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CMOS

BULLETIN

SCMO

Canadian Meteorological and Oceanographic Society

La Société canadienne de météorologie et d'océanographie

June / juin 2014

Vol.42 No.3

Wetland Swirls over Alberta

Tourbillons au-dessus de terres humides albertaines

ASL Environmental Sciences

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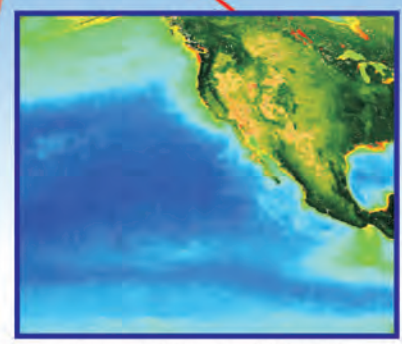
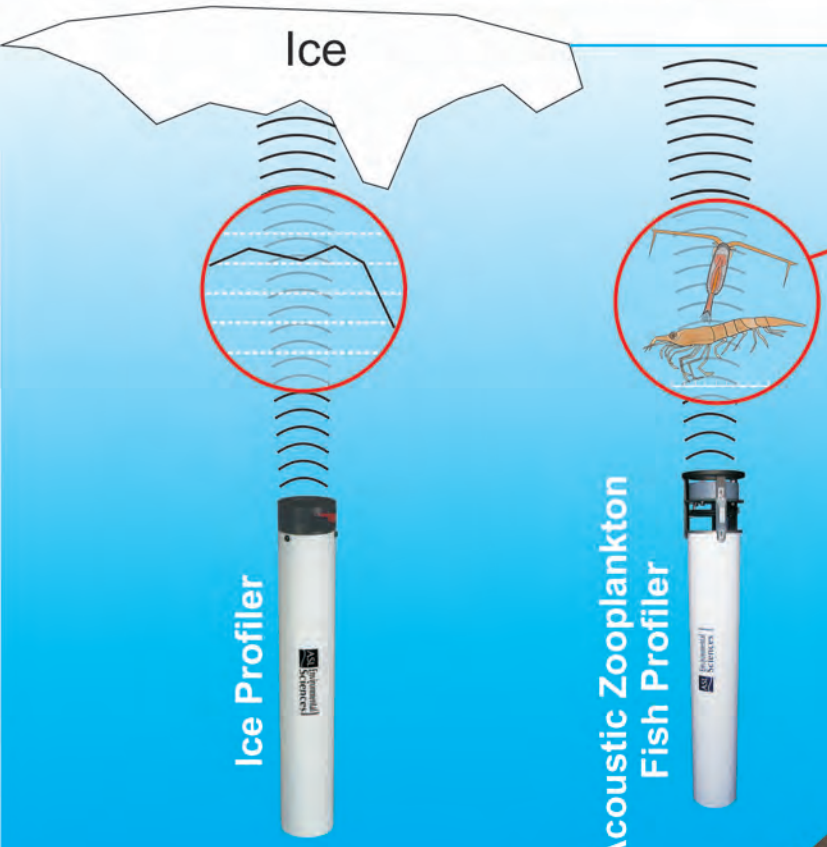
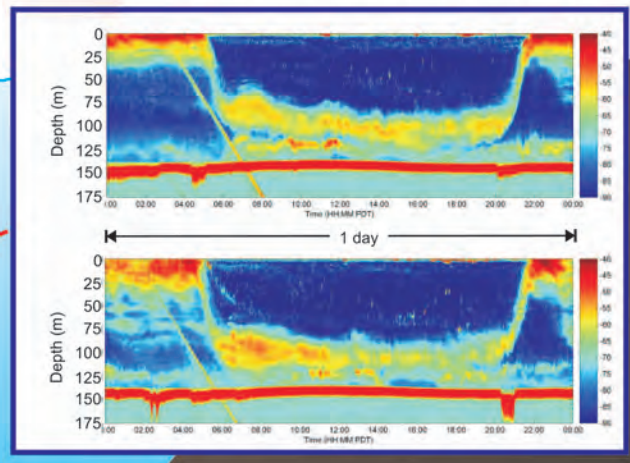
Spécialistes océanographiques



Ocean colours are chlorophyll concentrations and land colours are NDVI





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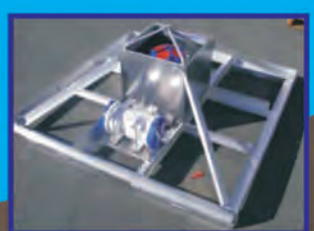

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.... Allocution du président sortant

Chers amis et collègues,

[English version follows on page 75]

Pierre Gauthier
Président sortant de la SCMO
CMOS Outgoing President

Mon terme comme président tire à sa fin. Une année peut sembler longue parfois mais très courte si vous voulez accomplir quelque chose. Néanmoins, en revenant sur ce qui s'est passé cette année, plusieurs choses ont été accomplies ou bien initiées. Le premier point sur notre agenda fut de trouver un nouveau directeur exécutif étant donné que Ian Rutherford avait manifesté son intention de se retirer après avoir servi pendant plusieurs années. Nous avons reçu quelques candidatures de personnes qui ont exprimé leur intérêt à s'impliquer dans la SCMO et ont présenté des idées intéressantes sur ce que la SCMO pourrait faire. Nous avons choisi Andrew Bell qui apporte sa touche toute personnelle à notre société. Ce qui est vrai pour Ian l'est également pour Richard Asselin qui a été directeur des publications et a servi la SCMO de plusieurs autres façons durant de nombreuses années également. Avant de quitter, il s'est assuré de convaincre Douw Steyn de prendre la barre comme directeur des publications. Encore une fois, on ne le remerciera jamais assez pour son dévouement envers la SCMO. Ceux qui ont été impliqués dans l'organisation du programme scientifique d'un congrès savent à quel point Richard travaillait fort pour que tout aille bien.

Lorsque je suis devenu président, j'avais quelques changements en tête qui devraient être apportés pour améliorer les services aux membres et la visibilité de la SCMO. L'un de ces changements visait à répondre à des commentaires que j'entends depuis longtemps concernant notre site Web. Un an plus tard, nous nous apprêtons à faire l'ouverture officielle d'un tout nouveau site Web. Je ne peux prendre le crédit pour ceci qui faisait partie d'un effort plus large pour remplacer le logiciel permettant de gérer la base de données de la SCMO qui contient une foule d'informations concernant les membres, les congrès, les publications et les archives.

[Suite à la page 75]

CMOS Bulletin SCMO
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Inside / En Bref

Articles

Climate Change / Changement climatique

Our regular sections / Nos chroniques régulières

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CMOS Bulletin SCMO
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Cover page: The photo shown on the cover page was taken on the way to Edmonton from Calgary, very early in the morning in September 2011. It illustrates mammatus clouds which, according to Bob Jones, CMOS Photo Contest organizer, are pouch-like cloud structures and a rare example of clouds in sinking air. Sometimes very ominous in appearance, mammatus clouds are harmless and do not mean that a tornado is about to form; a commonly held misconception. In fact, mammatus are usually seen after the worst of a thunderstorm has passed. Photo credit: Ms. Mar Martínez de Saavedra Álvarez, ASL Environmental Sciences Inc., Victoria, BC.

Page couverture: Photo prise très tôt le matin, en route vers Edmonton depuis Calgary, en septembre 2011. Elle montre une formation nuageuse appelée mammatus. Selon Bob Jones, l'organisateur du concours de photo de la SCMO, ces nuages en forme de poche illustrent un exemple peu commun de nuages présents dans un courant subsident. Parfois d'apparence très menaçante, les mammatus ne présentent aucun danger et n'annoncent pas la formation imminente d'une tornade, une idée fausse couramment répandue. En fait, les mammatus s'observent généralement quand le pire de l'orage est passé. Photo : Mme Mar Martínez de Saavedra Álvarez, ASL Environmental Sciences Inc., Victoria (C.-B.).

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Canadian Meteorological and Oceanographic Society (CMOS)
Société canadienne de météorologie et d'océanographie (SCMO)

Council / Conseil d'administration

.... Allocution du président sortant [Suite de la page 73]

Le site Web a été inclus dans le contrat qui a été accordé pour ce remplacement. Les gens au bureau de la SCMO ont travaillé avec énergie pour rendre ceci possible. C'est une première étape pour permettre d'autres changements à venir.

