de donner des avertissements lorsque leurs résultats de recherche indiquent une menace pour les gens, leurs communautés et l'environnement. Les météorologues et les océanographes le font quotidiennement en avertissant les Canadiens des événements météorologiques et océanographiques extrêmes imminents. Les scientifiques en recherche du climat le font en travaillant à améliorer les prédictions du climat et en aidant à mettre les changements climatiques à l'agenda politique. Cependant la continuité de ces activités ne peut être assurée que par un financement adéquat de la recherche, le maintien des observations systématiques de l'environnement et la formation de nouveaux scientifiques.

Les membres de la SCMO ont été encouragés par le financement fédéral des sciences récemment au moyen des initiatives telles que la Fondation canadienne pour l'innovation, le Programme des chaires de recherche du Canada, la Fondation canadienne pour les sciences du climat et de l'atmosphère, et l'Année polaire internationale. Cependant, la santé de l'entreprise scientifique s'appuie sur un soutien continu et assuré.

Nous croyons que la science, soutenue et utilisée de façon appropriée, peut être un ingrédient clé pour assurer notre sécurité et notre prospérité. Le Président élu Barack Obama a démontré, par de récentes nominations dans son administration, l'importance qu'il attache à nommer des scientifiques de grande classe dans des positions clés. Nous croyons qu'il est aussi important pour notre gouvernement d'avoir accès aux nombreux scientifiques exceptionnels qui travaillent dans nos universités, nos industries et nos ministères. Les membres de la SCMO peuvent contribuer à faire de la science un ingrédient important dans votre prise de décision.

Sincèrement,

Andrew Bush,
Président, SCMO

Copies: Ministre de l'Environnement, Ministre de Pêches et Océans, Chefs des parties de l'opposition, Journaux canadiens majeurs.

Statement on the Status of Global Climate in 2008 ***

2008 among the ten warmest years; marked by weather extremes and second-lowest level of Arctic ice cover

Résumé: Chaleur, extrêmes météorologiques et recul de la banquise, voilà en quelques mots le bilan de l'année 2008 publié par l'Organisation météorologique mondiale. 2008 devrait se classer au dixième rang des années les plus chaudes depuis 1850, date à laquelle ont débuté les relevés instrumentaux. La température moyenne combinée de l'air à la surface des terres et de la mer en surface, en 2008, présente actuellement une anomalie positive estimée à 0,31°C par rapport à la normale calculée pour la période 1961-1990 (14°C). Cette moyenne est légèrement inférieure à celles des années précédentes du XXI^{e} siècle, situation notamment imputable au phénomène La Niña classé comme étant modéré à fort et qui est apparu au deuxième semestre de 2007.

GENEVA, 16 December 2008 (WMO) – The year 2008 is likely to rank as the 10th warmest year on record since the beginning of the instrumental climate records in 1850, according to data sources compiled by the World Meteorological Organization (WMO). The global combined sea-surface and land-surface air temperature for 2008 is currently estimated at 0.31°C/0.56°F above the 1961-1990 annual average of 14.00°C/57.2°F. The global average temperature in 2008 was slightly lower than that for the previous years of the 21st century due in particular, to the moderate to strong La Niña that developed in the latter half of 2007.

The Arctic Sea ice extent dropped to its second-lowest level during the melt season since satellite measurements began in 1979. Climate extremes, including devastating floods, severe and persistent droughts, snow storms, heatwaves and cold waves, were recorded in many parts of the world.

This preliminary information for 2008 is based on climate data from networks of land-based weather stations, ships and buoys, as well as satellites. The data are continuously collected and disseminated by the National Meteorological and Hydrological Services (NMHSs) of WMO's 188 Members and several collaborating research institutions. Final updates and figures for 2008 will be published in March 2009 in the annual WMO Statement on the Status of the Global Climate.

WMO's global temperature analysis is based on two complementary sources. One is the combined dataset maintained by both the Hadley Centre of the UK Meteorological Office, and the Climatic Research Unit, University of East Anglia, UK. The other dataset is maintained by the US Department of Commerce's National Oceanic and Atmospheric Administration (NOAA).

Regional temperature anomalies

2008 again was a year with above-average temperatures all over Europe. A large geographical domain, including north-western Siberia and part of the Scandinavian region, recorded a remarkably mild winter. January and February were very mild over nearly all of Europe. Monthly mean temperature anomalies for these months exceeded +7°C in some places in Scandinavia. In most parts of Finland, Norway and Sweden, winter 2007/08 was the warmest recorded since the beginning of measurements. In contrast, the boreal winter was remarkably cold for a large part of Eurasia extending eastward from Turkey to China. Some places in Turkey had their coldest January nights in nearly 50 years. This extreme cold weather caused hundreds of casualties in Afghanistan and China.

February was a cold month across most of the USA Midwest, with average daily temperatures ranging from 4.0°C to 5.0°C below normal in some areas.

A very cold episode, due to an early Antarctic air mass outbreak, occurred in May in southern South America, particularly in central Argentina, where the minimum temperature dropped below –6°C in some locations, breaking annual absolute minimum temperature records. Conversely, mean July temperatures were more than +3°C above average in large parts of Argentina, Paraguay, southeast Bolivia and southern Brazil, making it the warmest July in the last 50 years for many locations. Also, November broke historical temperature records in association with an unusual heatwave. Central Argentina, including Buenos Aires city, had its warmest November in the last 50 years.

In March, southern Australia experienced a record heatwave that brought scorching temperatures across the region. Adelaide experienced its longest running heatwave on record, with 15 consecutive days of maximum temperatures above 35°C. Also, several heatwaves occurred in south-eastern Europe and the Middle East during April, associated with a very warm spring observed, not only in this region but also in a large part of the rest of Europe and Asia.

Prolonged drought

At the end of July, most parts of the Southeast of North America were classified as having moderate to exceptional drought, based on the US Drought Monitor. The continuous dry conditions across northern and central California hindered efforts to contain numerous large wildfires.

Southern British Columbia in Canada experienced its fifth driest period in 61 years. In Europe, Portugal and Spain had

their worst drought winter in decades.

In South America, a large part of Argentina, Uruguay and Paraguay experienced a prolonged and intense drought during most of 2008, which caused severe damage to agriculture.

Dry conditions in south-eastern Australia reinforced long-term drought over much of that region, with Victoria having its ninth-driest year on record. These conditions exacerbated severe water shortages in the agriculturally important Murray-Darling Basin, resulting in widespread crop failures in the area. September and October, in particular, were exceptionally dry in this region.

Flooding and intense storms

In January, 1.3 million square kilometres (km^2) in 15 provinces in southern China were covered by snow and experienced persistent low temperature and icing. This weather affected the daily life of millions of people who suffered from disruptions of transport, energy supply and power transmission, as well as damage to agriculture.

In Canada, several all-time snowfall records were set during winter, reaching more than 550 centimetres (cm) in many locations, including Québec City. The accumulation of snow was heavy enough to cause numerous roofs to collapse, killing at least four people. In Toronto, the 2007/2008 winter was the third snowiest on record in the 70 year of snow measurement records. At the end of January, Prince Edward Island was struck by one of the worst ice storms in decades. Nearly 95 per cent of the province lost power for a time.

In the United States of America, heavy April rainfall combined with previously saturated ground and snowmelt resulted in widespread major flooding that affected Missouri and southern Indiana. During the month of June, daily precipitation records were broken in many parts of Iowa, Illinois, Wisconsin and Missouri. Also, this year was one of the top 10 years for tornado-related fatalities (123 total) since reliable records began in 1953. According to statistics, from January to August, 1,489 tornadoes were recorded, marking a record since 1953.

In Germany, between May and September, a large number of strong thunderstorms with heavy rain, tornadoes and hail storms were observed, causing some casualties and significant damages.

Sub-Saharan Africa, including West and East Africa, was affected by heavy rains, which caused the worst-ever recorded flooding in Zimbabwe and affected more than 300,000 people in West Africa during the monsoon season.

In northern Africa, heavy and extended rainfall during the period of September to November affected Algeria and Morocco, causing important infrastructure damage and several casualties in many cities and villages. Extreme rainfall intensities were recorded in northern provinces of Morocco with up to 200 millimetres (mm) of rainfall in less than six hours. Within the same climate anomaly context and period, intense rainfall was also recorded in south-western Europe. In Valencia, Spain, a total rainfall of 390 mm was recorded in 24 hours, of which 144 mm were recorded in less than one hour. In France, heavy and intense rains affected several locations from 31 October to 2 November. In three days, total rainfall reached 500 mm in some locations, which caused severe flooding and flash floods particularly in central and east-central parts of the country.

In Canada, several all-time snowfall records were set during winter, reaching more than 550 centimetres (cm) in many locations, including Québec City. The accumulation of snow was heavy enough to cause numerous roofs to collapse, killing at least four people.

Several major rain events affected eastern Australia in January and February, causing significant flooding, particularly in Queensland. In November, widespread heavy rains occurred across most of the continent, ending an extremely dry period in central Australia. Associated severe thunderstorms caused damage from winds, hail and flash floods in many places.

In southern Asia, including India, Pakistan and Vietnam, heavy monsoon rains and torrential downpours produced flash floods, killing more than 2,600 people, and displacing 10 million people in India.

In western Colombia, continuous above-normal rainfall resulted in severe flooding that affected at least half a million people and caused extensive damage and landslides during the second half of the year.

In Southern Brazil, heavy rainfall affected Santa Catarina State from 22 to 24 November causing severe flooding and deadly mudslides, which affected 1.5 million people and resulted in 120 casualties and left 69,000 people homeless.

Weakening of La Niña

The first quarter of 2008 was characterized by a La Niña event of moderate to strong intensity, which began in the third quarter of 2007 and prevailed through May 2008. The large area of cool surface waters over the bulk of the central and eastern equatorial Pacific, combined with warmer-than-normal conditions in the equatorial western Pacific, represented typical La Niña forcing on the global atmosphere; many climate patterns reflected those normally observed during a La Niña event, both in the vicinity of, and remote from, the tropical Pacific. La Niña conditions have gradually weakened from their peak strength in February, and near-neutral conditions prevailed during the later half of 2008.

Tropical cyclones season
The most deadly tropical cyclone recorded in 2008 was Cyclone *Nargis*, which developed in the North Indian Ocean and hit Myanmar in early May, killing nearly 78,000 people and destroying thousands of homes. *Nargis* was the most devastating cyclone to hit Asia since 1991 and resulted in the worst natural disaster on record for Myanmar.

A total of 16 named tropical storms formed in the Atlantic including eight hurricanes, five of which were major hurricanes at Category 3 or higher (averages are eleven, six and two, respectively). The 2008 Atlantic hurricane season was devastating, with many casualties and widespread destruction in the Caribbean, Central America and the United States of America. For the first time on record, six consecutive tropical cyclones (*Dolly*, *Edouard*, *Fay*, *Gustav*, *Hanna* and *Ike*) made landfall on the United States of America, and a record three major hurricanes (*Gustav*, *Ike* and *Paloma*) hit Cuba. *Hanna*, *Ike* and *Gustav* were the deadliest hurricanes during the season, causing several hundred of casualties in the Caribbean, including 500 deaths in Haiti.

In the East Pacific, 17 named tropical storms were recorded, of which seven evolved into hurricanes and 2 of them into major hurricanes (averages are sixteen, nine and four, respectively).

In the western North Pacific, 22 named tropical storms were recorded, and 10 of them were classified as typhoons compared to the long-term average of 27 and 14, respectively. Philippines, Cambodia, Laos, Thailand, Vietnam and south-eastern China were the most affected by these events. For the first time since 2001, no named tropical cyclones made landfall in Japan this year.

Antarctic ozone hole larger than in 2007
The ozone hole area reached a maximum of 27 million km^2 on 12 September. This is less than in the record year 2006 (more than 29 million km^2) but larger than in 2007 (25 million km^2). The variation in the size of the ozone hole from one year to another can be, to a large extent, explained by the meteorological conditions in the stratosphere.

Artic sea ice down to second-lowest extent
Arctic sea ice extent during the 2008 melt season dropped to its second-lowest level since satellite measurements began in 1979, reaching the lowest point in its annual cycle of melt and growth on 14 September 2008. Average sea ice extent over the month of September, a standard measure in the scientific study of Arctic sea ice, was 4.67 million km^2. The record monthly low, set in 2007, was 4.3 million km^2. Because ice was thinner in 2008, overall ice volume was less than that in any other year.

A remarkable occurrence in 2008 was the dramatic disappearance of nearly one-quarter of the massive ancient ice shelves on Ellesmere Island. Ice 70 metres thick, which a century ago covered 9,000 km^2, has been chiselled down to just 1,000 km^2 today, underscoring the rapidity of changes taking place in the Arctic. The season strongly reinforces the 30-year downward trend in Artic sea ice extent.

Information sources
This press release was issued in collaboration with the Hadley Centre of the UK Meteorological Office, the Climatic Research Unit, University of East Anglia, UK, and the National Climatic Data Centre, National Environmental Satellite and Data Information Service and National Weather Service of NOAA and the National Snow and Ice Data Centre in the United States of America. Other contributors are the NMHSs of Algeria, Argentina, Australia, Brazil, Canada, China, Colombia, Finland, France, Germany, India, Japan, Morocco, Spain, Sweden, Turkey and Uruguay. The African Centre of Meteorological Applications for Development (ACMAD, Niamey), the Australian Commonwealth Scientific and Industrial Research Organization (CSIRO), the Centro Internacional para la Investigación del Fenómeno El Niño (CIIFEN, Guayaquil, Ecuador), the IGAD Climate Prediction and Applications Centre (ICPAC, Nairobi, Kenya), the SADC Drought Monitoring Centre (SADC DMC, Gabarone, Botswana) and the World Climate Research Programme (WCRP) also contributed.

Source: WMO Website http://www.wmo.ch on December 16, 2008. WMO Press Release # 835.

The World Meteorological Organization is the United Nations' authoritative voice on weather, climate and water.

How ATMOSPHERE-OCEAN Stacks Up as an Author's Journal of Choice

by Richard Asselin[1]

Résumé: Le Rapport sur les citations des revues scientifiques de ISI (Thomson Reuters) est utilisé depuis longtemps comme outil d'analyse statistique de la valeur des articles scientifiques. Un nouvel outil appelé SJR, développé par SCImago, un groupe de recherche de l'Université de Grenade, Espagne, est apparu récemment sur le web (http://www.scimagojr.com/index.php). Cet outil est basé sur l'algorithme bien connu Google PageRank et utilise la base de données Scopus® de Elsevier B.V. Il donne à peu près les mêmes résultats que ISI, et offre d'autres avantages en plus. Au moyen des données de SJR, cet article vise à situer ATMOSPHERE-OCEAN parmi la centaine d'autres revues météorologiques et océanographiques de langue anglaise. Nous portons une attention particulière à deux revues concourantes, soient *Journal of the Atmospheric Sciences* et *Journal of Physical Oceanography*. Nous montrons que ATMOSPHERE-OCEAN se classe généralement parmi les 30 premières revues, et se compare avantageusement à ses deux rivales. Ceci devrait encourager les auteurs à utiliser notre revue canadienne plus souvent pour diffuser les résultats de leurs travaux de recherche.

Scientists, managers and publishers have long made use of Journal Citation Reports published by ISI (Thomson Reuters) to assess statistically the value of scientific publications. A new tool, developed by SCImago, a research group at the University of Granada in Spain, has recently become available on the web (http://www.scimagojr.com/index.php). This tool, the SCImago Journal & Country Rank, offers indicators derived from data collected in the Scopus® database by Elsevier B.V. since 1996. It greatly facilitates journal assessments.

The SCImago Journal Rank (SJR) system of indicators was developed from the widely known algorithm, Google PageRank™. The SJR offers very nice features, including, several indices and measures, methods to compare journals, and charts. Parts of the database may be downloaded into Excel. To top it off for CMOS, the SJR is free!

Using the SJR data, this article aims to position ATMOSPHERE-OCEAN (A-O) in the context of all other meteorological and oceanographic journals. We selected the Journal of the Atmospheric Sciences (JAS) and the Journal of Physical Oceanography (JPO) to compare more specifically with A-O. These two journals had been selected several years ago for monitoring their ISI statistics. They were judged at the time to be the main "competitors" of A-O, i.e. the journals to whom Canadian scientists tend to submit mostly. We also focus on ISI's Impact Factor, which corresponds to SJR's CitesXDocs(2 years) index. (The impact factor of a journal for a given year is the number of citations received in that year divided by the number of articles published in the previous two years, exactly the same as CitesXDocs (2 years)).

Our first task was to compare the two indices, in the graph shown in Figure 1.

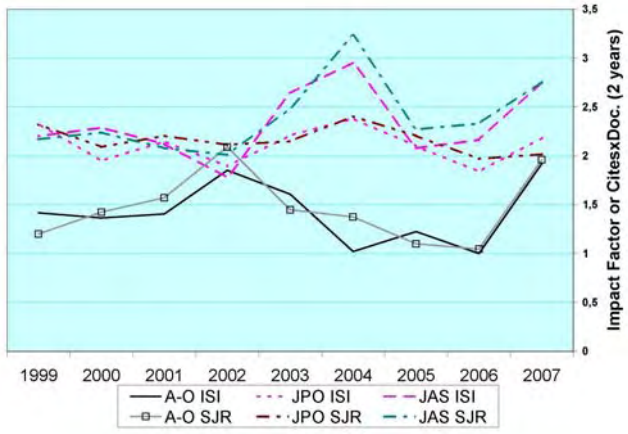


Figure 1: Comparison of the Impact Factor (ISI) with the CitesXDoc (2 years) (SJR) for A-O, JAS and JPO.

The two curves for each journal show an obvious correlation. There are differences, which according to SCImago (personal communication), are caused by a slightly different coverage of journals being monitored in the two databases, the time at which the data has been updated and the method of classifying articles as citable or not (related to whether the article is peer-reviewed or not). On the basis of this comparison, one may reasonably conclude that there is validity to the SJR system, and, in fact, there is no way to tell which of ISI or SJR is "better".