La raison pour laquelle on fait tout çà, est pour que la SCMO soit en mesure d'améliorer les services aux membres et, on l'espère, attirer de nouveaux membres. Cependant, ceci ne peut aller que dans un sens et vous les membres pouvez aider également. Par exemple, je vous encourage à soumettre vos publications à notre revue *Atmosphere-Ocean*. C'est l'endroit tout indiqué où, je crois, on devrait retrouver des publications importantes concernant les réseaux nationaux de recherche financés par des subventions canadiennes. Je ne dis pas que tous nos articles devraient y être publiés car nous voulons se donner une visibilité internationale. Nous avons toutefois quelques inquiétudes concernant la baisse du nombre de manuscrits qui y sont soumis malgré qu'*Atmosphere-Ocean* ait déjà un facteur d'impact respectable. L'exécutif n'y peut rien mais vous pouvez changer ceci. Une recherche de haut niveau se fait au Canada et nous aimerions qu'*Atmosphere-Ocean* puisse en témoigner.

On devrait également utiliser le bulletin de la SCMO pour informer nos collègues d'évènements et réalisations au Canada en sciences atmosphériques, océaniques et climatiques. D'ailleurs, rappelez-vous que le *CMOS Bulletin SCMO* est lu par un public plus large. Il y a quelques semaines un journaliste m'a contacté concernant le contenu de l'une de mes colonnes. J'ai été un peu surpris mais ceci m'a fait réaliser que le Bulletin est perçu comme une revue contenant de l'information fiable et pertinente. Je vous invite à en faire usage.

Finalement, je souhaite la bienvenue à notre nouveau président, Harinder Ahluwalia. Au cours de la dernière année, il s'est investi pour augmenter l'intérêt envers la SCMO et attirer de nouveaux membres. J'ai eu le plaisir de travailler avec lui cette année et nous partageons une vue commune concernant ce que pourrait être et sera, on l'espère, l'avenir de la SCMO. Je m'arrête donc ici et je lui laisse le soin de continuer cette colonne aujourd'hui et pour l'année qui vient.

Pierre Gauthier, Président sortant de la SCMO

Le but de la SCMO est de stimuler l'intérêt pour la météorologie et l'océanographie au Canada.

[La version française précède en page 73]

.... Words from the Outgoing President

Friends and colleagues:

My term as president is coming to an end. One year seems long at times but short when you want to get something done. Nevertheless, going back over what happened this year, several things were either completed or initiated. First thing on our agenda was to find a new executive director as Ian Rutherford wanted to step down after having served CMOS for so many years. We received applications from a few persons who expressed interest in being involved in CMOS and proposed interesting ideas of what CMOS could do. We selected Andrew Bell who brings his own approach to our society. What is true for Ian can also be said for Richard Asselin who was director of publications and served CMOS in many other ways over also many years. Before stepping down, he did manage to get Douw Steyn to take over his position as director of publications. Again we cannot thank him enough for his dedication to CMOS. Those who have been involved in organizing Congress scientific programs know how central Richard has been to make things go smoothly.

When I became president, I had a few changes in mind on what should be made to improve both the services to our members and its visibility. One of them was to echo comments I heard for a long time about our website. One year later we are now ready for the new website's official opening. I cannot take any credit for that which was part of a broader effort to change the software used to manage the CMOS database that contains a wealth of information about the members, congresses, publications, and the archives. The website was included in a contract that was awarded to do just that. People at CMOS office worked very hard to make all this possible. It was a necessary first step for future changes.

The reason we do this is for CMOS to improve the services to its members and hopefully, attract new members. However, this is not a one-way ticket and you the members can help also. For instance, I encourage you to submit more of your publications to our own *Atmosphere-Ocean* journal. I think this is where important publications on national networks research funded by Canadian grants should go. I am not saying that all of them should be published there as we do want to gain an international visibility. We have some concerns about the decline of papers submitted by Canadians to *Atmosphere-Ocean* despite the fact that it already has a respectable impact factor. We cannot do anything about this but you can. There is state-of-the-art research in our field in Canada and we would like *Atmosphere-Ocean* to showcase it.

We should also use the *CMOS Bulletin SCMO* to inform our colleagues about important events and achievements happening in Canada in atmospheric, oceanic, and climate sciences. Please note that the Bulletin is read by the general public. A few weeks ago a reporter contacted me about what I wrote in the bulletin. I was somewhat surprised but it made me realize that the bulletin is regarded as a publication with reliable and relevant information. Make use of it.

Finally, let me welcome our new president, Harinder Ahluwalia. During the last year, he worked very hard to increase interest towards CMOS and attract new members. I had the pleasure to work with him over the last year and we share a common view on what the future of CMOS could be and hopefully, will be. So I am stopping here and give him the pen to continue this column today and for all of next year.

Pierre Gauthier, Outgoing CMOS President

.... Words from the Incoming President

Friends and colleagues:

First of all I would like to congratulate Dr. Pierre Gauthier, our outgoing President, for a job well done during the last year. We worked very well together to lay the groundwork for a renewed CMOS. I look forward to similar cooperation from him as Past-President during my term as CMOS President.

Harinder Ahluwalia
CMOS Incoming President
Nouveau président de la SCMO

When I was asked by the Montreal Centre Chairman, Louis Lefaivre, to accept the nomination as CMOS Vice-President for the year 2013 to 2014, I was skeptical about what I could add to such a prestigious organization. Because Louis stated that this time they would like somebody known from industry to provide a different perspective, I accepted the nomination.

My involvement as CMOS Vice-President since June 2013 has shown me that CMOS is a very prestigious organization but does not appear to be growing; in fact it is losing membership. Its voice is also not as strong as it should be as the premier organization in meteorology and oceanography, two of the most important fields for Canada for its safety and development.

In order to keep up with the times and support met-ocean sciences as well as to make CMOS a unified voice for met-ocean, it needs to be strengthened considerably. It needs more members, more funds, and a strong membership benefits package.

A society such as CMOS can be sustained but not brought to a higher level just with volunteers. We need some permanent staff to implement ideas generated by its Executive. In order to achieve that, we need funds and hence more members and sponsors.

During my term as Vice-President we have started many initiatives to strengthen CMOS. These initiatives include convincing Environment Canada about certification and accreditation of meteorologists and technicians, recruiting meteorological information users, establishing a stronger relationship with the American Meteorological Society (AMS) and subsequently other international societies, enhancing membership benefits package, etc.

In addition, in order to raise the CMOS profile, we need to have a strong communication and media relations wing. We have prepared a document "*Discussion Paper on a Roadmap for the Future of CMOS*" which acted as basis for discussion at the Rimouski Congress session "**Future of CMOS**".

After defining our direction at the above-mentioned session and during the Annual General Meeting, my objective for the coming year would be to implement the initiatives we have started and agreed to in 2013-2014 for the promotion of CMOS and met-ocean sciences.

I believe that strength of science comes from its users; therefore, involvement of users is very important for collaboration and generation of ideas as well as financing. New government policy is to approve projects involving collaboration between industry, universities, and government scientists.

In my humble opinion, the future of CMOS depends upon how we rejuvenate it. This is not the task of any single individual, it needs the support of all professionals and well-wishers of the Society.

Let's work together and strengthen our venerable professional Society.

Harinder Ahluwalia, Incoming CMOS President

CMOS exists for the advancement of meteorology and oceanography in Canada.

ARTICLES

Evaluation of Davis Instruments Entry-Level Weather Station

by Sander Schimmelpenninck[1]

At less than $400, Davis Instruments Vantage VUE is a decent multifunction weather station for amateur meteorologists with an analytical bent.

VUE Indoor Console

Description

The system consists of a pole-mounted, solar-powered, wireless sensor package, an indoor display console, and a Windows- or Mac-based data storage and analysis software package. I bought it in late 2013 and studied it in the four months ending March 2014. In that month, Scientific Sales Inc. of Lawrenceville (NJ) quoted the system at US$364.90 plus US$75 shipping to Canada.

The sensor package (#6357) incorporates an arrow-vane windset, a tipping-bucket rain gauge, shielded temperature and humidity sensors, and a spread-spectrum 900-MHz data transmitter.

The indoor console (#6351M for Metric) contains an air-pressure sensor and shows received and derived data including indoor and outdoor temperature, their extremes, the dewpoint, winds, rainfall and rate, and some history. A 117-V converter powers it, but it also houses three C-cells for hydro outages.

The WeatherLink software package (#6519USB) plugs into a computer for data storage, analysis, and transmission to other parties—a separate feature I did not buy.

VUE Outdoor Sensor System

Evaluation setup

For my experiment, I compared VUE temperatures, relative humidities, dewpoints, wind directions and velocities, and sea-level pressures with those in the hourly sequences (METARs) from St. Catharines Airport (CYSN), 8.9 km and 39° from my house in the flat northeast corner of Niagara Peninsula between Lakes Erie and Ontario. I also spot-checked VUE temperatures with a zero-error sling Environment Canada psychrometer and a wireless La Crosse Technologies temperature sensor averaging 0.2°C above METAR values. That sensor was always in the shade from January through March.

Temperatures a bit high

I soon noticed that my VUE temperatures were too high, especially in sunlight and with snow on the ground, so I took 20 readings in each of the following three conditions: "Dark" = Thick overcast and/or overnight; "No Snow" = Bright or dim sun, no snow; and "SOG" = Bright or dim sun, snow on the ground. Table 1 on next page lists the following errors and their standard deviations expressed in °C.

[1] A serious amateur meteorologist since 1943, Sander Schimmelpenninck operated an Environment Canada climatological weather station for 16 years.

Condition	Error °C	Standard Deviation
Dark	0.2	0.8
No Snow	1.5	0.7
SOG	2.2	0.8

Table1: Temperature errors for three different conditions

It appears the VUE temperature sensor is very good, but the screen does not handle sunlight well, and reflection from a snow deck worsens the error.

Adopting a compromise, I calibrated the temperature readout down 0.8°C, hoping for a mean error of less than one degree most of the time-close enough for non-government work.

The allowable temperature error in the 2005 US NOAA Federal Meteorological Handbook (FMH) is ±0.6°C for temperatures between -50°C and +50°C.

Dewpoint errors were pretty small: 1.1°C with a standard deviation of 0.6°C in sunlight and 0.5°C with a standard deviation of 0.5°C in the dark. Here the FMH limits are ±1.7°C for dewpoints between -24°C and -1°C and ±1.1°C for dewpoints between -1°C and +30°C.

Other findings mostly good

Relative humidity reads 4% points too low in sunlight with a standard deviation of 5 in the sun and 1 with a standard deviation of 3 in the dark. I found no FMH standard, but 2 to 3 percentage points appear to be commonly accepted values for good hygrometers.

Wind directions originally averaged 8° too high, with a standard deviation of 18°, better than one-fourth of a cardinal, despite a tall cedar fence 5 metres west of the station and a two-story house 6 m to the south. It turned out my sensor unit was rotated 10 out of true north. Those are very good results. Wind speeds read far too low, due to my poor obstruction plane.

Surface-level pressure was the big surprise, with a mean error of 0.01 mbar and a standard deviation of 0.02 mbar. The FMH allows ±0.68 mbar.

I did not evaluate the tipping-bucket rain gauge except to notice that it responds even when only a trace of rain falls. The VUE does not record snowfall.

The WeatherLink's current-weather screen shows a one-line weather forecast for the next 24 hours, based mainly on pressure and wind-direction trends. Casual observation shows it does not do badly for a single-station forecast - but that is not saying much.

DAVIS VUE CUTLINES

Outdoor sensor unit

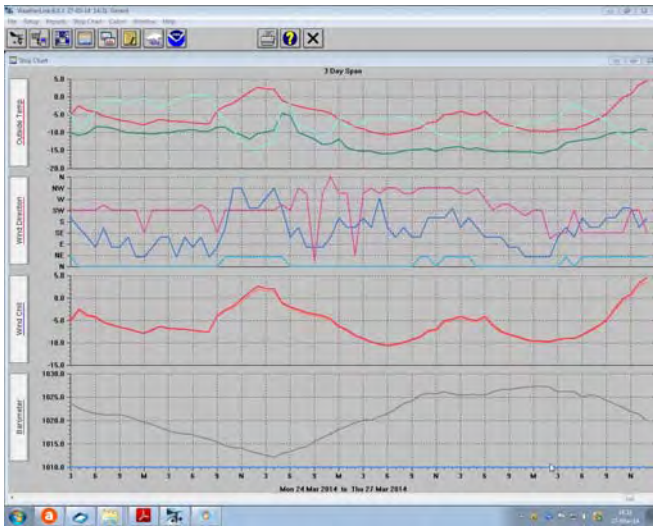
The outdoor multi-sensor unit sits about two metres above ground level on a pole and sends data to the indoor console via spread-spectrum radio. Its solar panel must point geographic south.

Indoor console

The 18-cm wide indoor console receives,logs, and displays data from the outdoor sensor unit. It connects to a house-current converter and also houses three backup C-cells.

Three-day trends

The WeatherLink software connects the console to a Windows or Mac computer and presents data in user-configurable graphs and tables. Together the graphs may signal a frontal passage.



Davis Instruments support technicians do not work on users' systems by remote control, a great diagnostic time-saver used by many sophisticated IT firms. This doubtless helps avoid lawsuits when PCs go up in smoke, but corporate lawyers have found language to prevent those. I hope Davis hires one who can.

Conclusion

As Davis Instruments entry-level weather station, Vantage VUE is worth the money. The company's full weather-station line tops out at well over $1,000.

WMO Annual Climate Statement Highlights Extreme Events

Geneva, 24 March 2014 – The year 2013 once again demonstrated the dramatic impact of droughts, heat waves, floods, and tropical cyclones on people and property in all parts of the planet, according to the World Meteorological Organization's (WMO) Annual Statement on the Status of the Climate. The report confirmed that 2013 tied with 2007 as the sixth warmest on record, continuing the long-term global warming trend. It provided a snapshot of regional and national temperatures and extreme events as well as details of ice cover, ocean warming, sea level rise, and greenhouse gas concentrations – all inter-related and consistent indicators of our changing climate.

Thirteen of the fourteen warmest years on record have all occurred in the 21st century, and each of the last three decades has been warmer than the previous one, culminating with 2001-2010 as the warmest decade on record. The average global land and ocean surface temperature in 2013 was 14.5°C (58.1°F) – 0.50°C (0.90°F) above the 1961–1990 average and 0.03°C (0.05°F) higher than the 2001–2010 decadal average. Temperatures in many parts of the southern hemisphere were especially warm, with Australia having its hottest year on record and Argentina its second hottest.

"*Naturally occurring phenomena such as volcanic eruptions or El Niño and La Niña events have always contributed to frame our climate, influenced temperatures or caused disasters like droughts and floods. But many of the extreme events of 2013 were consistent with what we would expect as a result of human-induced climate change. We saw heavier precipitation, more intense heat, and more damage from storm surges and coastal flooding as a result of sea level rise - as Typhoon Haiyan so tragically demonstrated in the Philippines*," said WMO Secretary-General, Michel Jarraud.

"*There is no standstill in global warming*," said Mr. Jarraud. "*The warming of our oceans has accelerated, and at lower depths. More than 90 percent of the excess energy trapped by greenhouse gases is stored in the oceans. Levels of these greenhouse gases are at record levels, meaning that our atmosphere and oceans will continue to warm for centuries to come. The laws of physics are non-negotiable*."

"*Weather forecasting, including of storms and other hazards, has become much more skillful in recent years. As demonstrated in October by Cyclone Phailin, the second strongest tropical cyclone to strike India since modern records began, improved forecasting, combined with government action to build national resilience and provide shelters, greatly reduces the loss of life. We must continue strengthening preparedness and early warning systems and implementing a multi-hazard approach to disaster risk reduction*," he said.

The Status of the Climate Report contains a peer-reviewed case study into Australia's record warmth in 2013. The study by scientists at the Australian Research Council"s (ARC) Centre of Excellence for Climate System Science, University of Melbourne, Australia, used nine state-of-the-art global climate models to investigate whether changes in the probability of extreme Australian summer temperatures were due to human influences.

"*Comparing climate model simulations with and without human factors shows that the record hot Australian summer of 2012/13 was about five times as likely as a result of human-induced influence on climate and that the record hot calendar year of 2013 would have been virtually impossible without human contributions of heat-trapping gases, illustrating that some extreme events are becoming much more likely due to climate change*," the study concluded.