Indeed, both systems are incomplete because they only consider the journals published within the English language bubble. There are many meteorological and oceanographic journals published exclusively in other languages, such as Метеорология и Гидрология (Meteorology and Hydrology, Russia), Beiträge zur Physik der Atmosphäre (Contributions to Atmospheric Physics, Germany-Austria-Switzerland), La Météorologie (France), and undoubtedly from Brazil, China, Japan, Mexico, and several other countries. These journals and their scientists do look inside the English language

[1] CMOS Director of Publications

bubble and cite English language publications, although the reverse is less common. For example, ATMOSPHERE-OCEAN is abstracted by VINITI (All-Russian Institute of Scientific and Technical Information) and thus made available in Russian speaking countries; citations of articles published in A-O appear in the above named journal. Therefore, in assessing journals, one must be conscious that both ISI and SJR make their assessments on the basis of a partial world database.

There are many other things possible with the SJR portal. First, we downloaded all nine years of available data (1999-2007) for all the journals that are classified as Atmospheric Science or Oceanography. The data available for downloading are: SJR, H index, Total Docs, Total Docs (3 years), Total Refs, Total Cites (3 years), Citable docs (3 years), Cites x Doc. (2 years), Ref. x Doc, as well as the title, ISSN and Country of Origin. Most of these short names are self-explanatory. Suffice it to say here that the SJR index is a measure of the inter-connections in which the journal is involved, and that the H index is a combined measure of productivity and impact. The definitions of all the indices, including a few that are not included in the downloaded data, can be found at: http://www.scimagojr.com/help.php.

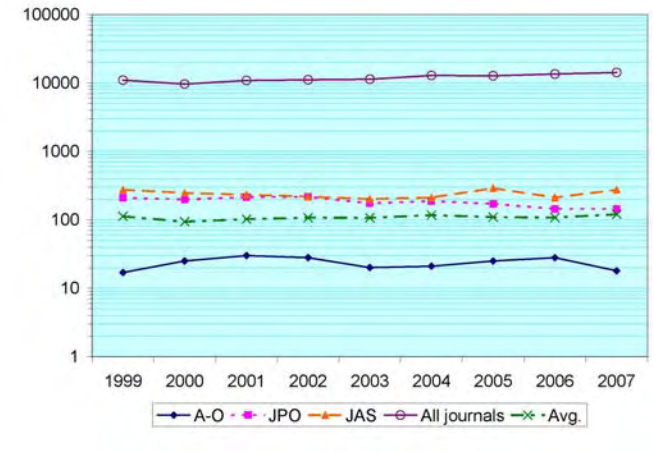


Figure 2: Number of articles published in A-O, JPO, JAS and all Atmospheric Science and Oceanography journals. Also shown is the average number of articles per journal.

For the purpose of this analysis, we combined the atmospheric journals with the oceanographic journals into a single list since there were seven journals, including A-O, that belonged to both groups. Figure 2 shows the number of articles published each year in all Atmospheric Science and Oceanography journals, highlighting the three selected journals. It is instructive to note that there has been an increase of about 50% in the number of articles published yearly between 1996 and 2007, a trend that does not seem to be reflected in any of the individual journals but is mainly the result of the publication of new journals. Indeed, there were 98 journals in 1999 and 125 in 2006. The curve labelled Avg. is the average number of articles published by all the journals in the list; the mean being 109 articles per year per journal. In the logarithmic scale of the diagram, it is readily apparent that, on the global scale, A-O is a small player.

For rating the performance of A-O, it is useful to rank all journals according to a selected index, rather than show the actual index. In the next graph, we show the rank comparison between the three selected journals according to CitesXDoc (3 years); (we chose 3 years rather than 2 years because this tends to smooth the curves). Also shown is the total number of journals in the database for each year, which helps to normalize the ranks visually.

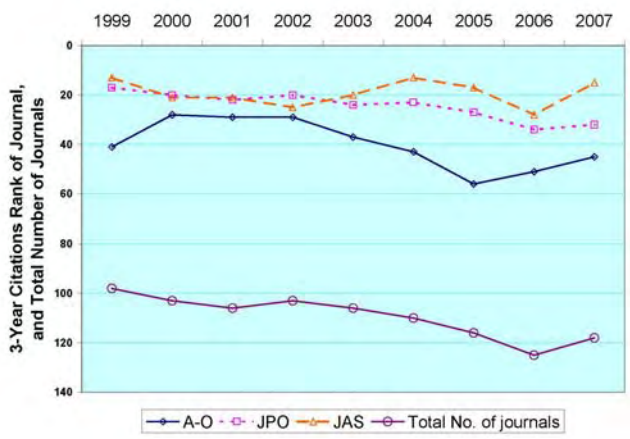


Figure 3: Ranks of A-O, JPO and JAS on the basis of CitesXDoc(3 years), compared to the total number of journals.

The longer trend in the performance of the three journals is shown in figure 4 using ISI data. In this graph we can see that all three journals have significant fluctuations, and that there is a tendency for the Impact Factor to increase with time. Note that in 2002 the Impact Factor for A-O was the same as for JAS and JPO. We attribute this outstanding result to the fact that we publish only a few articles per year, so that a single outstanding article that receives a large number of citations can easily cause a significant jump in the statistics.

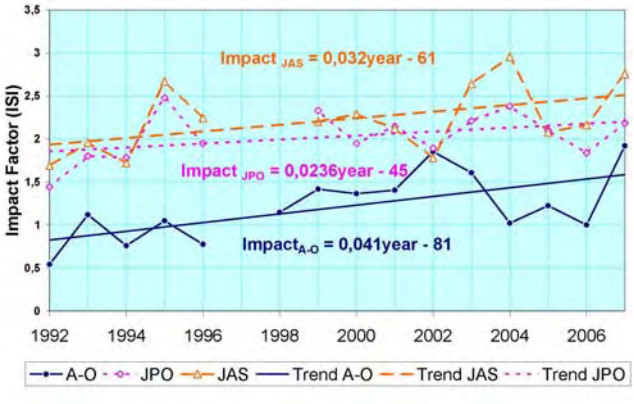


Figure 4: Impact Factor (ISI) for A-O, JPO and JAS, with trend lines (some data could not be found).

SJR Imago have developed a new index, the SJR, which is an assessment of the interconnections of the journal as indicated by the country of origin of the authors and of the cited works. We show the ranks for this indicator in figure 5. This shows that A-O generally ranks in the top 30 to 40 most "connected" journals.

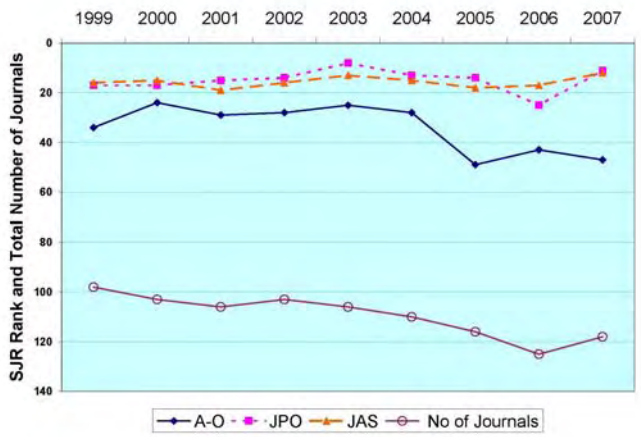


Figure 5: Ranking of A-O, JPO and JAS according the the SJR Index, and total number of journals.

Finally, SJR Imago also calculated the H-index (productivity combined with impact) for the complete period 1999-2007. According to this measure, the highest ranking journal is Journal of Geophysical Research, at 143, followed by Journal of Climate at 102. JAS ranks 7th at 72, JPO 12th at 62 and A-O is 53rd at 23, among 119 journal considered in 2007. The very successful journal Atmospheric Chemistry and Physics ranks 44th at 31 although it ranks the highest of all journals in terms of citations and 5th highest in terms of number of articles published in 2007. This anomaly is due to the fact that it only exists since 2001. The low ranking of A-O according to the H-index is due to its low "productivity" of 24 articles per year for the period 1999-2007, compared to the average of 109 for all journals.

In conclusion, this study demonstrates that, although ATMOSPHERE-OCEAN is a relatively small journal, it is very well positioned among all meteorological and atmospheric journals. Articles published in A-O receive about 1.5 citations, which is only a little less than for JPO or JAS, and A-O has an international recognition well above average. The main difference is that A-O does not publish a very large number of articles. Therefore, A-O should be a journal of choice for Canadian and international authors in the atmospheric and oceanographic sciences. Readers are invited to examine the performance of A-O in more detail by going directly to:

http://www.scimagojr.com/journalsearch.php?q=07055900&tip=iss&clean=0

Invitation

ATMOSPHERE-OCEAN has been published as a printed journal for 46 years. Since CMOS has initiated the electronic format (in 2000) the demand for this version has grown to the point that we need to review our options concerning printing. At the same time, we wish to consider whether we should make the journal completely open access on the web. I cordially invite all members to share their views with us on these matters by taking five minutes to complete an online questionnaire, found at the top of the A-O page:

http://www.cmos.ca/Ao/chronoindex.htm

We should also be pleased to receive your views and advice by e-mail (publications@cmos.ca) or telephone (613-991-0151), for those who hate filling out forms.

Richard Asselin, Director of Publications

Invitation

ATMOSPHERE-OCEAN est publiée sous forme imprimée depuis 46 années. Depuis que la SCMO a inauguré le format électronique (en 2000) la demande pour cette version a augmenté au point que nous devons reconsidérer nos options concernant l'impression. En même temps, nous voulons aussi considérer si nous devrions rendre l'accès gratuit sur le web. J'invite tous les membres à partager leurs opinions sur ces questions en prenant cinq minutes pour compléter un questionnaire en ligne qui se trouve au haut de la page de A-O :

http://www.cmos.ca/Ao/chronoindex.htm

Si vous êtes allergique aux formulaires, nous serons aussi heureux de recevoir vos commentaires par courriel (publications@scmo.ca) ou par téléphone (613-991-0151).

Richard Asselin, Directeur des publications

Last minute- BIG NEWS

Page charges for ATMOSPHERE-OCEAN will increase from $85 to $115, but the use of colour will be UNLIMITED! This will be effective for all newly accepted articles.

Dernière heure - IMPORTANTE NOUVELLE

Les frais d'auteur pour ATMOSPHERE-OCEAN augmenteront de 85$ à 115$ la page, mais l'usage de la couleur sera ILLIMITÉE! Ceci s'appliquera pour tout manuscrit nouvellement accepté.

Top 10 Canadian Weather Stories for 2008

by David Phillips[1]

Abstract
Canadians are some of the most weather-conversant people in the world. We talk about weather more than any other subject. Our weather was anything but boring or unimportant. For example, the thinning and shrinking of Arctic sea ice may not have grabbed headlines, but in many ways its accelerated disappearance was more shocking and worrisome than the year before. And while Canada continued to shrink in the North, Western Canadians proved their mettle as a winter people by beating back a brutal cold spell in late January. Easterners were no less heroic, having to shovel and plough record snowfalls. For snow enthusiasts, it was white gold for most of the winter, but the added weight of snow and ice brought down several roofs, which led to four deaths. The worst snowstorm of the winter was the last one, unleashing its payload on the get-away weekend in March when many residents were trying to head south for some recovery time.

Unfortunately, relief wasn't found in warmer weather. For every region of Canada, it was the summer of our discontent. Residents on the Prairies witnessed a record number of weather warnings due to tornadoes, intense rainfalls, wind storms and hail storms. Crop-hail losses approached $350 million on the Prairies and hailstorms were also damaging in Ontario and British Columbia. Chilly weather in April was equally devastating for B.C. fruit growers. For the Great Lakes/St. Lawrence Lowlands, it was one of the wettest summers on record, nearly 30 per cent wetter than normal, and in sharp contrast to the near-record dryness of the year before. Summer in the East was dismal and a downer because it rained hard and often.

In 2008, Canada experienced another warm year - its 12th year in a row.

Also on the list of this year's top Canadian weather events were major flooding in New Brunswick along the Saint John River – first in April and again in August – and the crippling ice storms that hit Prince Edward Island. The year 2008 also featured five major hurricanes in the Atlantic Ocean and Caribbean Sea. They were especially punishing to Cuba and Haiti, but largely spared Canada apart from some nuisance rains and major soakers in Saint John.

The news wasn't all bad, though! Our air was clearer than in most years; there were no summer blackouts; the pine beetle took a hit; it was a quiet year for wildfires; and there were fewer West Nile-carrying mosquitoes.

Shocking as it may seem, it was another warm year for Canada – our 12th year in a row – although not as warm as it has been in recent years. From January to November, the national average temperature was about 1.0°C above normal. Every region was warmer, especially the Eastern Arctic, which experienced its eighth-warmest January-to-November period on record. It was also the third-warmest summer on record at one degree warmer than normal. In the North, most districts reported their second- or third-warmest summer on record (some 1.5 degrees above the norm). On the other hand, much of British Columbia registered a cooler-than-normal summer – the coolest in 23 years. Countrywide, fall was the sixth warmest at roughly 1.4 degrees above the average.

Top Ten Weather Stories for 2008

1	**The East's Big Summer Soak**
2	**The Great Arctic Thaw Continues**
3	**A Never Ending Summer**
4	**Saint John River Floods from Top to Bottom**
5	**Pre-Winter Shockers**
6	**Hail of a Summer for Growers**
7	**Winter's Last Hurrah**
8	***Hanna* and her Brothers**
9	**The Coldest Place on Earth**
10	**PE-Ice Storms**

Canada's warmer weather was not exactly in step with the rest of the world. Globally, 2008 had the coolest average temperature since 2000 and was approximately 0.14°C below the average temperature for 2001-2007. The global combined sea-surface and land-surface air temperature for 2008 was cooler than most recent years, largely owing to a strong La Niña. This is characterized by unusually cold ocean temperatures in the equatorial Pacific Ocean. La Niña developed during summer 2007 and reached its peak strength in early 2008. Despite the cooling off, 2008 globally was 0.3 degrees above the 1961-1990 annual average of 14.0°C. Indeed, 2008 was the 10th warmest year in the 159-year record. The hottest was 1998, followed by 2005, 2003 and 2002. According to the World Meteorological Organization in Geneva, the global average temperature has risen about three times faster since 1976, compared to

[1] Senior Climatologist, Meteorological Service of Canada, Downsview, Ontario, Canada

that for the past 100 years. Now into the 21st century, global temperatures are more than 0.75°C above those at the beginning of the 20th century.

The top Canadian weather stories for 2008 listed above are rated from one to ten based on factors that include the impact they had on Canada and Canadians, the extent of the area affected, economic effects and longevity as a top news story.

1. The East's Big Summer Soak

At times this summer Canadians from Ontario to Newfoundland were not just complaining about the amount of rain or its intensity but that that it rained almost every day! Easterners even borrowed a "wet coast" expression, "If it isn't rainin', it's lookin' like rain." At times, the rainfall was sporadic and localized but always nearby, creating the impression it was a record wet summer. In Toronto it really was record wet; Sherbrooke was even wetter; and in deluged Québec City the 400th anniversary celebrations were marred by close to 500 mm of rain – the second rainiest summer in 65 years.

Toronto Pearson International Airport eclipsed its rainiest summer mark with more than three weeks left to the season. The total rainfall of 396.2 mm shattered the former high water mark by more than 60 mm, and was three-and-a half times greater than the total rainfall of last summer. But it wasn't just Torontonians cursing the wet summer. Sarnia, Ontario did not have a single dry day in July. And Hamilton had the dubious honour of being the sound and light capital of Canada in 2008, with thunderstorms on 28 days and for 77 hours – well above the average of 16 days and 23 hours.

Residents and visitors to Montréal and Ottawa also voiced disgust over the soggy summer. Yet, rainfall totals between June and August in both cities were below normal by about 5 per cent. It was the classic water torture test…drip, drip, drip. Ottawa tied its previous record for the most number of days with rain or traces of rain for June and July. People there had to wait until the end of August for some decent summer weather. Even the first smog day didn't occur until summer's end. It seemed that heat-starved Easterners were willing to accept the occasional high humidex or smog day – at least it felt like a summer day.

For Canadians, the notion of what makes a summer lousy or great, depends on the frequency of dry or wet weekends. In Montréal, there were only two weekends from May 31 to September 14 when both days were dry and seven weekends that were considered total washouts. With only 2 dry weekends out of 16, it's not only frustrating, it magnifies the wetness. Adding to the inclemency, Montréal experienced only five days when the temperature was above 30°C. The year before, there were 17. Across Québec, a record number of wet days in June, July and August were counted in Montréal, Québec, Val d'Or, Sherbrooke and Roberval. Surprisingly, sunshine totals and the number of sunny days were not far from normal, which goes to the heart of what was frustrating and fickle about the summer – a wet day and sunny day on the same day.

What was behind all the meteorological misery? An upper-air disturbance stalled over northern Ontario-central Québec, blocked from moving off the continent by a persistent ridge of high pressure over the North Atlantic. The stagnant low settled in from late May until mid-August, trapping the East in a repetitive cycle of rain, drizzle, cloud, fog, relatively cool temperatures and the occasional sunny interval.

The incessant rains disappointed golfers, campers, fair-goers and picnickers. Golf course revenue was down by more than 15 per cent. And the normally vibrant patio scene at bars and restaurants in urban Canada saw business plummet 25 per cent. At times, heavy rains flooded basements. In one incident in Toronto, a deluge in excess of 50 mm led to the fiery destruction of an apartment building's hydro vault, leaving 1,000 residents homeless for several weeks. Roofers and plumbers were never busier, but house painters sat it out or worked inside. For people allergic to pollen, ragweed, mould and other air-borne maladies, it was a terrible summer of wheezing, sneezing and sniffling. Excess moisture not only boosted volumes of grass pollen and ragweed, it also extended the growing season.

There were some who enjoyed the moist, temperate conditions because grass was lush, gardens were luxuriant and trees were healthier and less stressed than in recent years, leading to some spectacular fall colours. Forest fires were the lowest in number in 25 to 50 years. Wet weather helped reduce the threat of smog days and air conditioning bills were lower than in recent years. The Great Lakes-St. Lawrence region experienced its third-wettest summer since 1948 – nearly 30 per cent more than normal. Lake levels were up compared to recent years when levels were well-below average – a help for shipping, recreational boaters, marinas and hydro generation. Water levels in the St. Lawrence River were close to the 10-year average, but as much as half a metre higher than last year.

Maritimers' complaints came a little later in the season. Halifax got more rain in the first week of August than in June and July combined, and its June-to-September rainfall total (563.1 mm) beat last year's total by 11 mm – a close second to the all-time record of 571.3 mm in 1977. With nearly three times its usual August rainfall, Charlottetown, P.E.I. had the wettest month in its history with 240.2 mm. At 252.6 mm, Sydney, Nova Scotia was even wetter. August was the city's wettest month of summer ever and rainfall was three times the monthly average. The situation worsened in September with the passage of tropical storms Hanna and Kyle. For most of the Maritimes, it was the tale of two summers: sunny and warm through the first half, then grey skies and relentless rains in the last half.

The rain spelled ruin for many growers in Eastern Canada in 2008. There was no question it was the worst year ever for hay growers. In Eastern Ontario and parts of

southwestern Ontario, the first hay crop came in mid-August or later, never so late before and of poorer quality. In Cape Breton, hay production was down 50 to 80 per cent. Potato blight emerged. Blueberries were knocked off the vines, vegetables were bursting with too much water and grain crops lay flattened. At times, farmers in Atlantic Canada were up to their ankles in water, unable to drag machinery through the muck. Partial compensation helped Maritime farmers offset millions in losses. Québec's major commercial crops, which earn more than $1 billion for the province's farmers, were adversely affected by the excess moisture. Because of frequent rains and limited sunshine, summer staples such as lettuce, strawberries, raspberries and tomatoes were big losers.

2. The Great Arctic Thaw Continues

While news of this year's ice loss in Arctic waters was not as stunning as last year, the trend to thinner and newer sea ice continued to surprise scientists around the world on many fronts:

On September 12, the sea ice extent in the Arctic Ocean dropped to 4.52 million square kilometres, coming close to last year's record low of 4.13 million square kilometres. Because ice was thinner in 2008 (less than a metre thick in places), overall ice volumes were less than that in any other year. That we got all the way to the second-lowest ice extent in the melt season, following the coldest winter in eight years, is remarkable and reflects the dramatic and sudden change underway at the top of the world.

For August 2008, the rate of sea ice melt was the greatest ever. Satellite images showed ice declining at a rate of 84,686 square km per day in August, compared to 63,191 square km per day a year earlier.

In 2008, vast stretches of water in the western Arctic, including the Beaufort Sea, were almost clear of ice. For the first time in recorded history, the navigable deep water routes of the fabled Northwest Passage over the top of North America, and the Northeast Passage over the top of Russia, were simultaneously free of ice. The year 2008 also marked the third consecutive summer that ships could easily navigate the Northwest Passage without hitting, or being blocked by, sea ice.

Canadian Arctic waters had much less permanent ice compared to the same time last year. Only 11 per cent of the Canadian Arctic waters comprised thick, multi-year ice. In 2007, old ice accounted for 15.5%. Most of the old, hard ice either melted or was flushed into the Atlantic Ocean, where it disintegrated. Today, more than 70 per cent of the Arctic sea ice is new, thin, salty and less than a year old.

More stunning news in 2008 was the dramatic disappearance of nearly one-quarter of the massive, ancient ice shelves on Ellesmere Island. The 70m-thick ice that covered 9,000 square kilometres a century ago has been chiseled down to just 1,000 square kilometres today, underscoring the rapidity and irreversibility of changes taking place in the North.

The calving of glaciers from Greenland led to nearly 1,000 icebergs off Canada's east coast, more than in the previous four years combined. Some icebergs made it as far south as the site where the RMS Titanic sank on her maiden voyage in 1912. At times, the sizeable icebergs ceased production of the offshore oil fields.

Also noteworthy, the ice extent in the Baltic Sea was the lowest since records began in 1720. Latvia and most of Finland had their warmest winter since 1925. Norway's winter temperature was the second highest on record.

The unprecedented shrinkage of Arctic sea ice is a direct response to several years of favourable winds pushing old ice into the Atlantic. Also important: persistent, year-round warming in the North and a dramatic transformation of its surface from a highly reflective white snow or ice to dark, heat-absorbing sea water. Remarkable changes in the North are generally consistent with what scientists say we can expect as a result of climate change, but it comes much earlier than anticipated.

Scientists are still unclear how the rapid disappearance of the Arctic ice will influence weather in Canada's North or elsewhere in the world. The Arctic is the world's refrigerator and is a key factor in stabilizing global climates. Whether it will be prolonged drought in North America's Great Plains, warming of the Gulf Stream or increased storminess in Western Europe, it will be hard to deny that the vanishing ice at the top of the world is not, in part, a contributing factor.

3. A Never-Ending Winter

Ontario and Québec endured one of the longest and snowiest winters in years. At times, even snow enthusiasts had had enough and were desperate for spring. Every winter sees snow on the ground for weeks at a time, but not every winter has snow falling almost every day. Winter 2007-2008 was defined by the amount of snow and the record number of snow events. The Great Lakes and St. Lawrence River Basin registered its third-wettest winter in 61 years, with most of the precipitation falling as the white stuff. Among locations recording above 500 cm of snow were: Mont Ste-Anne, 676 cm; Québec City, 558 cm (record); Muskoka, 558 cm; Gander, 534 cm; Deer Lake, 534 cm; and Bathurst, 510 cm (record). Other locations with new seasonal snowfall records were: St. Léonard (492 cm); Trois-Rivières (457.6 cm); Montréal-Mirabel International Airport (375.6 cm); Trenton (270.8 cm); Kitchener-Waterloo (251.9 cm); and Toronto Buttonville Municipal Airport (250.8 cm).

Millions living in Montréal, Ottawa and Toronto were denied records by a mere dusting or two. Safe to say, near the end of winter the majority of snow-weary citizens began quietly cheering for one or two more snowfalls just to be able to lay claim to a new standard. Apparently, securing a weather record would justify endless complaining about the winter

from hell! But Nature had the last laugh. Toronto's snow total was 194 cm, just 13 cm shy of the record set 70 years ago. In a dramatic turnaround, Toronto's third-snowiest winter followed its second lowest the winter before of just 60 cm. Sadly, all that snow and nothing to brag about.

The most remarkable amount of snow was in Ottawa, where an excess of 432 cm fell, just 12 cm short of the venerable snow record of 444.6 cm in 1970-1971 – an event often regarded as a 1,000-year occurrence. Ottawans did not see bare ground for 143 consecutive days, from November 21 to April 11. This was the longest stretch on record and four days longer than the string of 139 snow cover days in 1970-1971. Less than a week before the first day of spring, snow on the ground in the nation's capital was at the season's deepest – 87 cm. During one particularly brutal four-day stretch in March, the city was pummelled with 73.2 cm. And while the snowiest month in history occurred in 1970-1971 (159.5 cm in February), Ottawa did claim its second- and third-snowiest months ever this winter (121.0 cm in December and 113.4 in March). Montréal's 371.4 cm also came close to breaking its 1970-1971 record of 383.3 cm and – like Ottawa – could claim December and March as its second-and third-snowiest months (respectively) on record.

All that white stuff made it an expensive year for snow removal. Snow dumps were full and city and provincial highway departments started rationing salt and sand supplies in February. Retailers sold out of snow shovels and salt early in the season. And with so much snow shovelling and pushing the "good old-fashioned" way, a 60 per cent increase in the number of musculo-skeletal injuries was noted. With thousands of impulsive Canadians looking for a break in the sun and sand, travel agents reported the busiest season in decades. Even deer and moose needed a vacation from foraging through the deep snowpack. Deer sightings in backyards and at intersections were way up, making them more vulnerable to predators.

Winter's relentless snow also led to dozens of roof collapses. The roof of a small warehouse in Morin Heights, about 85 km north of Montreal, collapsed under the added weight of accumulated ice and snow, killing three women. In Shawinigan, a fallen roof smothered a homeowner to death under several layers of snow just seconds after he directed the rest of his family outside to safety. Across Québec and eastern Ontario, large-span structures from arenas and warehouses to shopping centres were closed or evacuated by panicked officials. Hundreds of schools in and around Montréal were ordered closed by authorities to give workers a chance to clear heavy, dense snow from roofs. Frequent reports were received of ominous cracking sounds around buildings and of doors and windows no longer fitting frames. Several barns also collapsed, killing animals.

The length and toughness of winter led to reports of depression and anxiety among many storm-frayed residents. Finding a parking space was often a nightmare. As neighbours ran out of space to toss snow, territorial disputes erupted. An inordinate number of angry outbreaks led to skirmishes, with several charges being laid for those brandishing guns or warring with snowblowers.

4. Saint John River Floods from Top to Bottom

New Brunswick experienced its worst spring flooding in 35 years along the entire length of the Saint John River, affecting some 1,600 properties and causing $50 million or more in damages to homes, farms and small businesses. Miraculously, there were no deaths or serious injuries. However, more than 60 people and 140 farm animals needed to be rescued from rising waters.

The Saint John basin is no stranger to flooding, but this spring forecasters feared the "perfect storm": a record snowfall; a deep, growing and lasting snow cover well into spring; a delayed peak runoff; sudden warming; and a forecast of copious amounts of rain. At the beginning of spring, the record snowpack – some 50 per cent above normal – covered much of northern Maine, northern New Brunswick and Québec's Temiscouata region. Amid sunny skies, mid-April temperatures soared 7 to 12 degrees above normal. Around-the-clock warmth melted ripened the deep snowpack, unleashing a huge overland flow, and priming rivers and streams. The look of winter disappeared in a few days. Yet, the still-frozen ground was incapable of absorbing the sudden melt. Compounding the picture was the occasional ice jam backing up the river. In late April came the threat of heavy rains to swell an already water-charged Saint John River. Experts feared the worst flooding since 1973, from communities in the northwest all the way to the city of Saint John on the Fundy coast – 670 km from top to bottom.

Around May 2, the Saint John River spiked sharply at its highest level in years. The overflow swamped properties along the river and its tributaries, prompting the evacuation of hundreds of residents. Several roads, including the Trans Canada Highway outside Fredericton and numerous highway exits, parks and waterfront properties, were submerged when rivers exceeded their flood stage. Motorists had to deal with flooded intersections, blocked roads and countless detours. Emergency personnel went door-to-door warning of imminent dangers and encouraging evacuation. Some 1,000 residents agreed to leave. Hundreds of riverside basements filled with smelly, debris-laden waters. Health officials feared private wells would become contaminated. In Fredericton, rising waters forced the closure of the New Brunswick legislature. Harried employees at the Beaverbrook Art Gallery rushed artworks up from the basement.

As it turned out, less rain occurred than was originally forecast. The Saint John River's highest level peaked at 8.36 metres in Fredericton, just 25 cm shy of its peak in 1973. At its height, flow through the Mactaquac Dam was 36 times the normal summer flow. There was so much water in the river that the popular Reversing Falls reversed its flow. While falling short of the historic levels in 1973, this year's flood exceeded the earlier flood in duration with 16 consecutive days versus 12.

5. Pre-Winter Shockers

During the second week of December, a massive cold wave grabbed firm hold of the western half of North America with some of the most frigid December weather in years – more reminiscent of conditions in the dead of winter than a week before winter's official beginning. The extensive cold air outflow swooped down from Alaska and the Yukon and seeped into every nook and cranny from Tuktoyaktuk to Texas. Prairie residents shivered in temperatures a dozen degrees colder than normal. Adding to the extreme discomfort were brisk winds that generated stinging wind chills below -45. The low temperatures were far from record-breaking but a real shocker after an unusually mild November and early December. In Alberta, temperatures were five degrees warmer than normal in November and soared above 10°C as late as December 6. A minimum temperature of -36°C in Edmonton on December 14 made it colder than the North Pole – too cold for skating, jogging or skiing. In most major cities, the fierce cold drove the homeless into crowded shelters, forced the cancellation of several flights, froze countless pipes and left an icy grip on road surfaces. Being the first cold blast of the winter, towing companies were kept busy servicing motorists who'd forgotten to plug in their block heaters. In Saskatchewan, Key Lake registered the coldest temperature at -42°C on December 14 while Meadow Lake felt more like -53 with the wind. In Manitoba, wind chill warnings were issued province-wide. With an unlimited supply of Arctic cold, the frigid air mass gave no hint of leaving before the end of the year.

The Pacific coast faced its first arctic outflow of the winter along with some strong gusty winds that added to the misery. On December 14 and 15, extreme cold across British Columbia led to a total of 85 temperature records being broken across the province, including some that had been held for more than a century. When an intense storm off Vancouver Island plowed into cold, dense air at the surface, it produced some huge snowfalls over parts of southeast Vancouver Island. Around Duncan and Nanaimo, snow amounts on the weekend ranged from 40 to 50 cm – likely one of the heaviest snowfalls at any time of the year over the last 61 years. Elsewhere along the coast, many communities received enough snow (between 10 and 20 cm) to make a white Christmas likely given that the cold was settling in for an extended visit. In Vancouver, temperatures plunged to -15.2°C hardly Prairie-cold but still dangerous for west coast residents.

Ten days before Christmas, with the west enveloped in teeth-chattering cold, easterners were experiencing temperatures upward of +10°C. But they knew better than to be smug. Forecasts were ominously hinting at winter mayhem and Mother Nature dutifully delivered. Just before the official start to winter, the east was hit with a trio of wintry wallops that smothered a huge swath of southern Ontario from Windsor to Kingston during the busiest travel and shopping weeks of the year. It started with a "warm-up" snowstorm that dropped a nuisance 10 cm of snow on December 17. That was followed two days later by a dangerous dumping of 15 to 25 cm. Powerful easterly winds gusting near 70 km/h blew the fluffy snow into whiteouts and huge drifts. At Toronto's Pearson International Airport, more than a quarter of the day's flights were either delayed or cancelled. On major roadways, hundreds of accidents were reported. The next day offered some short-lived respite – 24 hours to be exact – before a third storm struck the same area and beyond. In the Golden Horseshoe, the third storm brought the area's total snowfall to over 30 cm in five days.

Snowfall amounts from the third winter blast increased eastward: 15 cm in eastern Ontario; 20 to 30 cm in Québec; 15 to 25 cm in northern Nova Scotia and Prince Edward Island; and 30 to 40 cm in New Brunswick. In the Maritimes, the wicked winter weather – featuring snow and hurricane-force winds – created whiteouts and a pounding surf that led to flooding and damage to coastal infrastructure. Severe winds gusting to an incredible 163 km/h also left 100,000 residents across the Maritimes without electricity and crews facing the impossible task of restoring power.

Even in Canada, the snowiest and second coldest country in the world, it's rare for the entire country to be blanketed in snow and engulfed in cold Arctic air – all before the first full day of winter.

6. Hail of a Summer for Growers

A series of hailstorms hammered crops and orchards across Canada this summer. Ontario growers of tender fruit and grapes couldn't remember more pelting times. In British Columbia's Okanagan, growers – already big losers from April cold – saw fruit badly bruised and trees rattled by hail in early July that caused some orchardists to lose 40 per cent of their fruit. Across the Prairies, the Canadian Crop Hail Association made record payments to western producers of more than $341 million. Québec and the Maritimes were largely spared the "white combine." In Oka, just southwest of Montréal, an early June swath of hail damaged orchards and property. More hail reports came later in June from Lanaudière and east of Montréal.

Surprisingly, southern Canada lacked the warm humid weather often associated with summer hail. However, cooler air in the upper atmosphere – along with relatively warm air at the surface – generated enough instability and unsettled weather to spawn pop-up thunderstorms with torrential rains, damaging winds and hail. Hail damage occurred often across Ontario over wide areas, sometimes three or four times, and affected a variety of crops. Agricore reported unprecedented crop hail losses in 2008 in terms of both the severity and frequency of damage. Both the number of reports and acreage damaged were in excess of four times the previous five-year average. The Ontario Tender Fruit Board claimed there wasn't an orchard in Ontario that wasn't touched by hail in 2008. Even apple farmers felt the sting, with some of their crop reduced to products for apple sauce at half the price.

On June 9, a severe storm ripped through Chatham-Kent, pummeling wheat, corn and soybeans, and pock-marking hundreds of vehicles with golf-ball sized hail. Aluminum siding and roofs also took a beating. Just two weeks later, the same communities were slammed again. On July 22, a brief but severe thunderstorm hailed down on areas around Grimsby and Winona in the Niagara-St. Catharines region. At one orchard, 80 per cent of the peaches and pears were lost. A front-end loader was even called to the scene in Grimsby to clear out drifts of gumball-sized hail that looked like a winter cover, marking the first time the town had ever pulled out a front-end loader for action in the summer. Twelve hours after the hailstorm, some backyards were still buried under 8 cm of nickel-sized hail steaming in the warm air. Other farms lost fields of beans and cucumbers just days before canning. Another hailer on August 2 struck the Grand Bend area on Lake Huron and south of London. One grower said it was the most intense hailstorm he'd ever seen. Another soybean grower commented that "it looked like somebody went through with a mower and just chopped the top off the plants." The damage was so bad that three weeks later there hadn't been any new growth.