WMO's statement, which is an internationally recognized authoritative source of information, highlights the key climate events of 2013:

- Typhoon *Haiyan* (*Yolanda*), one of the strongest storms to ever make landfall, devastated parts of the central Philippines.
- Surface air temperatures over land in the Southern Hemisphere were very warm, with widespread heat waves; Australia saw record warmth for the year, and Argentina its second warmest year and New Zealand its third warmest.
- Frigid polar air plummeted into parts of Europe and the southeast United States.
- Angola, Botswana, and Namibia were gripped by severe drought.
- Heavy monsoon rains led to severe floods on the India-Nepal border.
- Heavy rains and floods impacted northeast China and the eastern Russian Federation.
- Heavy rains and floods affected Sudan and Somalia.
- Major drought affected southern China.
- Northeastern Brazil experienced its worst drought in the past 50 years.
- The widest tornado ever observed struck El Reno, Oklahoma in the United States.
- Extreme precipitation led to severe floods in Europe's Alpine region and in Austria, Czech Republic, Germany, Poland, and Switzerland.

- Israel, Jordan, and Syria were struck by unprecedented snowfall.
- Greenhouse gas concentrations in the atmosphere reached record highs.
- The global oceans reached new record high sea levels.
- The Antarctic sea ice extent reached a record daily maximum.

The statement provides in-depth analysis of regional trends as part of a WMO drive to provide more information at regional and national levels to support adaptation to climate variability and change. It was published as part of activities marking World Meteorological Day 23 March.

The global temperature assessment is based on three independent datasets that are maintained by the Met Office Hadley Centre and the Climatic Research Unit of the University of East Anglia (HadCRU), both in the United Kingdom; the National Climatic Data Center of the National Oceanic and Atmospheric Administration (NCDC NOAA), based in the United States; and the Goddard Institute for Space Studies (GISS) operated by the National Aeronautics and Space Administration (NASA), also in the United States.

Reference: WMO Press Release No. 985; website visited on Monday, March 31, 2014.

Le compte rendu annuel de l'OMM sur l'état du climat met l'accent sur les phénomènes extrêmes

Genève, le 24 mars 2014 – L'année 2013 a illustré une fois de plus l'impact considérable des sécheresses, vagues de chaleur, inondations et cyclones tropicaux sur les personnes et les biens dans toutes les régions du monde, d'après le compte rendu annuel de l'Organisation météorologique mondiale (OMM) sur l'état du climat. Ce rapport confirme que 2013 se classe au sixième rang, ex aequo avec 2007, des années les plus chaudes jamais enregistrées, confirmant la tendance au réchauffement observée sur le long terme. Il donne un aperçu des températures régionales et nationales et des phénomènes extrêmes survenus pendant l'année et contient des précisions sur l'étendue de la banquise, la hausse du niveau de la mer et les concentrations de gaz à effet de serre, qui sont tous des indicateurs cohérents et interdépendants de l'évolution du climat.

Le XXI^{ème} siècle compte déjà treize des 14 années les plus chaudes jamais observées, et chacune des trois dernières décennies s'est révélée plus chaude que la précédente, la décennie 2001-2010 battant tous les records. La température moyenne à la surface du globe, terres émergées et océans confondus, était de 14,5°C (58,1 °F) en 2013, soit 0,50°C (0,90°F) de plus que la normale calculée pour la période 1961-1990 et 0,03°C (0,05°F) de plus que la moyenne de la décennie 2001-2010. Les températures ont été particulièrement chaudes dans maintes régions de l'hémisphère Sud, où l'Australie a connu l'année la plus chaude de son histoire depuis qu'il existe des relevés et l'Argentine sa deuxième année la plus chaude.

"*Les phénomènes naturels comme les éruptions volcaniques ou les épisodes El Niño et La Niña ont toujours contribué à façonner notre climat, influant sur les températures et provoquant sécheresses et inondations, entre autres catastrophes. Il n'en reste pas moins que nombre des phénomènes extrêmes survenus en 2013 correspondent à ce à quoi l'on pouvait s'attendre dans le contexte du changement climatique anthropique. Nous avons assisté à des précipitations plus abondantes, à des vagues de chaleur plus intenses et à une aggravation des dommages causés par les ondes de tempête et les inondations côtières du fait de la hausse du niveau de la mer: le typhon Haiyan qui s'est déchaîné aux Philippines en est la tragique illustration*", a déclaré le Secrétaire général de l'OMM, Michel Jarraud.

"*Le réchauffement du climat ne marque aucune pause*", a poursuivi M. Jarraud. "*Le réchauffement des océans s'est accéléré et atteint de plus grandes profondeurs. Plus de 90% de la chaleur piégée par les gaz à effet de serre est stockée dans les océans. Or les concentrations de ces gaz atteignent des niveaux records, ce qui signifie que l'atmosphère et les océans vont continuer de se réchauffer durant les siècles à venir. Les lois de la physique ne sont pas négociables*."

"*La prévision du temps, en particulier des tempêtes et autres phénomènes dangereux, a fait beaucoup de progrès ces dernières années. Comme on a pu le voir en octobre dans le cas du cyclone Phailin, deuxième cyclone tropical le plus violent qui ait frappé l'Inde depuis le début des observations météorologiques modernes, des prévisions de meilleure qualité conjuguées à des politiques gouvernementales visant à accroître la capacité d'adaptation des populations et à leur offrir des abris peuvent sauver un grand nombre de vies humaines. Aussi devons-nous continuer de renforcer la prévention et les systèmes d'alerte précoce et de privilégier une approche multidanger de la réduction des risques de catastrophes*."

Le rapport sur l'état du climat comporte aussi une étude scientifique digne de foi consacrée à la chaleur record qu'a connue l'Australie en 2013. Les auteurs, des scientifiques du Centre d'excellence pour la science du système climatique relevant du Conseil australien de la recherche (ARC, Université de Melbourne, Australie), ont utilisé neuf modèles du climat mondial parmi les plus perfectionnés qui soient pour déterminer si l'augmentation des probabilités

que l'été australien soit marqué par des températures extrêmes était due au changement climatique anthropique.

La conclusion de l'étude est la suivante: "*La comparaison des modèles de simulation tenant compte ou non des facteurs anthropiques montre qu'il est environ cinq fois plus probable que l'été australien 2012/13, pendant lequel des températures records ont été enregistrées, ait été dû à des facteurs anthropiques, et que les records de chaleur de l'année 2013 auraient été quasiment impossibles sans l'influence des gaz à effet de serre d'origine anthropique. Cela démontre que les changements climatiques entraînent une nette augmentation de la probabilité d'occurrence de certains phénomènes extrêmes*."

Source d'information faisant autorité auprès de la communauté scientifique internationale, le compte rendu de l'OMM sur l'état du climat met l'accent sur les principaux phénomènes climatiques survenus en 2013:

- Le typhon *Haiyan (Yolanda)*, l'un des plus violents qui ait jamais atteint les côtes, a eu des effets dévastateurs dans le centre des Philippines;
- Dans l'hémisphère Sud, la température de l'air à la surface des terres était particulièrement élevée, ce qui s'est traduit par des vagues de chaleur de grande ampleur; en 2013, l'Australie a enregistré des températures records; 2013 se classe au deuxième rang des années les plus chaudes en Argentine et au troisième rang en Nouvelle-Zélande;
- Des masses d'air polaire glacial ont envahi une partie de l'Europe et le sud-est des États-Unis;
- Une grave sécheresse a sévi en Angola, au Botswana et en Namibie;
- De fortes pluies de mousson ont entraîné de graves inondations à la frontière indo-népalaise;
- Le nord-est de la Chine et l'est de la Fédération de Russie ont été touchés par des pluies abondantes et des inondations;
- De fortes pluies et des inondations ont frappé le Soudan et la Somalie;
- Le sud de la Chine a été confronté à une grave sécheresse;
- Le nord-est du Brésil a souffert de la pire sécheresse de ces cinquante dernières années;
- Aux États-Unis, la tornade la plus large jamais observée a frappé la ville d'El Reno, dans l'Oklahoma;
- En Europe, des précipitations extrêmes ont entraîné de graves inondations dans les régions alpines, en Allemagne, en Autriche, en Pologne, en République tchèque et en Suisse;
- Israël, la Jordanie et la Syrie ont subi des chutes de neige sans précédent;
- Les concentrations de gaz à effet de serre dans l'atmosphère ont atteint des niveaux records;
- Le niveau des océans a atteint de nouveaux maximums records;
- L'étendue de la banquise de l'Antarctique a atteint un maximum record.

Ce compte rendu, qui fournit une analyse approfondie des tendances régionales, correspond à la volonté de l'OMM de diffuser davantage de données aux niveaux régional et national afin de soutenir les activités d'adaptation à la variabilité du climat et aux changements climatiques. Il sera publié dans le cadre des activités qui marqueront la Journée météorologique mondiale du 23 mars.