Several producers on the Prairies were hit with hail on two or more occasions. In some places, crops were totalled and property damage was extensive to homes, vehicles and farm equipment. Prairie-wide, more than 29,000 claims were filed. Loss ratios were very high in Alberta and Saskatchewan, but considerably lighter in Manitoba. Albertans filed in excess of 4,800 hail claims, edging past the record set last year. Further, it was the highest total payout to Alberta producers at $98.6 million (47 per cent more than that collected from premiums). In mid-July, hail wiped out roughly half of the famous Taber corn crop and much of the grain and specialty vegetable crops. Taber farmers lost millions of dollars when entire fields of corn were shredded by the hail. Hail insurance payouts to Saskatchewan growers were the highest in history, at approximately $228 million, for a loss-to-premium ratio of 129 per cent. Nearly 21,000 claims were filed – 7,000 more than last year. The acreage affected was also a record. On virtually every day in July, hail occurred somewhere in Saskatchewan. Massive storms on July 9 and 10 pounded many of the same areas. Claims from those two days alone were estimated at $80 million.

7. Winter's Last Hurrah

For residents in Eastern Canada, the coming of March and spring's immediacy was never more welcome. It had been a long winter with near-record snowfall, deep snow drifts, scores of roof collapses and several fatalities. But the season's greatest wallop was still to come. During the "getaway" weekend of March 8 and 9, a massive winter storm dumped as much as 50 cm of snow across Eastern Canada, leaving approximately 200,000 storm-ravaged Canadians in the dark from Windsor, Ontario to Wabush, Labrador.

The size and duration of the storm were impressive. The massive blizzard dumped gobs of snow and piled monstrous drifts across six provinces. While most hit-and-run storms seldom last longer than 12 hours, this one raged an impressive 40 hours, leaving more time for snow piling and drifting. Almost all of southern Ontario and Québec received between 25 and 35 cm of snow, accompanied by winds as high as 133 km/h. The heaviest snows fell in the Ottawa Valley and in the Niagara region, where 52 cm collected and blew into two-metre drifts, dwarfing vehicles on highways and blinding and trapping motorists inside. Frequent whiteout conditions led to hundreds of crashes on windswept highways. There were so many accidents in Ontario that police no longer attended crash sites and asked motorists to fill out their own collision reports. In the Greater Toronto Area alone, the 400-series highways saw 1,700 accidents, most of them involving spinouts and cars driving into ditches. To add insult to injury, winter's biggest blast landed on one of the busiest weekends of the year – the start of March Break. The storm led to the grounding or delay of more than 300 flights at Toronto's Pearson International Airport, which became a makeshift shelter for hundreds of stranded passengers.

Nearly as many flights were cancelled in Montréal. In the province, the storm brought 40-cm dumps of snow to Trois-Rivières, Mont Joli and Québec City. Montréal itself got less snow but more misery, with several hours of snow mixed with freezing rain and ice pellets, and powerful winds as strong as 140 km/h. In Québec City, the "big one" had a bigger impact because of a preview storm just three days earlier. On March 4 and 5, 33.4 cm of snow fell on the Québec capital. Compounding the mess were strong winds that felled trees and cut power. Flights were cancelled and schools were closed. Before the week was over, winter's last hurrah dumped another 40 cm. A veteran Environment Canada forecaster called the March 8 blast in Québec the fiercest he had ever seen. In a winter of "Paul Bunyon" snowfalls and with no place left to put the snow, the last one – with its -20 wind chill, zero visibility in blowing snow and sustained winds of 63 km/h – had to be the most memorable storm in a winter of storms.

8. *Hanna* and her Brothers

Hurricane experts foresaw another active Atlantic hurricane season in 2008 and they were right on the money. From *Arthur* to *Paloma*, 16 named storms formed in the Atlantic basin, well above the long-term average of 11. Half the storms were full-blown hurricanes, compared to a normal of six storms, with five logged as major at Category 3 or higher: *Bertha, Gustav, Ike, Omar and Paloma*. The 2008 Atlantic hurricane season is likely to be considered one of the most devastating, with many casualties and widespread destruction in the Caribbean, Central America and the United States. For the first time on record, six consecutive tropical storms made landfall in the United States and a record three major hurricanes struck Cuba. The busy storm season reflected a continuation of above-normal activity that began in 1995.

Tropical Storm *Cristobal* was Atlantic Canada's first major tropical system of the season. As it approached the

Maritimes on July 21, it reached its maximum intensity with sustained winds near 110 km/h. The storm soaked southern Nova Scotia, spilling a month's worth of rain on some coastal areas in less than 24 hours as it merged with a stationary front. Baccaro Point (just to the southwest of Shelburne) got the most rain with 165 mm from Cristobal and the front; Western Head received 127 mm; and Halifax got 42 mm. The heavy rains flooded basements, washed out roads and caused hydroplaning on local highways. Cristobal's strongest winds remained well off-shore.

After Hurricane *Hanna* slammed into Haiti in early September, killing more than 175 people and leaving thousands more homeless, the storm moved north, brushing the Carolinas and eastern New England. *Hanna* soaked New York City with a month's worth of rain in just a few hours. For most Maritimers, *Hanna* was more of a nuisance, spoiling an early September weekend. However, that was certainly not the case along the Bay of Fundy shoreline. For Saint Johners, *Hanna* was a real drencher – 145 mm of rain fell over 14 hours spanning two days. September 7 was the wettest September day on record (104.4 mm) and the fifth-wettest day ever – approaching a once-in-a-100-year event. Several washed streets in the downtown were left in waist-deep water. Overland flooding filled hundreds of basements with dirty sewer water to the depth of a metre or more. In the rural Maritimes, grounds already saturated from heavy August rains worried farmers who were unable to operate heavy machinery without damaging fields. The storm had little left for Newfoundland and Labrador. The greatest rainfall occurred in Burgeo (70 mm) and the strongest winds were recorded in the Wreckhouse area (wind gusts of 81 km/h).

Hurricane *Ike* was a killer and destroyer and the most costly hurricane of 2008: a Category 4 with maximum sustained winds near 230 km/h. Its track brought it across the Caribbean and Cuba and into the Gulf of Mexico, where it brought flooding and a damaging storm surge to the Texas coast. The storm weakened as it moved inland across Eastern Texas and Arkansas and then toward the Great Lakes basin, but its remains still produced wind gusts of hurricane force as far north as Ohio. On September 14 and 15, Ike's leftovers arrived over Lake Huron, where it brought significant amounts of rain. Stiff winds tangled power lines and toppled branches and trees along the immediate shorelines of Lake Erie and Lake Ontario. The day before, a slow-moving storm system with Pacific Ocean origins primed the province with some drenching, day-long rains. The combined rainfall amounted to 125 mm near Sarnia; 96 mm in Windsor; 91 mm in Mount Forest and 51 mm in Parry Sound.

Ike also dumped copious amounts of rain in Québec, including 67 mm at La Verendrye in 20 hours; 58 mm in 19 hours at Québec City; 58 mm in 19 hours at Baie-Comeau; and 70 mm in 17 hours at Bagotville. In some built-up areas, several basements were flooded and stretches of roads were submerged. It wasn't Ike's winds or rain that created the greatest impact in Québec. The high humidities associated with the tropical air mass led to a major stoppage on the Montréal subway system. According to officials at the Société de Transport de Montréal (STM), the malfunction was caused by the condensation of humidity on electrical equipment. The humidity (dew point) in the air mass reached 24°C in Montreal – a very rare occurrence, since only once in 55 years has such a high value been recorded there.

Still drying out from *Hanna*, counties around the Bay of Fundy took another tropical hit when Hurricane *Kyle* struck at the end of September. Early on September 27, the storm passed well to the west of Bermuda and became a hurricane later that day. It accelerated northward and moved over western Nova Scotia the next day. *Kyle* was at marginal hurricane strength when it came ashore just north of Yarmouth and well east of Saint John, New Brunswick. The storm dumped significant rainfalls on the Gaspé Peninsula and Lower North Shore of Québec. Cap-d'Espoir recorded 74 mm of rain in 31 hours. Once again, Point Lepreau was drenched when 68 mm of rain fell on September 27 and 28. Baccaro Point posted the strongest gusts at 124 km/h, although a Canadian Coast Guard vessel reported a wind gust of 154 km/h off the coast of Shelburne. These winds caused minor structural damage and blew down a number of large trees in Shelburne. Kyle's impact was blunted by the relatively cool 15°C waters of the Atlantic Ocean. However, its force caused thousands of Nova Scotia Power customers to lose electricity and more rains added to farmers' growing concerns that they were unable to get on the land to begin the harvest. Fortunately, *Kyle* was well publicized and because it arrived on the fifth anniversary of the infamous Hurricane *Juan*, Maritimers were ready for the storm, thus minimizing its impact.

9. The Coldest Place On Earth

Old-timers on the Prairies will tell you that winters aren't what they used to be and statistics back them up! Over the past quarter century, 17 winters were warmer than normal and only 5 colder. The last significantly cold winter was 12 years ago. At the end of January 2008, however, there was a sobering reminder of winters past when numbing glacial cold gripped the West. Even the heartiest old-timer, conditioned to expect warmer winters, was shocked and "Where was global warming?" became the rallying cry.

A strong Arctic ridge of high pressure ushered in teeth-chattering Siberian air and bone-chilling winds across the West. Temperatures tumbled to -40°C in all three Prairie provinces – and you had to subtract at least another 10 to get the "feel-like" temperatures. At its worst, on January 29, wind chills dipped to a deadly -52 in Regina. To the north, La Ronge felt more like -53 and Meadow Lake -56. Uranium City earned the ignominious distinction of being the coldest place on the continent – and possibly the entire planet – at an unbearable -59 wind chill. Vostok, Antarctica, which holds the record for the coldest temperature ever recorded on Earth (-89.2°C in 1983) was mild in comparison at -44 with the wind chill. A day later, Brandon boasted a -51 wind chill. The penetrating cold didn't break any records, but it did

at times eclipse high marks for electricity and gas consumption in several cities, including Calgary, Red Deer, Winnipeg and Regina. Millions of residents cranked up the thermostat to beat back the cold.

Tragically, the Arctic cold claimed several lives – some homeless, some stranded in the open and two young sisters, dressed only in T-shirts and diapers, who perished on the Yellow Quill First Nation in Saskatchewan. Across the Prairies, the homeless crowded shelters, hospitals were pushed to handle an overflow of frostbite cases, vets reported cats' ears and noses falling off, and farmers struggled to save newborn livestock.

The deep freeze had a vise-like grip on life in the West and the North. Concerts, bingos, hockey games and other events were postponed, and then cancelled. In northern Alberta, pipes froze, especially under mobile homes, and engineers suspended production at the Syncrude oil sands facility due to instrument freeze-up. In Edmonton, the NHL Oilers gave free jump-starts to any fan whose vehicle froze in the arena parking lot. It was so cold in Calgary that the zoo kept its Siberian tigers inside. The unbearable cold stopped garbage pick-up and snow clearing and shut down transit systems. City streets were littered with broken cars with dead batteries, and the theft of unlocked, idling vehicles was just too high to count. Cab companies ran full out on the coldest days, and roadside assistance services for boosting or towing had unprecedented numbers of calls. It's hard to believe that any good news could be attributed to the mid-winter cold snap, but experts were cautiously optimistic that the pine beetle took quite a beating – likely slowing its progress in northwest Alberta.

In the North, Yellowknife experienced one of its longest stretches of cold in years. There were nine straight days of -40°C temperatures. Lingering ice fog obscured entire neighbourhoods, caused several flight disruptions, lengthened work commutes and halted mail delivery. The -50 wind chill and freezing fog filled emergency shelters. In a rare move, the Yellowknife school board advised parents and caregivers that they were closing schools to ensure the safety of students and staff. If schools weren't cancelled, recess was, and students had to endure long cold waits for buses. In the Yukon, store clerks took off their gloves to use cash registers. Tow trucks rescued countless frozen vehicles and repair shops were backlogged. And for humanitarian reasons, the annual Polar Games for Grade 5 and 6 students were postponed.

The bout of cold weather led to the winter of 2007-2008 being the second coldest in 11 years on the Prairies. The Pacific Coast also felt its effects and registered its coldest winter in 15 years.

10. PE-Ice Storms

Ice storms left thousands of residents on Prince Edward Island unplugged and in the dark through long cold nights on at least a couple of occasions during the winter. An ice storm in December felled 300 utility poles – more than what were lost in Hurricane Juan. It was the worst power outage since the mid-1970s and cost Maritime Electric an estimated $1.5 million to repair. Still cleaning up two months later, the province was hit at the end of January by the most crippling ice storm in years. Nearly 95 per cent of Islanders were without electricity. The freezing rain and ice pellet-drizzle mix left thick layers of ice on roof tops, trees and transmission lines. Power poles dropped like dominoes pulled down by ice-laden lines and whipped by strong, gusty winds. The temperature never got much above zero and icing continued to grow. Western regions took the brunt of the damage, with thousands of miles of drooping power lines and hundreds of snapped poles. Ice-damaged trees bent so much they looked like frozen palm trees.

For those venturing outside, vehicles slid across ice-coated surfaces or were blocked by trees lying across the middle of the road. Almost three quarters of the trees in Summerside suffered some damage. Across the province, makeshift shelters were organized in legion halls, fire stations, schools and community centres, while tens of thousands bundled up in homes without light, heat or hot water in the bitter cold that followed. Rescue teams and hydro crews arrived from outside the province, toiling 16-hour days under extremely difficult conditions in order to restore power. They travelled by snowmobiles, but were frustrated at times by thick fog. Just in case, the Canadian military remained on standby at Canadian Forces Base Gagetown, New Brunswick.

Winter 2007-2008 was one of the worst years ever for ice storm assaults on the Island's electricity grid. Combined with ice storms in December, January and again in February, repairs to Maritime Electric infrastructure totalled well in excess of $3 million.

Source: Meteorological Service of Canada - Environment Canada - Government of Canada, The Green Lane™ Website, 30 December 2008.

Waterspouts in Montréal

The above event did not make it to the Top 10 list for 2008 but attracted the attention of many Montrealers. Rare cyclone-shaped waterspouts, familiar in the tropics, formed in the St. Lawrence River near Montréal on July 23. Eyewitnesses spotted numerous funnel clouds and, 70 km northeast of Montréal, a second waterspout. Fair-weather waterspouts form from convective cumulus clouds. While winds are rarely above 90 km/h, they have been known to capsize watercraft and damage waterfront properties. Although the spouts were all the buzz, it was the accompanying weather that took its toll. Winds reached 90 km/h, hail and heavy rain fell, and there was a F0 tornado report in Lanoraie.

Waterspout between Montréal and Longueuil on the St-Lawrence River. Modified photo from Cyberpresse.ca. Also available is a short video on YouTube.

Les dix événements météorologiques canadiens les plus marquants de 2008

par David Phillips[2]

Les Canadiens et les Canadiennes comptent parmi les personnes qui se préoccupent le plus des conditions météo. Après avoir parlé de nous, nous parlons du temps plus que de tout autre sujet. En 2008, le temps qu'il a fait au Canada est loin d'avoir été sans intérêt ni importance. Par exemple, l'amincissement ou le rétrécissement de la glace de mer de l'Arctique n'a peut être pas fait les manchettes, mais à bien des égards, sa disparition accélérée a été plus troublante et inquiétante que l'année précédente. Par ailleurs, pendant que le Nord du Canada continuait de se rétrécir, les Canadiens et les Canadiennes de l'Ouest ont prouvé leur courage en affrontant une vague de froid rude à la fin de janvier. Les habitants de l'Est ont été tout aussi héroïques en pelletant et chassant des chutes de neige records. Si les amateurs de neige ont profité de cet or blanc pendant la majeure partie de l'hiver, le poids ajouté de la neige et de la glace a mené à l'effondrement de nombreux toits, ce qui a causé quatre décès. La pire tempête de neige de l'hiver a été la dernière; elle s'est déchaînée pendant la fin de semaine de relâche de mars où bon nombre de résidants tentaient de se rendre dans le Sud pour trouver un peu de repos.

Malheureusement, l'été n'a pas été source de réconfort. Dans chaque région du Canada, on a connu un été de mécontentement. Les résidants des Prairies ont reçu un nombre record d'avertissements météorologiques annonçant des tornades, des pluies abondantes, des tempêtes de vent et des tempêtes de grêle. Les récoltes perdues en raison de la grêle ont été évaluées à près de 350 millions de dollars dans les Prairies. Les tempêtes de grêle ont également causé des dommages en Ontario et en Colombie Britannique. Le temps plutôt froid d'avril a été tout aussi dévastateur pour les fruiticulteurs de la Colombie Britannique. Dans la région des Grands Lacs et des basses terres du Saint Laurent, on a connu l'un des étés les plus humides enregistrés jusqu'ici, près de 30 % plus humide que la normale, ce qui contraste de façon marquée avec la sécheresse presque record de l'année précédente. Dans l'Est, l'été a été maussade et déprimant en raison des pluies fortes et fréquentes.

Par ailleurs, sur la liste des événements météorologiques canadiens les plus marquants cette année figurent les importantes inondations au Nouveau Brunswick, le long de la rivière Saint Jean, d'abord en avril puis à nouveau en août, et les tempêtes de verglas qui ont paralysé l'Île-du-Prince-Édouard. L'année 2008 a également été le théâtre de cinq ouragans majeurs dans l'océan Atlantique et la mer des Caraïbes. Ils ont surtout été violents à Cuba et en Haïti, mais ils ont pratiquement épargné le Canada, causant seulement des pluies agaçantes et un déluge à Saint John.

Les nouvelles n'étaient pas que mauvaises, cependant! Notre air était plus pur que la normale; il n'y a pas eu de panne de courant majeure pendant l'été; le dendroctone du pin a connu une baisse; il y a eu peu d'incendies de forêt et moins de moustiques porteurs du virus du Nil occidental.