L'évaluation de la température du globe repose sur trois jeux de données distincts tenus à jour respectivement par le Centre Hadley du Service météorologique national et la Section de recherche sur le climat de l'Université d'East Anglia (Had-CRU), au Royaume-Uni, par le Centre national de données climatologiques (NCDC) relevant de l'Administration américaine pour les océans et l'atmosphère (NOAA), aux États-Unis et par le Goddard Institute for Space Studies (GISS) relevant de l'Administration américaine pour l'aéronautique et l'espace (NASA), également aux États-Unis.

Référence: Communiqué de presse 985 de l'OMM; site Web visité lundi, le 31 mars 2014.

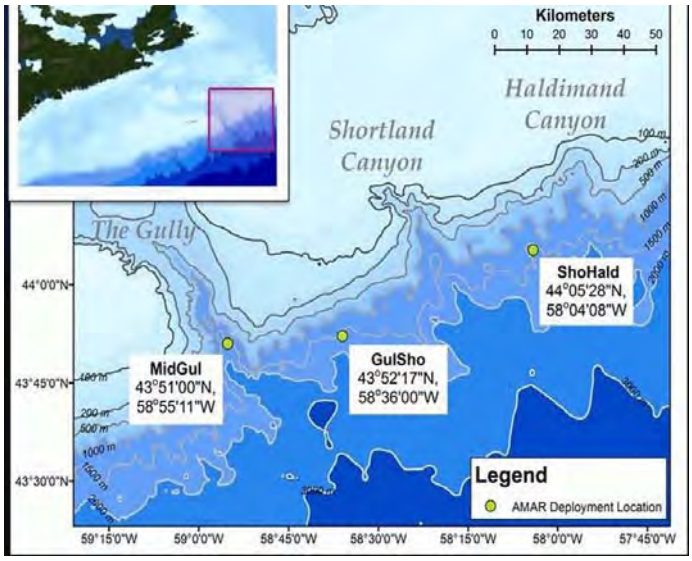
Listening in on the deep: passive acoustic monitoring of whales and ocean noise off Nova Scotia [1]

by Hilary Moors-Murphy[2]

More than twenty species of whales, dolphins, and porpoises occur off eastern Canada, including species listed under the Canadian *Species at Risk Act* such as endangered right whales, blue whales, and northern bottlenose whales. While much has been discovered about these magnificent creatures in our waters over the years, a considerable number of questions remain unanswered about the abundance, distribution, movement patterns, habitat requirements, and behavior of many of these species. Additionally, threats to these species, particularly the impacts of man-made ocean noise on individuals, populations, and their habitat, are poorly understood. To better protect whales in our waters, more baseline data on their occurrence and current exposure to man-made noise is needed.

In order to address some of these knowledge gaps, Fisheries and Oceans researchers at the Bedford Institute of Oceanography are listening in on waters off Nova Scotia for whales. Our research program, supported by the Strategic Program for Ecosystem-Based Research and Advice (SPERA), uses passive acoustic monitoring (PAM) methods and technologies to investigate the occurrence of whales in specific areas throughout the year. Because many species of whales are highly vocal with distinctive vocalizations, PAM offers an effective alternative to more traditional visual surveys to collect information on species occurrence, even during winter months when weather conditions make visual surveys difficult. The acoustic recordings collected can also be used to characterize the ocean noise environment of the Scotian Shelf, including the level and rate of both natural and man-made sources of noise. Our current focus is on the eastern Scotian Slope, a probable migration route for large baleen whales and home to rare deep-diving toothed whales. Autonomous Multichannel Acoustic Recorders ("AMAR"s © Jasco Applied Sciences Ltd) are used to monitor sound across a wide frequency range, capturing both low and high frequency sounds (from 2Hz to more than 60 kHz) in the Gully Marine Protected Area (MPA) and at two adjacent locations on the Scotian Slope. A near-continuous acoustic dataset extending over a two-year period ending in October 2014 is being collected and analyzed.

The most reliable datasets collected during the first year of this study show that noise levels occurring along the eastern Scotian Slope are roughly comparable to deep-ocean noise measurements made elsewhere. Noise from various sources, including wind-origin noise, vessel noise, and seismic survey impulses have been identified. As part of future work, we will continue to characterize environmental noise levels occurring in the area, especially noise contributions from specific human activities such as local and distant shipping, fishing activities, and seismic surveys.



Deployment Locations

Vocalizations from many different species of whales were detected in the first year of recording including blue whales, fin whales, sei whales, humpback whales, sperm whales, northern bottlenose whales, Sowerby's beaked whales, killer whales, pilot whales, and small delphinids. Many of these species were detected consistently during all seasons of the year, demonstrating that both toothed and baleen whales occur in the study area year-round. The vocalizations of some species, such as fin whales, occurred more often during winter months, suggesting that fin whales may be largely winter residents of the Scotian Slope. This is interesting given the fact that many large baleen whales are presumed to migrate to more southern waters during the winter to breed - our data shows that at least some individuals of these species remain in our waters throughout

[1] First published in *Canadian Ocean Science Newsletter*, No. 76, May 2014.

[2] Fisheries and Oceans Canada, Bedford Institute of Oceanography, Dartmouth, NS

the year.

Scotian Shelf northern bottlenose whales are known year-round residents of the Gully MPA and the nearby Shortland and Haldimand canyons, all of which have been identified as critical habitat of this endangered population. It is known that these whales travel between the three canyons, but the extent to which they use between-canyon areas is unknown. One of the main objectives of the current project is to investigate how northern bottlenose whales are using the continental slope areas between canyons, to determine if these areas may also constitute critical habitat for the population. More detailed analysis of the acoustic data collected will help answer this, and many other questions relevant for protecting at risk whale species.

A group of northern bottlenose whales socializing in waters of the Gully Marine Protected Area (Photo credit: Hilary Moors-Murphy).

William Li, DFO Scientist, Honoured by ASLO

A Note from Alain Vézina, DFO Regional Director, Science

"It is with great pride that I let you know that Bill Li will receive an award [John Martin Award] this week [May 20] from the American Society of Limnology and Oceanography (ASLO)[3] for his seminal 1983 paper primary production in the ocean.... Bill's paper changed our understanding of what organisms are responsible for most of the primary production in the ocean and remains one of the foundations of modern conceptions of marine food webs. This work also continues to have important implications for applied questions such as the impact of climate change on the productivity of the Arctic ocean as declining ice opens the potential for new fisheries. I am sure you will join me in congratulating Bill on this latest mark of recognition for his major contributions to marine science that have made him one of the most esteemed and respected researchers at BIO and in the department."

The John Martin Award

Background

The John Martin Award, established in 2005, recognizes a paper in aquatic sciences that is judged to have had a high impact on subsequent research in the field. The model for such a paper is Martin et al (1991), which laid out the case for iron limitation of phytoplankton productivity in the ocean. This award will be given to at most one paper per year. Unlike the Lindeman Award, which recognizes very recent papers (within two years) by young investigators, the Martin Award is for papers at least ten years old.

Martin, JH, RM Gordon, and SE Fitzwater. 1991. The case for iron. Limnol. Oceanogr. 36:1793-1802.

Eligibility

A nominated paper must be at least ten, but no more than thirty years old. It must be published in English and can be from any area of aquatic sciences. The spirit of the award is such that papers leading to fundamental shifts in research focus or interpretation of a large body of previous observations will be favoured. In general, summarizing reviews and methods papers will not be favoured.

Nominations Package

Nominations must include a copy of the paper and a brief letter of less than 500 words describing its impact. The latter may include a citation analysis, but this is not required. Nominations may be made by any ASLO member, with the exception of the authors, or members of ASLO Executive, Board, or Award Committees.

Criteria for judging the nominations

1. As stated above, the spirit of the award is such that papers leading to fundamental shifts in research focus or interpretation of a large body of previous observations will be favoured. In general, summarizing reviews and methods papers will not.

[3] Note from the Editor: Some years ago ASLO officially changed its name to "Association for the Sciences of Limnology and Oceanography".

2. A standing committee will judge nominations. The committee will vote once per year. To be chosen for the award, a nominated paper must be named on the ballots of all committee members. Each committee member may vote for a limited number of nominations, with this number to be determined by the committee annually, based on the number of nominated papers on the ballot [i.e. the larger the number of nominations, the greater the number of votes per committee member; otherwise you'd never get unanimity].
3. A paper may be nominated no sooner than ten years after it first appeared. Papers more than thirty years old will not be eligible.
4. No more than one award may be given per year; if more than one paper are named on all ballots in a given year, a runoff vote will be held and the loser(s) will be returned to the nominating ballot to be considered in subsequent years.
5. Nominated papers will stay on the ballot for three years or until unanimously approved for the award. After three years of consideration, papers not receiving the award will be removed from consideration. Nominated papers not receiving the award may be renominated as long as they remain eligible.

Previous Award Recipients

2006: Azam, F., T. Fenchel, J.G. Field, S. Gray, L.A. Meyer-Reil, and F. Thingstad. 1983. *The ecological role of water-column microbes in the sea*. Mar. Ecol. Prog. Ser. 10:257-263.

2007: Vannote, R. L., G.W. Minshall, K.W. Cummins, J. R. Sedell and C. E. Cushing. 1980. *The river continuum concept*. Canadian Journal of Fisheries and Aquatic Science 37: 130-137.

2008: Eppley, R. and B. Peterson. 1979. *Particulate organic matter flux and planktonic new production in the deep ocean*. Nature 282:677-680.

2009: Koehl, M. A. R., and J. R. Strickler. 1981. *Copepod feeding currents: food capture at low Reynolds number*. Limnol. Oceanogr. 26: 1062-1073.

2010: M.J.R. Fasham, H.W. Ducklow, and S.M. McKelvie. 1990. *A nitrogen-based model of plankton dynamics in the oceanic mixed layer*. Journal of Marine Research, 48: 591-639

2011: Øvind Bergh, Knut Yngve Borsheim, Gunnar Bratbak and Mikai Heldal. 1989. *High Abundance of viruses found in Aquatic Environments*. Nature 340:467-68

2012: Wanninkhof, R., 1992. *Relationship between gas exchange and wind speed over the ocean*. J. Geophys. Res. 97, 7373-7381.

2013: Val H. Smith, 1983. *Low Nitrogen to Phosphorus Ratios Favor Dominance by Blue-Green Algae in Lake Phytoplankton.* Science 221: 669-671.

Dr. William Li's Current Work

Freshening of Arctic Ocean Favours Smallest Algae, Potentially Altering Food Webs

In recent years, rising air temperature, increasing precipitation, higher river flows, and declining snow cover in the Arctic have led to large and rapid changes in the upper ocean. Surface waters in the Canada Basin - a large submarine basin in the Arctic Ocean - have also freshened (become less salty) due to increased sea ice meltwater and periodic large river runoff.

"*These climate related changes can alter the environmental conditions that support biological life*," says Fisheries and Oceans Canada (DFO) research scientist Dr. William (Bill) Li who has been engaged in research to explore the impacts of oceanic changes on phytoplankton, microscopic cells that function like plants to form the foundation of the marine food web.

Figure 1: Since 2004, DFO research scientist Dr. William Li has been leading research to explore the impacts of oceanic changes in the Arctic on phytoplankton – the foundation of the marine food web. Aboard the CCGS Louis S. St-Laurent, the team has carried out hydrographic observations and water column sampling at many stations in the Canada Basin, a large submarine basin in the Arctic Ocean. Photo by Vera Williams (Fisheries and Oceans Canada)

Ocean observations and sampling

The research team, formed in 2002 with Fisheries and Oceans Canada scientists from the Pacific and Maritimes regions, carries out ongoing hydrographic observations and sampling at about two dozen stations in the Canada Basin each summer. Funding from the Canada's Three Oceans (C3O) project led by Dr. Eddy Carmack (*CMOS Bulletin SCMO*, Vol.42, No.2, page 50-51), a Fisheries and Oceans Canada International Polar Year (IPY) initiative, enabled the team to carry out more extensive sampling in 2007.

Every year aboard the CCGS Louis S. St-Laurent the team samples key ocean properties from the surface to the ocean bottom approaching 4,000 metres including temperature, salinity, total phytoplankton content (by measuring chlorophyll a, dissolved nutrients (nitrate, silicate, and phosphate), picophytoplankton (smallest algae), nanophytoplankton, and bacteria. These nine quantities reveal a story about the changing ocean climate in the Arctic and related changes in the phytoplankton community.

Nutrients and increased ocean stratification

"*Phytoplankton require both sunlight and nutrients, which are essentially plant food, to grow. The problem is that plankton grow in the sunlit surface layer usually down to at most 200 metres in depth, while the ocean stores nutrients mainly at depths of 200 to 4,000 metres*," says Dr. Li. "*This means that the water column needs to mix for nutrients from deeper layers to reach the surface layer.*"

Figure 2: Sampling equipment is deployed in the Arctic Ocean from the CCGS Louis. S. St-Laurent as part of a study on how oceanic changes are affecting the phytoplankton community. Continued research is necessary to determine if an observed shift toward smaller phytoplankton in the Arctic is an ongoing trend that could alter other parts of the marine food web. Photo: © John Michael Wallace, University of Washington.

Whether the water column – which extends from the surface to about 4,000 metres – mixes up and down depends on whether there is a difference in the density (mass per unit volume) of the water. When there is heavy water on top of light water, it creates a physically unstable situation and the water will mix, which is the natural tendency of the system to achieve stability. However, if the surface water is lower density (lighter) it will stay on top of the heavier water making mixing more difficult.

How does this all relate to the Arctic Ocean? "*The climate is now warming the air and surface water, causing sea ice, which is fresh water, to melt. This melting is exacerbated by the inflow of warm Pacific Ocean water underneath the cold surface cap of Arctic water. In addition, there is greater runoff from rivers such as the Mackenzie, which also increases the amount of fresh water entering the Arctic Ocean. As a result, the surface of the Arctic Ocean is becoming warmer and fresher. Warmer water is less dense (lighter) than cold water, and fresher (less salty) water is also lighter than salty water*," says Dr. Li. "*This increased stratification of ocean layers reduces water column mixing and, therefore, the movement of nutrients to the surface, which is what we have observed. Since sea ice is low in nutrients, increased melting is also diluting the concentration of nutrients in surface waters*."

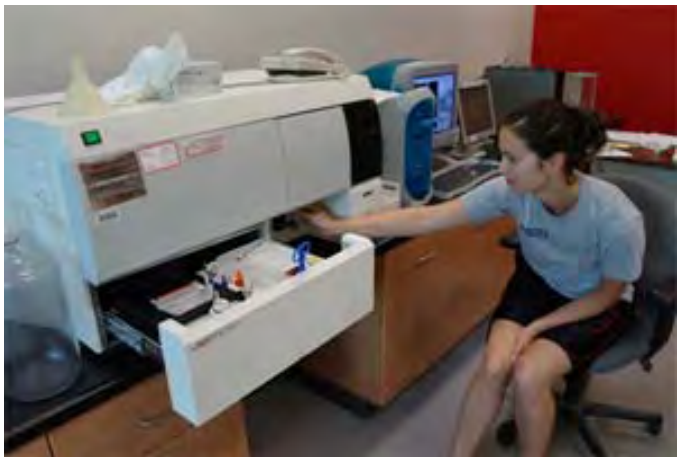


Figure 3: Fisheries and Oceans Canada technical expert Karen Scarcella operates a flow cytometer, which uses rapid electronic detection of light emission to analyze phytoplankton and bacteria in seawater samples from the Arctic Ocean. The speed, accuracy, and precision of flow cytometric analysis enable microbial cells to be surveyed and mapped at the high spatial resolution needed for detailed ecological study. Photo credit: William Li (Fisheries and Oceans Canada)

Data collected since 2004 reveal that while deep-water nutrients have not changed, upper-ocean nutrients have decreased. For example, there is now less nitrate in the top 100 metres of the water column than a few years ago. There is also some evidence that the phytoplankton growth in the Arctic is controlled more by the availability of nutrients than the total amount of solar radiation received over the growing season.

Smaller phytoplankton are increasing

The research also reveals that there has been an increase in the smallest algae (picoplankton) in the Canada Basin, both in total amount and as a percentage of total phytoplankton. Bacteria are also increasing, while the total amount and percentage of larger nanoplankton have decreased. Scientists presume that smaller cells fare better than large cells because they are more effective in acquiring nutrients and less susceptible to gravitational settling.