Dix événements météorologiques les plus marquants en 2008

1	**Un été exécrable dans l'Est**
2	**Le dégel se poursuit dans l'Arctique**
3	**Un hiver interminable**
4	**La rivière Saint Jean déborde d'un bout à l'autre**
5	**Des surprises avant l'hiver**
6	**L'été laisse les cultivateurs de glace**
7	**Le dernier passage de l'hiver**
8	***Hanna* et ses frères**
9	**L'endroit le plus froid sur Terre**
10	**Tempêtes de verglas sur l'Île-du-Prince-Edouard**

Aussi étonnant que cela puisse paraître, le Canada a connu une année chaude, pour une douzième année consécutive, même si elle n'a pas été aussi chaude que les dernières années. De janvier à novembre, la température moyenne nationale était d'environ 1,0 °C au dessus de la normale. Il a fait plus chaud dans toutes les régions, en particulier dans la région Est de l'Arctique, où l'on a connu la huitième période de janvier à novembre la plus chaude enregistrée. On a aussi enregistré le troisième été le plus chaud, avec un degré plus élevé que la normale. Dans le Nord, on a vécu dans la plupart des districts le deuxième ou le troisième été le plus chaud jamais enregistré (quelque 1,5 degré au dessus de la normale). Par ailleurs, dans la majeure partie de la Colombie Britannique, on a enregistré un été plus froid que la normale, le plus froid des 23 dernières années. Dans tout le pays, on a connu le sixième automne le plus chaud, la température étant de près de 1,4 degré au-dessus de la moyenne.

Le temps chaud au Canada n'était pas exactement en phase avec le reste du monde. À l'échelle planétaire, on a connu en 2008 la température moyenne la plus froide depuis 2000; la température était environ 0,14 °C sous la

[2] Climatologue principal, Service météorologique du Canada, Downsview, Ontario, Canada

température moyenne pour la période de 2001 à 2007. En 2008, sur le plan mondial, les températures combinées de la mer en surface et à la surface des terres ont été plus froides que celles des dernières années, en grande partie en raison d'une forte La Niña. Ce phénomène se caractérise par des températures océaniques inhabituellement froides dans la région équatoriale du Pacifique. La Niña s'est développée pendant l'été 2007 et a atteint le sommet de sa force au début de 2008. Malgré le refroidissement, la température mondiale de l'année 2008 a été de 0,3 degré supérieure à la moyenne annuelle de 14,0 °C pour la période de 1961 à 1990. En effet, 2008 a été la 10e année la plus chaude des 159 dernières années. L'année la plus chaude a été 1998, suivie de 2005, de 2003 et de 2002. Selon l'Organisation météorologique mondiale à Genève, la température moyenne mondiale augmente environ trois fois plus rapidement depuis 1976, comparativement à celle des 100 dernières années. Au XXI^{e} siècle, les températures du globe sont supérieures de plus de 0,75 °C à celles qu'on enregistrait au début du XX^{e} siècle.

La liste présentée ci-haut recense les dix événements météorologiques les plus marquants survenus au Canada en 2008. Ils sont cotés de un à dix selon, entre autres facteurs, la mesure dans laquelle le Canada et les Canadiens et Canadiennes ont été touchés, la superficie de la région touchée, les répercussions économiques et la durée pendant laquelle l'événement a fait les manchettes dans les médias.

 # 1 : Un été exécrable dans l'Est
Les Canadiens et les Canadiennes de l'Ontario à Terre-Neuve-et-Labrador ne se plaignaient pas que de la quantité de pluie ou de son intensité, mais du fait qu'il pleuvait presque chaque jour!

 # 2 : Le dégel se poursuit dans l'Arctique
Les nouvelles de cette année en ce qui concerne la perte de glace dans les eaux de l'Arctique ne sont pas aussi stupéfiantes que celles de l'année dernière, la tendance vers une glace marine plus mince et nouvelle continue de surprendre les scientifiques de partout dans le monde, sur plusieurs fronts.

 # 3 : Un hiver interminable
Les résidents de l'Ontario et du Québec ont subi l'un des hivers les plus longs et les plus enneigés depuis des années. À certains moments, même les amateurs de neige en ont eu assez et attendaient le printemps avec impatience.

 # 4 : La rivière Saint-Jean déborde d'un bout à l'autre
Le Nouveau-Brunswick a connu sa pire inondation printanière en 35 années tout le long de la rivière Saint-Jean. Cette inondation a touché quelque 1 600 propriétés et a causé 50 millions de dollars ou plus en dommages aux maisons, aux exploitations agricoles et aux petites entreprises.

 # 5 : Des surprises avant l'hiver
Même au Canada, le pays le plus enneigé et le deuxième pays le plus froid au monde, il est rare que tout le pays soit recouvert de neige et envahi d'une masse d'air arctique avant le premier vrai jour d'hiver.

 # 6 : L'été laisse les cultivateurs de glace
Cet été, une série de tempêtes de grêle a martelé les récoltes et les vergers partout au Canada.

 # 7 : Le dernier passage de l'hiver
Pendant la fin de semaine de relâche des 8 et 9 mars, une grosse tempête d'hiver a déchargé jusqu'à 50 cm de neige dans l'est du Canada. Près de 200 000 Canadiens et Canadiennes touchés par la tempête sont restés dans le noir, de Windsor, en Ontario, à Wabush au Labrador.

 # 8 : Hanna et ses frères
Les spécialistes des ouragans avaient prévu une autre saison d'ouragans active dans l'Atlantique en 2008, et ils avaient vu juste.

 # 9 : L'endroit le plus froid sur Terre
Une forte crête de haute pression de l'Arctique a soufflé un air glacial à claquer des dents, et des vents sibériens sur l'ensemble de l'Ouest. Les températures ont chuté à -40 °C dans les trois provinces des Prairies, et vous devez soustraire au moins 10 autres degrés pour obtenir les températures «ressenties».

 # 10 : Tempêtes de verglas à l'Île-du-Prince-Édouard
Les tempêtes de verglas ont laissé des milliers de résidants de l'Île-du-Prince-Édouard sans électricité pendant de longues nuits froides à quelques reprises, pendant l'hiver.

Source: Service Météorologique du Canada - Environnement Canada - Gouvernement du Canada, Site web La voie verte^{MC}, 30 décembre 2008.

Des trombes d'eau à Montréal
L'événement suivant ne s'est pas qualifié parmi les dix événements les plus marquants pour 2008 mais a tout de même attiré l'attention de plusieurs montréalais. De rares trombes ayant la forme d'un cyclone, habituelles dans les tropiques, se sont formées dans le fleuve Saint Laurent, près de Montréal, le 23 juillet. Des témoins oculaires ont aperçu de nombreux nuages en forme d'entonnoir et, à 70 km au nord est de Montréal, une deuxième trombe. Les trombes marines se forment à partir de cumulus de convection. Ces vents dépassent rarement 90 km/h, mais ils sont connus pour faire chavirer les embarcations et endommager les propriétés situées au bord de l'eau. Bien que les trombes étaient le sujet sur toutes les lèvres, c'est le temps qui les accompagnait qui a fait des ravages. Des vents atteignant 90 km/h ont soufflé, de la grêle et une forte pluie se sont abattues et on a signalé une tornade de force F0 à Lanoraie.

Atelier d'été en météorologie
Projet Atmosphère 2009

Demande de candidats professeurs de niveau pré-collégial

Comme par les années passées, la Société canadienne de météorologie et d'océanographie (SCMO) a été invitée à choisir un enseignant canadien qui participera au PROJET ATMOSPHÈRE en 2009. Il s'agit d'un atelier d'été à l'intention des enseignants de niveau pré-collégial spécialistes en sciences atmosphériques; cet atelier est parrainé par l'American Meteorological Society (AMS) et la National Oceanic and Atmospheric Administration (NOAA) américaine. Il aura lieu du 19 au 31 juillet 2009 au centre de formation du National Weather Service à Kansas City au Missouri.

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

Matteo Babini (2008 selected teacher) in front of the National Weather Service in Topeka, Kanzas

Les anciens participants du Canada ont trouvé leur expérience très enrichissante et stimulante. Les exposés de l'atelier sont présentés par des experts américains les plus réputés dans les sciences atmosphériques et océanographiques. Les enseignants sont revenus avec du matériel, des ressources et des modules didactiques qu'ils peuvent facilement adapter dans leurs cours.

Les enseignants intéressés peuvent obtenir plus d'information en visitant le site de la SCMO sur la toile à www.scmo.ca/hsworkshop.html où ils peuvent obtenir un formulaire d'application. Ils peuvent également obtenir un formulaire en le demandant le plus tôt possible à l'adresse suivante:

SCMO - Atelier Projet Atmosphère
Casier postal 3211, Station D
Ottawa, ON K1P 6H7
Téléphone: (613) 990-0300
Télécopie: (613) 990-1617
courriel: scmo@scmo.ca

Ces demandes doivent être soumises au bureau ci-haut mentionné au plus tard le **31 mars 2009**.

Summer Meteorology Workshop
Project Atmosphere 2009

Call for Applications by Pre-College Teachers

As in previous years, the Canadian Meteorological and Oceanographic Society (CMOS) has been invited to select a Canadian teacher to participate in PROJECT ATMOSPHERE in 2009. This is a summer workshop for pre-college teachers of Atmospheric Science topics sponsored by the American Meteorological Society (AMS) and the National Oceanic and Atmospheric Administration (NOAA) of the United States. It will take place July 19-31, 2009 at the National Weather Training Center, Kansas City, Missouri.

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

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

Interested teachers can obtain more information on the workshop from the CMOS website www.cmos.ca/hsworkshop.html from where they can also download an application form. They can also request an application form by writing, as soon as possible, to the following address:

CMOS - Project Atmosphere Workshop
P.O. Box 3211, Station D
Ottawa, ON K1P 6H7
Telephone: (613) 990-0300
Fax: (613) 990-1617
e-mail: cmos@cmos.ca

These requests should be submitted to the above office not later than **March 31, 2009**.

*** Call for Papers ***

43rd Annual Canadian Meteorological and Oceanographic Society Congress

May 31 to June 4, 2009
Halifax, Nova Scotia, Canada

http://www.cmos.ca/Congress2009

The Canadian Meteorological and Oceanographic Society (CMOS) Congress 2009 will be held in Halifax, Nova Scotia, Canada at the World Trade and Convention Centre from May 31 to June 4, 2009. The Congress theme is "*Sea and Sky Come to Life*".

The Congress will feature:

- Plenary presentations by leading researchers;
- Science sessions that highlight top Canadian and international research contributions to climate, meteorology, oceanography, and hydrology, as well as the policy implications of research in these fields;
- An evening lecture of general-interest, open to the public, on the theme of hurricanes;
- A banquet, a hosted lunch, awards of CMOS prizes and the CMOS Annual General Meeting.

Please submit abstracts electronically to the link found on the Congress website (http://www.cmos.ca/Congress2009) after **January 7, 2009** and before the deadline of **February 15, 2009.** You will be asked to submit your abstract to one of several planned sessions that are listed on the website and to specify your preference for either an oral or a poster presentation. An abstract fee of $50 will be charged at the time of submission. Your abstract will be evaluated by the Congress's Science Program Committee and you will be notified by the end of March 2009 if your presentation has been accepted for oral or poster presentation.

Student CMOS members are welcomed and encouraged to apply for a Student Travel Bursary when submitting an abstract.

If you are an exhibitor, an educator, a member of the media, or anyone else with an interest in the meeting, please visit the Congress website

(http://www.cmos.ca/Congress2009)

and contact the Chair of the Local Arrangements Committee for further information.

Blair Greenan
Chair of the CMOS 2009 Scientific Program Committee
(greenanb@mar.dfo-mpo.gc.ca)

John Parker
Chair of the CMOS 2009 Local Arrangements Committee
(john.k.parker@ec.gc.ca)

*** Demande de soumission des résumés ***

43e Congrès annuel de la Société canadienne de météorologie et d'océanographie

31 mai au 4 juin 2009
Halifax, Nouvelle-Écosse, Canada

http://www.cmos.ca/Congress2009

Le congrès 2009 de la Société de météorologie et d'océanographie (SCMO) aura lieu du 31 mai au 4 juin 2009 à Halifax en Nouvelle-Écosse, Canada, au World Trade and Convention Centre. Le thème du congrès est "*Mer et ciel s'animent*".

Le congrès inclura:

- Des présentations plénières par des scientistes à la pointe de la recherche;
- Des sessions scientifiques accentuant les contributions ultimes de la recherche canadienne et internationale dans les domaines du climat, de la météorologie, de l'océanographie et de l'hydrologie, ainsi que les implications politiques de la recherche avancée dans ces domaines.
- Une présentation en soirée d'intérêt général et ouvert au public sur le thème des ouragans.
- Un banquet, un petit déjeuner accueilli, remise des récompenses SCMO et réunion générale annuelle de la SCMO.

Veuillez soumettre vos résumés électroniquement en utilisant le lien sur le site du congrès (http://www.cmos.ca/Congress2009) entre le **7 janvier et le 15 février 2009,** cette dernière étant la date limite pour vos soumissions. Vous devrez soumettre votre résumé sous une des nombreuses sessions affichées sur le site et spécifier votre préférence quant à une présentation orale ou une présentation affichée. Des frais de $50 seront chargés au moment de la soumission. Votre soumission sera évaluée par le comité du programme scientifique du

congrès qui vous avisera avant la fin du mois de mars 2009 de la décision de présenter votre contribution oralement ou avec une affiche.

Les membres étudiants de la SCMO sont les bienvenus et sont encouragés à appliquer pour une bourse étudiante d'aide au voyage lors de leur soumission.

Si vous êtes un exposant, un éducateur, un membre des médias, ou quelqu'un avec un intérêt pour le congrès, veuillez visiter le site Web du congrès

(http://www.cmos.ca/Congress2009)

ou contactez le président du Comité des arrangements locaux pour obtenir plus d'information.

Blair Greenan
Président, Comité du programme scientifique de SCMO 2009, (greenanb@mar.dfo-mpo.gc.ca)

John Parker
Président, Comité des arrangements locaux de SCMO 2009 (john.k.parker@ec.gc.ca)

A-O Abstracts Preview

Avant Première des résumés de A-O

The following abstracts will soon be published in your next ATMOSPHERE-OCEAN publication.

Les résumés suivants paraîtront sous peu dans votre prochaine revue ATMOSPHERE-OCEAN.

Sensitivity of the Statistical DownScaling Model (SDSM) to Reanalysis Products

E.N. KOUKIDIS and A.A. BERG

Abstract
Numerous general circulation models (GCMs) have been designed by climate centres to predict future climate trends. A remaining issue with the use of GCM output for local applications is the coarse spatial resolution. To produce accurate daily predictions of future climate variables at the regional scale, the Statistical DownScaling Model (SDSM) is a commonly used downscaling technique. The SDSM statistically identifies relationships between large-scale *predictors* (i.e., GCM) and local-scale *predictands*, using a multiple linear regression model. Reanalyses, such as those produced by the National Centers for Environmental Prediction/National Center for Atmospheric Research (NCEP/NCAR) and the European Centre for Medium-range Weather Forecasts (ECMWF), are important components for the structuring of the SDSM as they supply the predictor values for the calibration and validation of the model. It is well known that the reanalysis products contain biases which may subsequently impact the development of downscaling scenarios when used with the SDSM. In this paper, separate downscaled precipitation and temperature scenarios were generated using the SDSM with the calibrations and validations derived from two different reanalyses for a climate station in southern Ontario. From these comparisons, we have identified statistically significant differences between the two time series. Therefore, it is clear that choice of the reanalysis used to calibrate the SDSM can significantly effect the downscaled scenario over a region evaluated in southern Ontario.

Résumé
De nombreux modèles de circulation générale (MCG) ont été élaborés par les centres climatologiques pour prévoir les tendances futures du climat. La faible résolution spatiale des sorties de MCG pour les applications locales pose toujours problème. Pour produire des prévisions quotidiennes précises des variables du climat futur à l'échelle régionale, on emploie couramment une technique de réduction d'échelle appelée *modèle de réduction d'échelle statistique* (SDSM). Le SDSM identifie statistiquement des relations entre des prédicteurs à grande échelle (c.-à-d. le MCG) et des prédictants à l'échelle locale à l'aide d'un modèle de régression linéaire multiple. Les réanalyses, comme celles produites par les National Centers for Environmental Prediction et le National Center for Atmospheric Research (NCEP/NCAR) ainsi que le Centre européen pour les prévisions météorologiques à moyen terme (CEPMMT), sont des éléments importants pour la structuration du SDSM, car elles fournissent la valeur des prédicteurs pour l'étalonnage et la validation du modèle. Il est bien connu que les produits de réanalyse renferment des biais qui peuvent ensuite avoir une influence sur l'élaboration des scénarios de réduction d'échelle lorsqu'ils sont utilisés avec le SDSM. Dans cet article, nous avons produit des scénarios séparés de précipitations et de température à échelle réduite au moyen du SDSM avec des étalonnages et des validations dérivés de deux réanalyses différentes pour une station climatologique du sud de l'Ontario. À partir de ces comparaisons, nous avons trouvé des différences statistiquement significatives entre les deux séries chronologiques. Par conséquent, il est clair que le choix de la réanalyse utilisée pour étalonner le SDSM peut avoir un effet important sur le scénario à échelle réduite dans une région évaluée dans le sud de l'Ontario.

Comparing Two Climatologies of the Labrador Sea: Geopotential and Isopycnal

NILGUN KULAN and PAUL G. MYERS

Abstract
Two climatologies, one using an isopycnic approach and the other employing a more classical geopotential approach, are produced for the Labrador Sea region. These differ from existing climatologies through the use of smaller search radii, more data and a carefully chosen depth

dependent correction scheme. This results in the preservation of the strong fronts that exist between cold, fresh boundary currents and warmer, more saline interior waters, and in general, less smoothing of features. The waters of the West Greenland Current, the Labrador Current and the interior are well represented, especially Labrador Sea Water and the Deep Western Boundary Current. We consider that our 'best' results are produced by the isopycnal climatology. Isopycnal averaging gives more realistic results by reducing artificial mixing of water properties and preserving the baroclinicity of the flow.