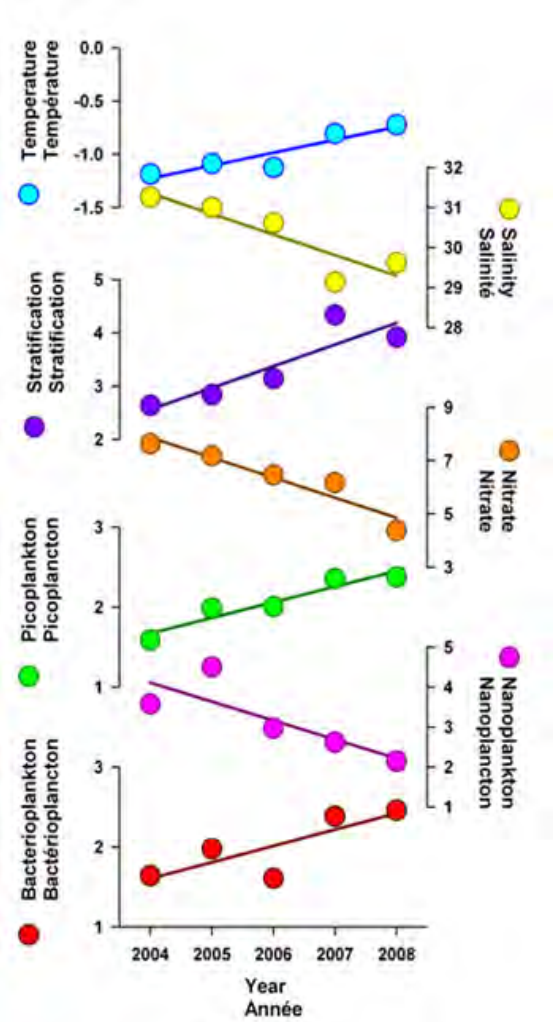


Figure 4: Research findings reveal that from 2004 to 2008, water temperature increased and salt content decreased in the Arctic Ocean, causing a stronger vertical separation of the water column and reduced mixing between upper layers, where phytoplankton grow, and deeper layers where most nutrients are stored. This led to a reduced concentration of nutrients in the upper ocean, which favoured an increase in smaller cells (picoplankton and bacterioplankton) and a decrease in large cells (nanoplankton). Figure by: William Li (Fisheries and Oceans Canada)

Climate-ecosystem linkages

"*Our findings suggest a chained link of cause-and-effect from physical drivers to biological responders, that is to say between climate and the ecosystem*," says Dr. Li. "*However, due to inter-annual variability, a much longer observational time series is necessary to establish a trend. As others have noted, our understanding of the biological impacts of climate change cannot approach the level achieved in physical climate science*." Nonetheless, observed changes in surface nutrients combined with an increase in smaller phytoplankton in the Arctic Ocean lead Dr. Li to conclude that other parts of the food chain may also be susceptible to change.

"*The size of a plankton cell may denote its role in the ecosystem because size determines what types of animals farther up the food chain can eat the cell*," says Dr. Li. "*Smaller picoplankton tend to be consumed by small animals such as protozoans, which will be eaten by small herbivores, which will be eaten by small carnivores. On the other hand, larger nanoplankton will tend to be eaten by larger protozoans and larger invertebrate animals such as copepods (tiny crustaceans of a few millimetres in size), which are food for larger fish and so on."*

Potential impacts on the food web

"*If current changes persist and the Arctic ecosystem continues to shift toward more small algae, a plausible consequence is an altered food web because the only things that consume small algae are microbes and other kinds of small animals. This means that less of the food web would be suitable for consumption by larger animals such as fish, Arctic char ,and marine mammals*," says Dr. Li. "*Our team is collaborating with researchers who are monitoring other parts of the food web, which will tell us whether what we suspect may be going on is in fact discernable*."

Reference: DFO, Science, website visited on May 23rd, 2014.

Congratulations from the CMOS community to Dr. William Li as recipient of an ASLO distinguished award.

Next Issue *CMOS Bulletin SCMO*

Next issue of the *CMOS Bulletin SCMO* will be published in **August 2014.** Please send your articles, notes, workshop reports or news items before **July 4, 2014** to the electronic address given at the top of page 74. We have an URGENT need for your written contributions.

Prochain numéro du *CMOS Bulletin SCMO*

Le prochain numéro du *CMOS Bulletin SCMO* paraîtra en **août 2014.** Prière de nous faire parvenir avant le **4 juillet 2014** vos articles, notes, rapports d'atelier ou nouvelles à l'adresse électronique indiquée au haut de la page 74. Nous avons un besoin URGENT de vos contributions écrites.

Canada's Top Regional Weather Stories for 2013

by David Phillips[1]

Atlantic Regional Highlights

1. January Ends Warm, Windy, and Snowless

In late January, an intense weather system blanketed the Maritimes with rain, fierce winds, and mild air that set record high temperatures. Charlottetown broke its old January 31 record when temperatures soared to 11.2°C. The city also set a near record for the least amount of snow in January - a mere 15 cm. In Nova Scotia, the sudden warmth forced major ski hills to close and backyard ice rinks to melt away. High winds in excess of 100 km/h blew down construction scaffolding in Halifax and delayed flights. High winds also wreaked havoc in Saint John as near hurricane-force wind gusts tore pieces off building roofs and pushed ocean waves over city roads. Across New Brunswick, Nova Scotia, and PEI, thousands of residents lost power.

2. Fog on Fogo

No one got off Newfoundland's Fogo Island for five days at the end of February because heavy ice conditions and dense fog shut down ferry and air travel. The Island's school closed, stores ran low on supplies, and residents were unable to attend off-island medical appointments. Feelings of isolation and frustration only increased as strong winds blew more fog in on the Island instead of blowing it away.

3. Early Spring Flooding

A moist weather system tracked slowly across New Brunswick on March 13 setting rainfall records in Moncton, Saint John, Fredericton, and Gagetown. Upwards of 30 cm of snow on the ground melted in a day or two. Heavy rains, snowmelt runoff, and ice jams sent flood alerts up and down the Saint John River. Residents kept a close watch on a large ice jam on the Nashwaak River, nervous it would spill its banks. On the 15th, residents in Stanley, north of Fredericton, confronted the town's worst flooding in about 40 years amidst rushing water and massive chunks of ice.

4. Newfoundland's Victoria Weekend Snowfall

A slow-moving low-pressure system south of Newfoundland brought inclement weather to much of the Island during the May long weekend. Rain and fog prevailed over the Avalon Peninsula, while significant snow fell on higher terrain. Gander was hardest hit with 58 cm over 26 hours. May's previous record total was 49 cm in 1972 and average May snowfall is 13 cm. Needless to say, the heavy, wet snow put a damper on long-weekend activities, although some campers stuck it out and children entertained themselves with snow forts instead of campfires.

5. New Brunswick Tornado

On July 20, hot, humid, and unstable air combined with a cold front to generate severe thunderstorms across southern portions of New Brunswick. The most intense event occurred in the Grand Lake area where a tornado touched down near Jemseg. Winds blew between 135 to 175 km/h. The tornado uprooted trees, broke phone lines, and damaged buildings. At least three barns, sheds, and a garage were destroyed in the Whites Cove area with barn debris scattered 350 m away.

6. New Brunswick Soaker

A slow-moving weather system with embedded thunderstorms yielded record rains in New Brunswick on July 26. Fredericton and nearby Gagetown got 120 mm of rain, but the heaviest deluge occurred at St. Stephen where 163 mm fell. For Fredericton there had never been a wetter day in July. The rain that fell on the 26th was 40 per cent more than normal for the whole month. Not only was it the wettest day, it was also the wettest July ever (228.2 mm) with records dating back to the 1870s. In St. Stephen, it rained every day between July 17 and July 26. In total, 271 mm of rain fell leaving businesses and residents with flooded basements.

7. August Soaker

Another slow-moving storm tracked over Atlantic Canada on August 10 bringing moderate to heavy rains and strong southerly winds to the region. The nastiest effects were felt along Newfoundland's south coast. Marystown and other communities along the Burin Peninsula received in excess of 60 mm of rain resulting in damage to both municipal and provincial roads and culverts. Personal losses included flooded basements and washed-out driveways.

8. Blustery Labour Day Weekend

An intense weather system that developed off the east coast of the United States in late August tracked across Nova Scotia dumping in excess of 50 mm of rain in western sections of the province. Moving eastward, the system's high moisture content combined with its slow-moving track to bring the heaviest rainfalls over southern and eastern Newfoundland. Gander received 125 mm – more rain than it got during Hurricane Igor – leaving the Trans-Canada Highway between Gander and Gambo impassable.