We estimate the total transport, using the results from the isopycnal climatology in a diagnostic model driven by climatological winds. For the Labrador Current/subpolar gyre at 53°N we find a transport of 46.6 Sv southward, with 9.7 Sv of that being Labrador Sea Water, 12.1 Sv being Gibbs Fracture Zone Water and 8.0 Sv being Denmark Strait Overflow Water. Transport into the Labrador Sea is 41.2 Sv with 6.6 Sv of Labrador Sea Water exported back to the Irminger Sea. Total southward freshwater transport by the Labrador Current (including slope and 'gyre' branches) is 239 mSv at 53°N, with almost 60% of this carried in the upper layer. Import of freshwater to the Labrador Sea from the east in the East Greenland Current is 129 mSv, which is divided almost equally among all layers. Our estimate of the long-term mean formation rate of Labrador Sea Water is between 3.6 and 3.8 Sv.

Résumé
Nous produisons deux climatologies, l'une utilisant une approche isopycne et l'autre une approche géopotentielle plus classique, pour la région de la mer du Labrador. Ces climatologies diffèrent des climatologies existantes par l'emploi de plus petits rayons d'exploration, de plus de données et d'un schéma de correction lié à la profondeur soigneusement choisi. Cela a pour effet de préserver les fronts nets qui existent entre les courants de bord froids et doux et les eaux de l'intérieur chaudes et plus salées et, en général, de produire moins de lissage des caractéristiques. Les eaux du courant groenlandais de l'Ouest, du courant du Labrador et de l'intérieur sont bien représentées, surtout les eaux de la mer du Labrador et le courant profond de bord ouest. Nous considérons que nos « meilleurs » résultats proviennent de la climatologie isopycne. Le moyennage isopycne donne des résultats plus réalistes en réduisant le mélange artificiel des propriétés de l'eau et en préservant la baroclinité de l'écoulement.

Nous estimons le transport total en utilisant les résultats de la climatologie isopycne dans un modèle diagnostique piloté par les vents climatologiques. Pour le courant du Labrador/circulation subpolaire à 53°N, nous trouvons un transport de 46,6 Sv vers le sud, dont 9,7 Sv sont des eaux de la mer du Labrador, 12,1 Sv sont des eaux de la zone de fracture Gibbs et 8,0 Sv sont des eaux de débordement du détroit du Danemark. Le transport entrant dans la mer du Labrador est de 41,2 Sv, avec 6,6 Sv des eaux de la mer du Labrador retournées dans la mer Irminger. Le transport total d'eau douce vers le sud par le courant du Labrador (y compris les sections de la pente et de la « circulation ») est de 239 mSv à 53°N, dont presque 60 % sont transportés dans la couche supérieure. L'importation d'eau douce vers la mer du Labrador par l'est dans le courant groenlandais de l'est est de 129 mSv, qui se divisent presque également dans toutes les couches. Notre estimation du taux de formation moyen à long terme d'eau de la mer du Labrador est entre 3,6 et 3,8 Sv.

Extreme Wind Regime Responses to Climate Variability and Change in the Inner-South-Coast of British Columbia, Canada

Dilumie S. Abeysirigunawardena, Eric Gilleland, David Bronaugh and Pat Wong

Abstract
This study shows how information about climate variability can be valuable to the understanding of wind regime responses and the improvement of wind forecasting skill. To this end we demonstrate the use and value of climate information in accurately determining extreme wind recurrences at three locations on the inner-south-coast of British Columbia (48°-49°N, 123°W). The methodology is primarily based on approximating a Generalized Pareto distribution (GPD) to extreme winds in the presence of climate variability covariates. The long-term hourly wind speed data maintained by the Meteorological Service of Canada are used to evaluate the possible influence of climate variability on extreme wind response. Preliminary results suggest that there are significantly different extreme wind responses to warm and cold El Niño Southern Oscillation (ENSO) modes, with a tendency for high extreme winds to occur during the negative (i.e., cold) ENSO phase.

Résumé
Cette étude montre comment l'information sur la variabilité climatique peut contribuer à la compréhension des réponses des régimes de vent et à l'amélioration de la capacité de prévoir le vent. À cette fin, nous montrons l'utilisation et la valeur de l'information climatologique dans la détermination précise des périodes de retour de vents extrêmes à trois endroits de la côte intérieure sud de la Colombie-Britannique (48°-49°N, 123°O). La méthodologie consiste principalement à approximer une distribution de Pareto généralisée (GPD) des vents extrêmes en présence de covariables de variabilité climatique. Nous nous servons des données horaires de vitesse de vent à long terme du Service météorologique du Canada pour évaluer l'influence possible de la variabilité climatique sur la réponse des vents extrêmes. Les résultats préliminaires semblent indiquer qu'il y a des différences significatives dans les réponses de vents extrêmes aux modes chaud et froid de l'ENSO (El Niño – Oscillation australe), les vents extrêmes élevés ayant tendance à se produire durant la phase négative (c.-à-d. froide) de l'ENSO.

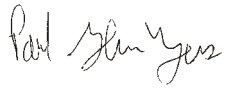
Report of the Nominating Committee

The nominating committee consists of the past-president (Chair), President and Vice-president. So for the present year, the committee consisted of Paul Myers (Chair), Andy Bush and Bill Crawford. The goal this year was to provide a new slate for the executive as it moved to Victoria/Vancouver after 3 years in Edmonton. We are happy to report the following people have agreed to stand for election to the CMOS executive for 2009-10.

President Président	***William (Bill) Crawford***, Head, State of the Ocean Section, Institute of Ocean Sciences, Fisheries and Oceans Canada
Vice-President Vice-Président	***David Fissel***, President and CEO, ASL Environmental Sciences Inc.
Treasurer Trésorier	***Rich Pawlowicz***, Associate Professor, University of British Columbia
Corresponding Secretary Secrétaire correspondant	***Jane Eert***, Research Scientist, Institute of Ocean Sciences, Fisheries and Oceans Canada
Recording Secretary Secrétaire d'assemblée	***Sophia (Sophie) Johannessen*** Research Scientist, Institute of Ocean Sciences, Fisheries and Oceans Canada
Past President Président d'office	***Andrew Bush***, Professor, Department of Earth & Atmospheric Sciences, University of Alberta, Edmonton, AB
Councillors-at-Large Conseillers	• ***Kent Johnson***, Manager, NSO, Environment Canada, Kelowna, B.C. and LAC Chair for the 2008 CMOS Congress in Kelowna • ***John Parker***, Environment Canada (MSC) Dartmouth, NS and LAC Chair for the 2009 CMOS Congress in Halifax. • To be announced / À déterminer

Rapport du Comité de mise en candidature

Le comité de mise en candidature est formé du Président sortant, du Président et du Vice-Président. Pour cette année, le comité était donc formé de Paul Myers (Président), Andy Bush et Bill Crawford. Comme l'exécutif venait de la région d'Edmonton depuis trois ans, le but de cette année était de former un exécutif venant de la région de Victoria/Vancouver. Nous sommes heureux d'annoncer que les personnes suivantes ont accepté que leur nom soit mis en candidature pour l'élection de l'Exécutif de la SCMO pour 2009-2010 (Voir tableau ci-haut).



Paul Myers
Chair, Nominating Committee
Edmonton, AB

Survival: Survival of the Human Race

Edited by Emily Shuckburgh

Cambridge University Press, January 2008
ISBN 978-0-521-71020-6, 233 pp. Paperback, US$25

Book reviewed by Dov Richard Bensimon[1]

This book reunites nine lectures that fall under the general theme of "Survival", each making up a chapter of the book. This topic is explored in particular as it pertains to mankind, and is prompted by an examination of how the expression "Survival of the fittest", derived from the works of Charles Darwin, applies to various aspects of human life.

The first chapter, written by the book's editor, presents a broad overview of the theme of survival and introduces the remainder of the book. Each of the remaining chapters covers a specific aspect of survival.

Chapters 2 through 4 look at survival of political empires, culture and languages. For readers with a background in science, these are topics that may be unfamiliar, yet which can give an appreciation of some of the many facets of survival.

The book shifts more into the realm of science in chapter 5, where dangers associated with major pandemics such as AIDS and the avian flu are examined, as well as ways to avert such problems. World history from the last couple of decades has shown how quickly both of these threats to human survival can spread.

Natural disasters can also threaten survival, as discussed in chapter 6. Being a professor of earth sciences, the author concentrates on the threat posed by earthquakes and looks at factors that explain much higher death tolls in countries such as Iran and Pakistan when compared to those in Japan and the U.S.

Health sciences come to the forefront in the next couple of chapters, which are devoted to famine and ageing. Though more technical in nature, the chapter on ageing is particularly interesting. The authors recount results of laboratory experiments on worms, and how modification of certain proteins in the worms' bodies led to a significant increase in the lifespan of these organisms. The potential to which this may apply to humans is discussed briefly.

It is the final chapter that is the most directly related to the sciences dealt with by CMOS. In it, Prof. Diana Liverman of Oxford University discusses many aspects of climate change and its influence on human survival. Not only does she discuss some of the basic science behind climate change, but she also examines political and economical issues related to it. In particular, she sheds light on certain loopholes that allow countries participating in the Kyoto Protocol to emit more greenhouse gases than one might be led to believe otherwise.

Because the book is a collection of public lectures, it has been written with the general public in mind. This makes the book generally easy to follow and fairly non-technical, and gives it a potentially wide readership. It can not only appeal to members of the general public interested in the theme, but also to members of a given specialty covered in the book.

Writing styles vary with each author, so that the reader will be likely to identify more with certain styles than others. From information on each of the contributors in the book, we see that each has extensive experience and knowledge in his/her fields.

This relatively short book covers a large variety of topics, meaning that each is covered succinctly. This may whet the appetite of certain readers for more knowledge about a given topic, thus a short list of further reading is given at the end of each chapter. Although most of the book covers topics far removed from meteorology or oceanography, this is a good opportunity to broaden one's horizons and learn about other topics. It is striking to see how multi-disciplinary a topic like "survival" is.

If you are interested in reviewing one of the books listed on page 33 for the *CMOS Bulletin SCMO*, please contact the Editor at the e-mail address provided below. Of course, when completed, the book is yours. The instructions to be followed when reviewing a book for the *CMOS Bulletin SCMO* will be provided with the book. Thank you for your excellent collaboration.

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Oil, Water and Climate – An Introduction

by Catherine Gautier

Cambridge University Press, ISBN 978-0-521-70919-4, 2008, 366 pp. Paperback, US$49

Book reviewed by John Stone[2]

Many of us have struggled with mixed success to explain to our fellow Canadians the threat of climate change through lectures to students, public talks, media interviews and the occasional article. With the United Nations Framework Convention on Climate Change (UN/FCCC) we can claim some success in putting the issue on the policy agenda of governments although, to quote the Economist, "there is little sign of mind-concentrating effect". There is also evidence of some general public awareness even if this has not led to a realization that we are each part of the problem and can be equally part of the solution. Although a full understanding of the climate involves a deep and broad scientific comprehension (hence the 600-odd page Assessment Reports of the Intergovernmental Panel on Climate Change - IPCC) and represents possibly one of the greatest intellectual challenges of our time, the essence can be explained quite simply – that is if we stick to the science. Where the complications arise is in determining how best to respond. It is here that we have to try to deal with the complex variety of inter-connected issues and all their unavoidable feed-back mechanisms.

There is a growing recognition now that climate change is not just an environmental issue. Indeed, there is some hope that the more ways in which the issue can be framed, the greater the possibility of including more constituencies and building a consensus that will stimulate the political will for real action. It is clearly an energy issue, for most of the emissions of greenhouse gases that are at the root of climate change are produced by our profligate consumption of fossil fuels and the free dumping of their wastes into the atmosphere. Less well-recognized is that climate change is also a water security issue since climate change will alter the availability of water and many energy sources rely on adequate water supply. Thus water enters both through considerations of adaptation as well as mitigation.

The issues of climate change, energy and water are brought together in this book by Catherine Gautier: Oil, Water and Climate: An Introduction. The book is primarily written for freshman students but needs to be read by a wider audience in order that we have a better informed public capable for critical thinking. Gautier has joined that small company of public scientists that have taken up the challenge of sounding the alarm. As the author notes, she hopes that the overall value of the book will be in the doors that it opens – an admirable aspiration – and in stimulating the leaders of tomorrow. The book does read as a collection of lectures that can be read individually. In fact, the book is based on a course the author taught at the University of California, Santa Barbara. This results in what seems like a somewhat arbitrary set of chapter titles which collectively cover a rich amount of material but which makes searching for a specific topic not always easy.

The author does recognize that the tangled web of issues is much broader and she notes that many of the changes in population, resource consumption and development are occurring at a rate that is pushing the resilience of our communities and ecosystems to a breaking point beyond which we may not be able to adapt and continue to sustain ourselves. She notes that this is happening in a World of fast-paced communications where the changes are being witnessed in real-time leaving many feeling unable to comprehend the complexity and impotent to act. She also makes the point, which was not obviously present at the recent UN/FCCC Conference of the Parties in Poznan, that the scale of these changes and the limited time to address them creates a sense of urgency.

The book begins with an excellent Foreword by Richard Somerville who highlights an issue that the author only discusses in Chapter 3 and elsewhere only marginally – population. Two thousand years ago the Earth supported a population of some 300 million people who had to contend with the threats of starvation, disease and war. Between 1930 and 2006 – roughly one human lifetime - there was a three-fold increase in World population to about 6.5 billion. This growth is expected to continue with much occurring in developing countries, in large cities in proximity to the coast. The enormous increase exacerbates the issues discussed in this book: Population is a potent multiplier.

The recent decades have also seen a parallel growth in prosperity fuelled by the rapid exploitation of abundant and cheap energy and other resources catalyzed by technological innovation but at a great cost to the environment and with the ever-present scourges of continued starvation, disease and war. In the face of these urgent challenges, Somerville and the book's author see the power of science. In contrast to earlier generations we now have the scientific tools to observe the changes and look into the future. Ignoring what we know about climate change is irresponsible. To quote Somerville: "nature is supremely indifferent to politics and spin".

While this book is a valuable addition to the number of recent books on climate change, the particular value of this volume is the attention it gives to the issue of water availability. When I'm asked where Canada is especially vulnerable to the threat of climate change, I mention the Arctic and water (particularly in the West). Although many might immediately think of potable water for drinking, this only accounts for some 3-6 litres for our daily needs; the

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food we consume requires three orders of magnitude more. We are more likely to run out of water than fossil fuels. Gautier's preoccupation is with the water needs for providing energy supply (only slightly behind agriculture) – cooling water for power plants, river water for hydroelectric power, water for oil and gas extraction (including the tar sands) and water for biofuels production. It is estimated that it takes about 400 litres of water to produce one litre of bioethanol. It was this realization that forced China to rethink its plans for massive bio-fuel production.

Gautier pays less attention to the need to adapt to the impacts of climate change on water availability. According to the IPCC's Fourth Assessment Report there is already evidence that climate change is affecting the water cycle. In addition to the expected increase in floods and droughts (the wet places will become wetter and the dry places drier), there is the concern for the 50% of the World's population that relies on glacier and snow melt from mountain ranges. As the author points out, water managers will have to deal with these pressures in the context of aging or non-existent infrastructure, population increases, rising prosperity and the potential for conflict. The past will be no guide to the future.

One set of issues that the author discusses is that of security of energy, water, environment, etc…., and the potential for conflict (dealing with oil in Chapters 7, water in Chapter 13 and generally in Chapter16). She mentions the already differential access to energy which has the potential to increase the disparity between the rich and the poor and in turn breed conflict, resentment and terrorism. As the IPCC's Third Assessment Report pointed out in 2001, climate change will exacerbate this disparity. Gautier sees greater possibility for conflicts over oil (as though that was not already evident) than water (where she presents evidence for a peaceful example of water-sharing around the World).

Overall, this is an excellent book. It clearly sets out the issues and the science for the reader who might lack a technical background. It makes liberal use of diagrams from readily available web-sites and offers the reader web-access to all the figures in the book. It provides examples of what can be done so as not to leave the reader with a sense of despair. It gives a sense of the urgency for action and that the present economic crisis provides an opportunity to restructure our industry, introduce new technologies and offer different lifestyles that have a smaller carbon footprint. It recognizes that facing these challenges will require extraordinary determination, leadership and cooperation.

The Chronologers' Quest – The Search for the Age of the Earth

by Patrick Wyse Jackson

Cambridge University Press, 2006
ISBN 0-521-81332-8
291 pp., Hardback, US$30

Book reviewed by Bob Jones[3]

Originally, this title was accepted for review by Patrick Spearey. At Patrick's untimely death this spring (reported in the April 2008 Bulletin), he was beginning his work on this book. In recognition of the large number of books Patrick has reviewed, it was decided to undertake this review in his memory.

The title indicates that this subject is a vast topic to be considered for a single book. The author writes in readable prose with no complex figures or pages of equations in the science. However, as a non-geologist, the reading became tedious at times as an increasing number of geological terms were encountered (e.g. time epochs like Pleistocene, Jurassic, Cambrian and older, and special terms to describe fossils and stratified rock sediments).

The fourteen chapters are organized in order of the time people made their discoveries. Even the early chronologies detailed in biblical writings are well covered, and indeed the story of creation and later flood described there delayed the investigation and recognition of newer science-based answers because investigators were roundly dismissed by the prevailing religious rulers. In some cases they were threatened with torture and death for spreading false information about the creation and age of the earth.

Once science was permitted to examine the issue, many roads were traveled and they are well covered in the chapters. Researchers looked first at rocks and eventually constructed a "geological column" of deposited sediments which were calculated to be much older than the age of 4,000 years from earlier beliefs. The fossils which were discovered in the rock column were tested and found to be of very great age. Next, it was thought that the earth was cooling down from a hot sphere (at creation) and researchers tried to heat up a large metal sphere and time its cool-down, extending the calculations to the size of the globe which was well known by the mid-1700s. Other scientists decided that the salinity in the oceans increased over time assuming the earth was created with oceans of fresh water. This resulted in an even older age, but as time passed, the cooling and salinity theories became obsolete.

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Ottawa, Ontario, Canada

Proceeding through the book, the direction of research always returned to the sediment and the rock column which generated conflicting answers but also continued to extend the age of the earth. By the mid-1800s, famous scientists such as Lord Kelvin and Charles Darwin became involved in the quest. During this period, rapid development of knowledge about the rock column, age of fossils and stratification of sediments extended the accepted age from 50 million to 1,500 million (1.5 billion) years. Even the theories of sphere cooling and the salinity of the oceans were revisited, but the fossil results caused both to again be dismissed. It was determined that the oceans were actually saltier millions of years ago and the earth was somehow generating its own internal heat, thus debunking the salinity and cooling-sphere theories.

Once good telescopes were available, the astronomers jumped into the fray with theories about age of the moon, planets, the sun and stars but, because they were examining areas beyond the earth, their first contributions were not taken seriously. Even their use of "light-years" of distance and the realization that the universe was expanding and that its size and extent were unknown, did not add measurably to the 1.5 billion years' age accepted in the early 1900s.

The book is an interesting story of the scientific developments during this chronological quest and, in the last two chapters, the answer is finally revealed. The currently-accepted age of the earth is about three times the age estimated around 1900. This result involved scientists who began to study radioactivity in rocks. Eventually the rate of decay from uranium to lead using its half-life gave the answer. Consistent answers were found by examining many meteorites which have been recovered from all parts of the world. It is now thought that the meteorites are not from outer space but are parts of our own solar system. Therefore the latest answer to the question of how old is the earth is also the same as the time when our solar system was formed.

At the end of the book, along with a normal index, is a very comprehensive chapter-by-chapter bibliography, essential for a work of this scope. The order and organization of the book is good and there is a lot to fascinate both historians and scientific-minded readers and anyone curious about the age of the planet.

Progress in Oceanography

Observing and Modelling Ocean Heat and Freshwater Budgets and Transports

Reported by Igor Yashayaev

A Special Issue of Progress in Oceanography (see citation below) has recently been published with Dr. Igor Yashayaev of Ocean Sciences Division (OSD) of the Bedford Institute of Oceanography as the Guest Editor. The issue has a collection of papers on observations and analyses of oceanic inventories of heat and freshwater which have recently provided convincing evidence of systematic global-scale changes. The papers are intended to provide an overview of recent advances in our knowledge of large-scale heat and freshwater changes, and of questions requiring further research. Several of the advances have contributed to the *Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (IPCC). Five of the articles were authored or co-authored by Canadian scientists, with a focus on the northwest North Atlantic.

The observational section of the issue is led by a comprehensive summation of Arctic and Subarctic freshwater flux and budget studies (*Dickson et al.*). This overview is followed by four papers on ocean currents and water masses. Spanning geographically from the Nordic Seas (*Jonsson*) to Antarctica (*Cunningham and Pavic*), these papers demonstrate unique instrumental records and discuss variability in regional ocean transports and water mass properties (*Yashayaev*; *Johnson and Gruber*). The two papers closing the observational section discuss sea surface salinity changes (*Reverdin et al.*; *Myers et al.*) in complementary spatial domains, using similar approaches in constructing time series of regional precipitation minus evaporation. The time periods covered in these four studies are very similar, allowing a link to be established between the oceanic changes and their potential sources.

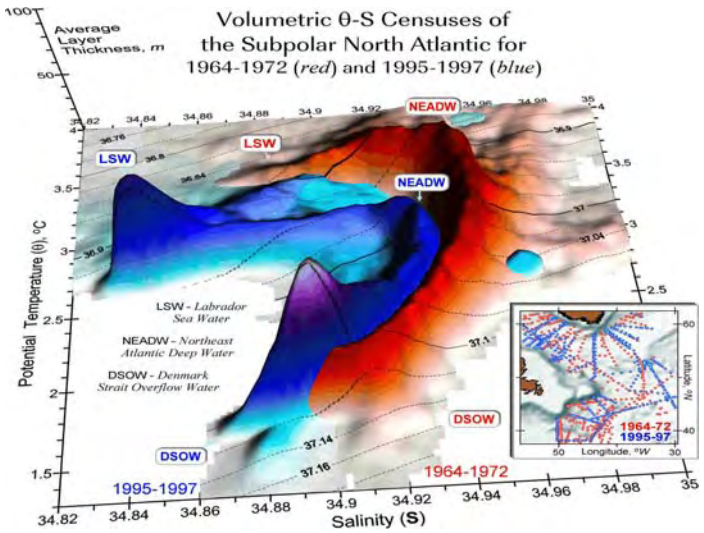

Figure from *Changing freshwater content: Insights from the subpolar North Atlantic and new oceanographic challenges* by *Igor Yashayaev*.

The modelling section of the special issue starts with results of experiments investigating how the global ocean conveyor is controlled by varying freshwater disparities or salinity differences between major ocean basins (*Haupt and Seidov*). Three other studies presented in this special issue analyze hydrographic changes in the North Atlantic simulated by coupled (*Wu et al.*; *Hu et al.*) and ocean (*Lu et al.*) models. All three models show freshening of the

subpolar basins through the 1980s and 1990s. *Hu et al.* build a detailed account of various sources, which contribute to the changing fresh water budget. Freshening of the deep ocean forced by different scenarios of the planetary climate change is explored by *Wu et al*. Finally, *Lu et al.* simulate the response of the deep Labrador Sea reservoir to realistic atmospheric forcing and explore the contribution of different factors to the varying production of Labrador Sea Water and subpolar ocean circulation.

Changes in the North Atlantic heat and freshwater storages and transports are central to the special issue. From the introductory article the intermediate and deep water masses of the subpolar region became notably fresher between the 1960s and 1990s accounting for the oceanic freshwater storage change that is equivalent to dumping (mixing) a ~3.9 m layer of freshwater into the water column of the 1960s (*Figure*). The leading role of the Labrador Sea Water (LSW, a product of deep convection in the Labrador Sea) in such a massive freshwater gain is also acknowledged in several other studies presented in the issue.

Volumetric potential temperature–salinity censuses of the subpolar North Atlantic for 1964–1972 (red) and 1995–1997 (blue). The values represent thickness of 0.1°C×0.01 (temperature×salinity) layers in metres. The insert map shows the locations of the hydrographic profiles in the 1960s' and 1990s' compilations. Labrador Sea Water (LSW), Northeast Atlantic Deep Water (NEADW) and Denmark Strait Overflow (DSOW) experienced large changes in their temperature, salinity and associated heat and freshwater storages between these two periods. The sources, signatures and effects of these and some other ocean changes are discussed in the special issue.

Citation: 2007. Observing and modelling ocean heat and freshwater budgets and transports. *Progress in Oceanography 73* (3-4): 203-426.

Source: Canadian Ocean Science Newsletter, No.36, May 2008. Reproduced here with the authorization of the Editor.

Si vous êtes intéressés à faire la critique d'un des livres listés en page 33 pour le *CMOS Bulletin SCMO*, prière de contacter le rédacteur-en-chef à l'adresse électronique mentionnée ci-bas. Bien entendu, le livre vous appartient lorsque vous avez terminé la critique. Les instructions qui doivent être suivies lors de la critique d'un livre dans le *CMOS Bulletin SCMO* vous parviendront avec le livre. Merci pour votre collaboration.

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The Long Emergency – Surviving the Converging Catastrophes of the 21st Century

by James Howard Kunstler

Atlantic Monthly Press, 2005
ISBN-0-87113-888-1 Hard Cover
pp. 307 text, seven chapters, $35.00 Cdn

Book reviewed by Bob Jones[4]

Some readers of the *CMOS Bulletin SCMO*, who attended the 2008 Kelowna Congress, heard the excellent plenary presentation by David Hughes on sustainability of non-renewable resources, peak oil and declining natural gas supplies. While discussing the current equity market decline with CMOS member (Vancouver Centre) Peter Scholefield, he recommended I read this title because the author predicted the 2008 financial meltdown – in 2005! This was a challenge not to be resisted. The reviewed copy came from the Ottawa Library and was not sent to the CMOS Bulletin Editor. Further, it should be noted that there is close linkage between the conclusions of Hughes and Kunstler, but Kunstler goes further by predicting what life will be like as fossil fuels become scarce. The *Long Emergency* is organized in seven easy-to-read chapters, and yes, in Chapter Six, *Running on Fumes: The Hallucinated Economy*, Kunstler predicts the current global financial crisis in detail, right down to the failure of Fanny Mae and Freddie Mac.

The other chapters, however, were for me the most compelling reading, fiction or non-fiction, in several decades. Readers will encounter no complex graphics or equations, but some new and disturbing terminology is presented. "Peak Oil" is the point where half of the earth's oil has been recovered. This was also well covered by Hughes. Globally, we may be there now; the USA passed Peak in 1970, and Canadian natural gas and oil are well past Peak. Much of the tar sands may not be recoverable because of lack of natural gas to drive the sands infrastructures. Natural gas is a special case because wells suddenly stop producing when depleted; there is no gradual draw-down like oil wells. This is especially critical for Canada, because we are shipping two-thirds of all our gas to the USA and we are past Peak. When gas supplies are interrupted (e.g., by Russia to the Ukraine), dangerous consequences of fires and explosions because of open pilot lights are likely when gas pressure is resumed. Kunstler makes another important point about the last half of the recoverable fuels - we won't be able to get it all and what we do get will be harder to recover. "ERoEI" is an acronym for Energy Returned over Energy Invested. Its value needs to be more than one for any energy recovery process to make sense. The ethanol disaster is a recent example of a

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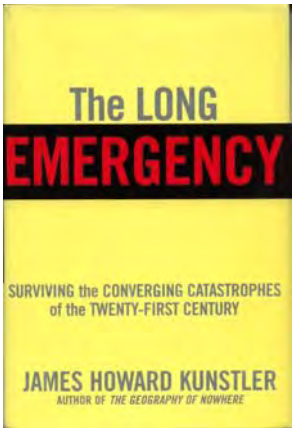
very low ERoEI and our vaunted tar sands are very close to one because of the huge amount of depleting natural gas and other energy needed to process the oil shale. Conversely, easy-to-recover Texas crude oil in the 20th century had an ERoEI of 20 and early Arabian crude was even higher. Now, however, the Saudis are destroying some very large oil fields by pumping in immense amounts of seawater to recover oil that is mixed with water. "McHouse" and McMansion" describe our typical suburban sprawl and lifestyle. "Entropy" and high entropy comes from the second law of thermodynamics which says that all energy sources move only in one direction - to spread, diminish and reduce eventually to zero. North American cities with suburbs and high-rise buildings are high entropy projects. "Carrying Capacity" of the globe, countries, continents and regions relates to population growth, but with the understanding that the huge increases of the 20th century are related directly to the fossil fuel age. Without fossil fuels, Kunstler holds that the earth's carrying capacity would only be one sixth of what it is now. The so-called "green revolution" yields of surplus crops has only been possible because of fertilizers created with fossil fuels.



The space kindly given to me by the Bulletin Editor will limit this review on a chapter-by-chapter basis. Rather, I will use the remainder to touch on Kunstler's high points and mention a few deficiencies. Early on, Kunstler sets the stage for the upheaval and adjustments the world will have to make in the short period (just a few decades) while the remaining oil and gas is recovered and used. Globalism will end, suburbia will be destroyed and subsistence farming will return for those who survive. The carrying capacity of the world will shrink. Climate change - which Kunstler accepts as under way - will make the transition harder. A large section of the book examines possible replacement energy sources (for oil and gas) - in every case, there is nothing so far discovered which could replace our current huge consumption. Nuclear and coal sources can help in many ways, but the scary thing about these two best alternatives is that they need an underlying fossil fuel base to manufacture and maintain their infrastructures. Other proposed replacements such as solar, hydrogen, wind, hydro, etc. also require the fossil fuel base to build and maintain. Even hydro electric dams can't last once oil is depleted because they need to be dredged frequently to prevent river silt buildup from clogging the turbines.

Perhaps the most frightening conclusion Kunstler makes is that the North American way of life will end and the transition here will be more disruptive than in other parts of the world. Indeed the carrying capacity of the southwest USA (read Los Angeles) because of its desert location is so bloated that once fuel supplies decline, this area – and nearby Mexico – will suffer severe stress as populations try to relocate. He identifies two uniquely North American decisions made after WW II, which technologically locked us in to gulp down huge amounts of oil in the future: 1) to build suburbia - worse in the USA than Canada because of their decline of inner city cores; and 2) to build the interstate highway system. The only USA politician to understand the coming Long Emergency was Jimmy Carter. Other politicians seem unable to grasp or prepare for the crisis because their windows of view are just a few years, usually from election to election. At current rates of consumption, Kunstler calculates we have only about 35 years of relatively easily-recoverable oil remaining, less for natural gas. Therefore, our children and grandchildren will experience the Long Emergency. The current recession may be a signal of the beginning of the Long Emergency. Kunstler suggests the length of time the Long Emergency will take is open-ended. He hints that before the end of this century, the "worst" may be over, but the interim will be a very bad time for everyone and fatal for many. He suggests that, during the Long Emergency, the world's nations will divide into "overdeveloped" and "never-developed". Population decline will be accelerated by AIDS, some old and vector-borne diseases (while there is still air travel), and a long-overdue flu pandemic. Wars over the remaining fossil fuel resources are expected because most are in the hands of the current "enemies" of the West, radical Islamic nations.

After the Long Emergency, living will be very different and more local than today. Kunstler suggests: the Amish example of subsistence farming is a good model; keeping of chickens and increased use of horses; the end of big box stores; 12,000-mile supply lines of products made in China will be cut; buildings will be two to five floors, skyscrapers will be abandoned; there will be no air conditioning, no insect repellant; and we will return to steam-driven rail or trolleys. The aircraft industry will die. Churches and religious practices will survive and will probably be strengthened. Education will need to change vastly with children being taught survival and help skills mainly dedicated to family support and food production.

A few things could have been added or improved in the book. There is no index. Any time I spend as much time with a book as this one, an index is very helpful. There was no mention of the role, if any, and if significant, of the US Strategic Petroleum Reserve. Similarly, rationing, while mentioned, was not given much space; suffice to say, in the Long Emergency, there will be severe fuel rationing. Very deep undersea drilling for alternative sources was omitted - Kunstler stated that the world has been almost completely explored for oil and gas. What about the bottom of the Red Sea, Persian Gulf and other nearby (to Arabia) sea shelves? Recovery of deep thermal energy for heating was not mentioned. It might be possible if we use some of the remaining oil to drill far enough down. These were minor limitations to what I saw as a well reasoned and sensible prediction of a frightening world to come.

In conclusion, people who worry about global warming, human-made climate changes, and other stuff raised by Al Gore, may be far better served by reading the *Long Emergency* than viewing *An Inconvenient Truth*. The Long Emergency will trump Climate Change. Climate Change will just be a part of it. Both truths are certainly very inconvenient to our present way of life, but Kunstler puts his finger on coming changes in a much more believable way. Actually, David Hughes reached the same conclusion in Kelowna, that is, the accelerating shortage of fossil fuels, which is just around the corner, will more than take care of the greenhouse gas reductions being discussed now. Whatever human-caused climate change will happen, and it will be as a result of our having burned all the recoverable fuel.

About the Author

James Kunstler graduated from the State University of New York (major in Theatre), Brockport campus, worked as a reporter and feature writer for a number of newspapers, and finally as a staff writer for Rolling Stone Magazine. In 1975, he started writing books on a full-time basis. He has lectured at Harvard, Yale, Columbia, Dartmouth, Cornell, Massachusetts Institute of Technology, Rensselaer Polytechnic Institute, University of Virginia and many other colleges. He has appeared before many professional organizations such as the American Institute of Architects, the American Planning Association, and the National Trust for Historic Preservation. Kunstler's web site www.kunstler.com lists his 13 books to date. The *Long Emergency* is number 12.

Books in search of a Reviewer
Livres en quête d'un critique

Lagrangian Analysis and Prediction of Coastal and Ocean Dymanics, Edited by Annalisa Griffa, A.D. Kirman, Jr,, Arthur J. Mariano, Tamay Özgökmen, and Thomas Rossby, Cambridge University Press, ISBN 978-0-521-87018-4, 2007, Hardback, US$160.

An Introduction to Atmospheric Thermodynamics, by Anastasios A., Tsonis, Cambridge University Press, ISBN 978-0-521-69628-9, 2007, pp.187, US$55.

Ebb and Flow: Tides and Life on our Once and Future Planet, by Tom Koppel, The Dundurn Group, Toronto, Canada, ISBN 978-1-55002-726-6, Paperback, pp.292, CDN$26.99.

The Dynamics of Coastal Models, by Clifford J. Hearn, Cambridge University Press, ISBN 978-0-521-80740-1, 2008, pp.488, Hardback, US$100.

Basics of the Solar Wind, by Nicole Meyer-Vernet, Cambridge University Press, ISBN 978-0-521-81420-1, 2008, pp.463, Hardback, US$132.

Mesoscale Dynamics, by Yuh-Lang Lin, Cambridge University Press, ISBN 978-0-521-80875-0, 2008, pp.630, Hardback, US$165. 2 copies available.

Chemical Oceanography and the Marine Carbon Cycle, by Steven Emerson and John I. Hedges, Cambridge University Press, ISBN 978-0-521-83313-4, 2008, pp.366, Paperback, US$90. 2 copies available.

An Introduction to Ocean Turbulence, by S. A. Thorpe, Cambridge University Press, ISBN 978-0-521-67680-9, 2007, pp.240, Paperback, US$60.

The Asian Monsoon, Causes, History and Effects, by Peter D. Clift and R. Alan Plumb, Cambridge University Press, ISBN 978-0-521-84799-5, pp.270, Hardback, US$150. 2 copies available.

Large-Scale Disasters, Prediction, Control and Mitigation, Edited by Mohamed Gad-el-Hak, Cambridge University Press, ISBN 978-0-521-87293-5, pp.576, Hardback, US$200. 2 copies available.

Mountain Weather and Climate, by Roger G. Barry, Cambridge University Press, ISBN 978-0-521-68158-2, pp.576, Paperback, US$80.

Aquatic Ecosystems: Trends and Global Perspective, Edited by Nicholas V.C. Polunin, Cambridge University Press, ISBN 978-0-521-83327-1, pp. 482, Hardback, US$160.

Physics of the Earth, by Frank D. Stacey and Paul M. Davis, Cambridge University Press, ISBN 978-0-521-87362-8, 4th Edition, pp. 532, Hardback, US$80.

Quantitative Modeling of Earth Surface Processes, by Jon D. Pelletier, Cambridge University Press, ISBN 978-0-521-85597-6, pp. 295, Hardback, US$80.

Drinking Water Quality: Problems and Solutions, by N.F. Gray, Cambridge University Press, ISBN 978-0-521-70253-9, 2nd Edition, pp. 520, Paperback, US$70.

Ecological Climatology: Concepts and Applications, by Gordon B. Bonan, Cambridge University Press, ISBN 978-0-521-69319-6, 2nd Edition, pp. 550, Paperback, US$80.

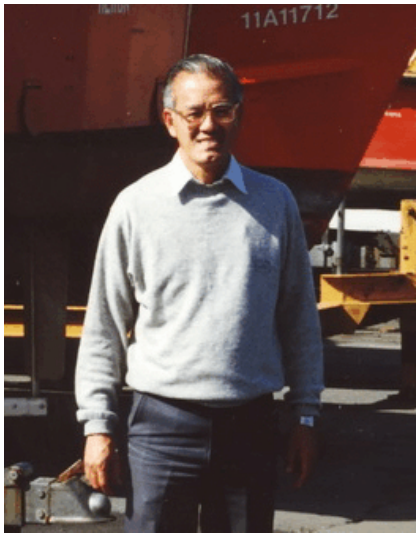
Beach and Dune Restoration, by Karl F. Nordstrom, Cambridge University Press, ISBN 978-0-521-85346-0, pp. 187, Hardback, US$140.

Facing Climate Change Together, Edited by Catherine Gautier and Jean-Louis Fellous, Cambridge University Press, ISBN 978-0-521-89682-5, pp. 257, Hardback, US$80.

Applied Geophysics in Periglacial Environments, Edited by C. Hauck and C. Kneisel, Cambridge University Press, ISBN 978-0-521-88966-7, pp. 240, Hardback, US$140.

Kim-Tai Tee

Kim-Tai Tee, research scientist at BIO's Ocean Circulation Division/Section from 1975 to 1997, passed away peacefully on Saturday November 29, 2008, in Abbey J. Lane Memorial Building, QEII, Halifax, at the age of 62. Kim Tai was born in Malaysia. In 1969 he moved to Halifax. In 1975 he received a Ph.D. degree in physical oceanography and joined the Bedford Institute of Oceanography.



Dr. Kim-Tai Tee; photo courtesy of Kim-Tai's family.

Kim-Tai began his graduate career at Dalhousie in low temperature solid state physics but, after completing his M. Sc., switched to physical oceanography. He completed his Ph. D. in less than 4 years, unravelling the tidal residual circulation in the Bay of Fundy. The physics of tidally-induced flows became the dominant recurring theme of his science career. Kim Tai was recognized as one of the world authorities on that topic. At Dalhousie, he played intercollegiate badminton, finishing second in the Maritimes university tournament. He was stronger in badminton than in hockey, though he enjoyed the Oceanography weekly fun game.

Kim-Tai's early work at BIO focused on the dynamics and circulation of the Labrador Sea; he used the Princeton model developed by Kirk Bryan, the state-of-the-art at the time. He was the first Canadian oceanographer to study the open ocean with a realistic 3-dimensional ocean circulation model. However, the demand for computing power for his model was huge which BIO could not meet. As a result, he turned his attention back to coastal problems.

His regional modelling focus expanded from the Bay of Fundy to the entire Gulf of Maine region, with particular emphasis on Georges Bank and the shallow, well-mixed waters off southwest Nova Scotia, and to the St. Lawrence Estuary. A series of papers on tidally-induced residual currents and upwelling in these regions were published which had a major impact on shelf modelling. He also extended his disciplinary focus to include the modelling of sediment transport processes in the upper Bay of Fundy, a problem of distinct interest to this day. In recognition of his insightful and innovative work in shelf modelling, a ubiquitous feature of coastal circulation was named the "Tee Current" after Kim-Tai.

Kim-Tai is survived by his wife, Jenru, and his two sons, James and Frank.

Reported by Charles Tang, Brian Petrie, Peter Smith and Charlie Quon.

Source: Canadian Ocean Science Newsletter, No.40, December 2008. Reproduced here with the written authorization of the authors and the Editor.

SHORT NEWS / NOUVELLES BRÈVES

2008 Atlantic Hurricane Season

During the current Atlantic hurricane season, 16 cyclones have formed, of which eight were hurricanes, making it the busiest since the record-breaking season of 2005, which produced 28 cyclones.

The season began more actively than normal with four storms before August and the earliest known date for three storms to be active on the same day (Hurricane *Bertha*, and tropical storms *Cristobal* and *Dolly* were all active on 20 July). It was one of only nine seasons on record to have a major hurricane before August and the only season in recorded history to feature a major hurricane (Category 3 or higher) in every month from July to November.

Haiti was hit by four hurricanes (*Fay*, *Gustav*, *Hanna* and *Ike*) and Cuba by three (*Gustav*, *Ike* and *Paloma*). *Ike* was the most destructive of the season and *Hanna* the deadliest (537 deaths). *Bertha* was the longest-lived July Atlantic tropical cyclone on record.

The Atlantic hurricane season lasts officially from 1 June to 30 November. The average hurricane season produces about 10 storms, of which six become hurricanes.

Source: WMO Website visited December 13, 2008.

Sargassum Patch Detected with MERIS in the Northern Atlantic Ocean

by Martin L. Taillefer (DFO), Guy Aube (CSA) and Jim Gower (DFO)

With over $20 billion in annual economic activity, Canada's oceans and their resources are significant contributors to the overall Canadian economy. Developing the full potential of Canadian fisheries as an economic driver for our coastal

and rural communities is among Government of Canada's priorities.

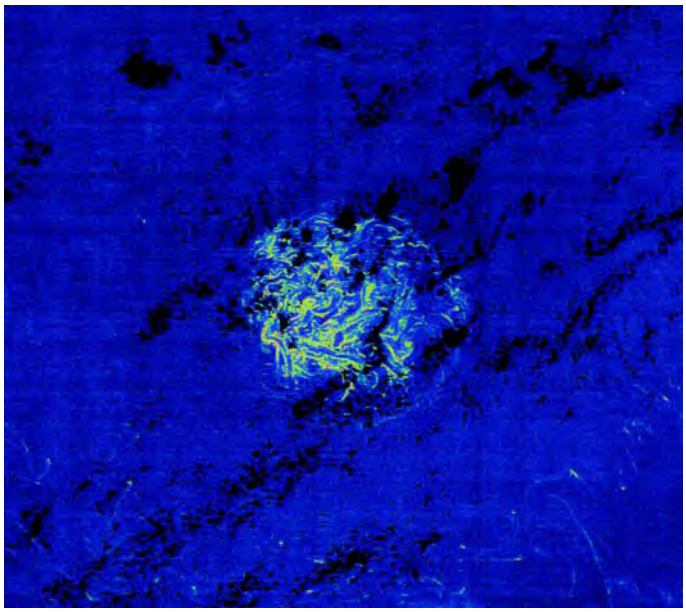
Through the Canadian Space Agency (CSA) Government Related Initiatives Program (GRIP), the Department of Fisheries and Oceans (DFO) is developing new tools and methodologies based on Earth observation (EO) data to better understand ocean ecosystems, climate changes and renew the economic viability of our fisheries. Much of the Medium Resolution Imaging Spectrometer (MERIS) analysis and validation efforts for the Full Resolution mode in Canada has been spearheaded by Dr. Jim Gower from DFO's Institute of Ocean ScienceS, in Sidney, British Columbia.

This image (below) was aquired by the MERIS instrument on September 4, 2008, working in Full Resolution mode to provide a spatial resolution of 300 metres. It highlights the patch of Sargassum detected with MERIS on the North Atlantic Ocean (35°45'N and 66°21'W). Sargassum is floating marine vegetation that absorbs carbon dioxide (CO_2) – the most important greenhouse gas that contributes to global warming – through photosynthesis and converts it into organic carbon. This process is known as primary productivity. The patch is near 45 km across.

The primary mission of MERIS is the measurement of sea colour in the oceans and in coastal areas. But MERIS imagery can also be applied to a wide range of applications: ocean productivity, water quality, chlorophyll mapping, phytoplankton monitoring, harmful algal blooms detection, suspended sedimentation, etc. The ability to monitor Sargassum allows DFO researchers and the Government of Canada to better understand the primary productivity of the ocean, predict climate changes and develop the full potential of Canadian fisheries. To better understand primary productivity, it is necessary to monitor the amount of chlorophyll in marine vegetation. The MERIS instrument is able to detect chlorophyll, the green photosynthetic compound in plants that captures energy from sunlight necessary for photosynthesis.

About MERIS

Canada is a cooperating member of European Space Agency (ESA) and contributed to the development of ENVISAT. In response to an expression of interest articulated by Canadian Government users, such as DFO, the CSA has invested in the upgrade of the Canadian ground infrastructure at the Canada Centre for Remote Sensing (CCRS) for the reception and processing of ENVISAT MERIS Full Resolution. As a result, MERIS Full Resolution data acquired over North America are now available on Internet for the Canadian Government users. This initiative, established in collaboration with the European Space Agency and the support of the CCRS, will provide access to all recent MERIS Full Resolution (FR) Level 1 products (MER_FRS_1P) and Level 2 products (MER_FRS_2P) covering North America (visibility mask of the Gatineau and Prince Albert stations). Canada is a cooperating member of ESA and contributed to the development of ENVISAT.



Sargassum Patch detected with MERIS Instrument on September 4, 2008 in the North Atlantic Ocean. Image credit: DFO, 2008

This sargassum patch discovery is the results of the DFO EO team and CSA GRIP program team joint efforts. The CSA GRIP program focuses on developing Canadian government use of space-based land, ocean, and atmospheric observation systems and services. It supports the development and demonstration of new applications that increase the benefits and effectiveness of Government of Canada services for Canadians through use of EO information sources and raises awareness within the Government of the uses and benefits of Canadian supported EO missions.

Source: Canadian Ocean Science Newsletter, No.40, December 2008. Reproduced here with the written authorization of the authors and the editor.

Trent University Graduate Students Bring Home Award-Winning Scientific Posters from Arctic Change 2008 Conference

Thursday, December 18, 2008, Peterborough. Trent University graduate students **Kaitlin Breton-Honeyman** and **Jennie Knopp** returned home last week award-winning researchers following their scientific poster presentations at Arctic Change 2008 in Québec City, the largest international Arctic research conference ever held in Canadian history.

"*It meant a lot to me to win this award because injuries resulting from climate change in the Western Arctic are a crucial issue that haven't received a lot of attention yet*," said Kaitlin Breton-Honeyman, who won second place in the health sciences category for her poster entitled **Climate**

Change, Public Health and Safety in the Arctic. "*For Inuit, health and safety on the land is of particular concern as many communities report increasingly frequent uncharacteristic weather and sea-ice conditions putting hunters and others at greater risk than ever before*."

Her classmate Jennie Knopp placed third in the social sciences category for her poster **Bridging the Gap: Linking Scientific and Traditional Knowledge with Community-Based Monitoring** which was part of the International Polar Year Char Climate Variability and Change project. Ms. Knopp and Ms. Breton-Honeyman were two of only twelve award winners out of a field of 320 posters.

Supervising both students through the Environmental and Life Sciences Graduate Studies Program is Trent's Dr. Chris Furgal, a professor of Indigenous and Environmental Studies and member of the conference's international organizing committee. "I was extremely pleased and proud to learn of the recognition given to both Kaitlin and Jennie's poster presentations at the Arctic Change conference. To be awarded for outstanding work among the large number of students in attendance is a great achievement," he said.

Kaitlin Breton-Honeyman and Jennie Knopp

Coinciding with the pinnacle of the **International Polar Year**, Arctic Change 2008 gathered researchers, students, policy-makers and stakeholders from all fields of Arctic research and all countries to address the global challenges and opportunities brought by climate change in the circum-Arctic. With over 900 participants, Arctic Change 2008 was the largest trans-sectoral international Arctic research conference ever held in Canada. The conference ran from December 9 to12, 2008.

"Nous redonnerons à la science la place qu'elle mérite".

Barak Obama, Président des États-Unis.
Discours d'investiture, 20 janvier 2009.
D'après le réseau RDI de Radio-Canada

Governor General Announces New Appointments to the Order of Canada

December 30, 2008, OTTAWA — Her Excellency the Right Honourable Michaëlle Jean, Governor General of Canada, announced today 60 new appointments to the Order of Canada. The new appointees include 4 Companions (C.C.), 14 Officers (O.C.), and 42 Members (C.M.). These appointments were made on the recommendation of the Advisory Council on the Order of Canada.

Dr. Gordon A. McBean

* Gordon A. **McBean**, C.M.
* London, Ontario
* Member of the Order of Canada

For his contributions to the advancement of climate and atmospheric sciences in Canada, and for his leadership in national and international scientific organizations, helping to generate and disseminate research findings to policymakers and stakeholders.

Thanks to all of those with whom I have worked with over the years. This is recognition of our work.

Professor Gordon McBean, C.M., Ph.D., FRSC
Departments of Geography and Political Science
The University of Western Ontario, London, ON, Canada

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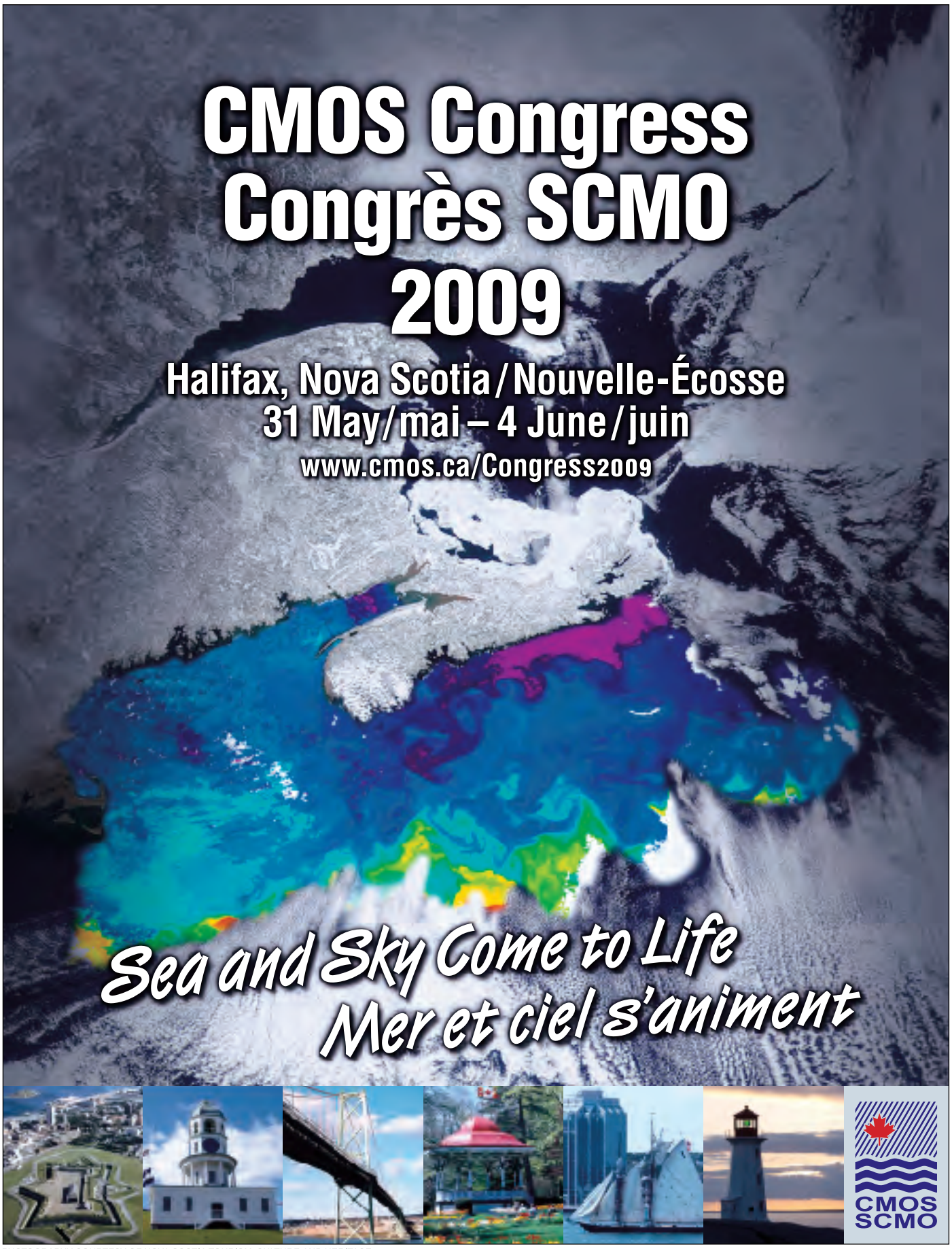

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OUR PEOPLE, YOUR DATA

notre personnel, vos données

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