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

9. Badger Loses Power in Storm

A powerful winter storm hit western and central Newfoundland on November 21, with winds of 140 km/h and heavy snow triggering power outages throughout the region. At Badger, about 25 utility poles were pulled down by the powerful winds causing the town to lose power and cutting off the water supply. Officials declared a state of emergency that lasted for three days. In the meantime, the Canadian Red Cross brought in water for residents.

Québec - Faits Saillants Régionaux

1. La tempête du siècle à Montréal

Montréal a reçu près de 250 cm de neige durant l'hiver 2012-2013, soit environ 20 % de plus que la normale. La période de neige a débuté en grand le 27 décembre 2012 lorsqu'une quantité record de neige (45,6 cm) est tombée sur la ville – le jour le plus enneigé jamais vu à l'aéroport international Trudeau. Probablement plus de 50 cm de neige sont tombés en une journée dans les banlieues de la rive sud de la ville. Bien que le nettoyage ait pris près de six jours, les équipes de la Ville et les résidents ont déployé des efforts miraculeux le lendemain qui ont permis de tout dégager, à l'exception des gigantesques bancs de neige. Le processus complet de déneigement a coûté 25 millions de dollars ou 20 % du budget annuel de la Ville alloué au déneigement.

2. Froid polaire et surcharge de tension en janvier

Un froid intense et persistant s'est installé sur une grande partie du Québec le 20 janvier, avec des températures atteignant -40 °C. Les valeurs de refroidissement éolien les plus basses étaient de -51 dans les régions de Saguenay – Lac-Saint-Jean/Normandin et de Lac Wagéguma et de -49 à Matagami. La consommation d'électricité a atteint un record historique pendant cette période de froid polaire; Hydro-Québec a demandé au public de conserver l'énergie et a même contribué en fermant les lumières alimentant son logo emblématique « Q » à son administration centrale de la région de Montréal. La température glaciale a entraîné la fermeture d'innombrables écoles, le bris de conduites d'eau et l'ajout de lits dans les refuges pour sans-abri. Cette vague de froid extrêmement glacial a été considérée comme étant rare, n'ayant eu lieu qu'une seule fois en 35 ans.

3. Opérations de secours reportées en raison de vents violents

À la fin janvier, des vents violents atteignant près de 100 km/h privent 100 000 clients d'électricité, renversent des véhicules sur l'autoroute 40 et forcent la fermeture de la route entre Joliette et Mascouche. Les opérations de secours à la carrière L'Épiphanie, où deux camionneurs ont été ensevelis lors d'une série de glissements de terrain le 29 janvier, ont également dû être reportées.

4. De la neige le premier jour de printemps

Pendant la semaine du 19 au 23 mars, une tempête déverse de 20 à 35 cm de neige sur le sud du Québec. Après cette tempête hivernale tardive, des vents forts du nord-ouest se sont abattus sur les eaux libres, favorisant la formation de bourrasques de neige qui ont laissé derrière elles plus de 50 cm de « neige marine » sur certaines régions de la rive nord de la Gaspésie.

5. Vague de chaleur en début de saison

À la fin avril et début mai, les températures observées dans le tiers sud du Québec sont exceptionnellement chaudes, atteignant un maximum de 29,8 °C le 6 mai à La Tuque – soit de 10 à 15 degrés supérieurs à la normale. Cette chaleur précoce accélère considérablement la fonte des neiges dans les régions plus au nord. Elle accélère aussi le séchage au champ, permettant ainsi aux cultivateurs d'entamer l'ensemencement plus tôt que d'habitude et rehaussant la menace d'incendie de forêt.

6. Première tornade et dernière chute de neige au Québec

Une ligne d'orages violents traverse la partie sud-ouest du Québec le 1er juin, apportant des pluies abondantes et provoquant des inondations au sud de la région de Lac-Kénogami et près de La Baie. La pluie délave aussi des sections d'une autoroute principale reliant les régions de Charlevoix et du Saguenay. Les rafales ont atteint près de 100 km/h, causant des pannes d'électricité et entraînant la première tornade (EF0) de la saison dans la région de Saint-Hugues en Montérégie, où elle a arraché des portes de garage et des morceaux de toiture. Quelques jours seulement avant la tempête, un système dépressionnaire immobile au-dessus de la Nouvelle-Angleterre avait déversé de 60 à 150 mm de pluie sur les Cantons de l'Est, la Beauce, la ville de Québec et la région de Chaudière-Appalaches. Les niveaux d'eau se sont élevés rapidement, provoquant des inondations et des glissements de terrain qui ont forcé l'évacuation de résidents et de campeurs ainsi que la fermeture de plusieurs routes. Fait choquant, une chute de 19 cm de neige est enregistrée à une station en Beauce. Selon un expert particulier, elle constitue la plus grande quantité de neige tardive tombée sur le sud du Québec depuis 1967.

7. Temps orageux

Le 11 juillet, un front froid passager occasionne des orages violents qui déversent 50 mm de pluie torrentielle sur une période de deux heures dans les Laurentides et les Cantons de l'Est. Les orages apportent aussi de la grêle et des rafales, endommageant les cultures dans les Laurentides et la région autour de Drummondville. De plus, les experts ont confirmé la survenue d'une tornade (EF0) à Saint-Marc-des-Carrières entre Trois-Rivières et la ville de Québec.

8. Une tempête avec un peu de tout

Le 13 août, des orages intenses inondent subitement plusieurs rues et sous-sols dans les régions de Laval, de Montréal et de Saint-Jérôme, suscitant alors la fermeture d'un grand nombre de routes et d'autoroutes. Vers 22 h 30, une tornade de faible intensité frappe un concessionnaire d'automobiles à Sherbrooke, endommageant la toiture et fracassant plusieurs fenêtres. Le système météorologique a également déversé d'importantes quantités de pluie dans le centre et l'est du Québec, y compris 87 mm entre Sept-Îles et Mingan.

9. Des inondations causées par la pluie

Le 11 septembre, une masse d'air chaud et humide contenant des cellules orageuses encastrées apporte des pluies abondantes dans le Suroît, les Cantons de l'Est et la Beauce. Les municipalités de Saint-Anicet et de Lacolle ont reçu la plus grande quantité de pluie : 80 mm de pluie y sont tombés en moins de 5 heures, provoquant de vastes inondations des sous-sols. Des vents violents ont également soufflé, déracinant plusieurs arbres, et des grêlons d'un diamètre allant jusqu'à 3 cm se sont abattus sur les récoltes et les propriétés à Saint-Anicet ainsi qu'à Hemmingford. Les valeurs de l'humidex dans la masse d'air ont atteint 42 – un niveau incroyablement élevé si tard dans l'année.

10. Des premières chutes de neige abondantes

Le système dépressionnaire intense qui est demeuré au-dessus de la mer du Labrador a provoqué des vents violents, qui ont balayé les régions du Saguenay–Lac-Saint-Jean, du nord des Laurentides et de l'est du Québec, les rafales de pointe dépassant les 90 km/h à certains endroits. Des bourrasques de neige se sont également formées, expliquant l'abondance des premières chutes de neige de la saison : entre le 23 et le 25 novembre, il est tombé entre 17 et 36 cm de neige, réduisant la visibilité à zéro à certains moments dans le nord de la Vallée de la Matapédia, dans l'arrière-pays de Rimouski, dans le nord du Parc de la Gaspésie et dans la ville de Blanc-Sablon.

11. Les sorcières de novembre

Dans les premiers jours de novembre, de violents vents du sud-ouest font des ravages dans le sud de l'Ontario ainsi qu'au Québec, dans la vallée du Saint-Laurent, abattant des arbres et des lignes électriques. Les violentes rafales de vent ont atteint des vitesses de 100 km/h à Montréal, de 109 km/h à Saint-Hubert, et de plus de 110 km/h à Cap-Chat. Près de 350 000 clients se sont retrouvés sans électricité par moments, notamment des dizaines de milliers d'habitants de Montréal et de Laval, et des régions de Lanaudière et de l'Outaouais. Juste au nord de Montréal, les vents ont jeté sur un centre commercial les débris d'un échafaudage ayant été broyé et ont provoqué la rupture d'une conduite de gaz. Dans plusieurs régions, il est également tombé jusqu'à 60 mm de pluie.

Ontario - Regional Highlights

1. Spectacular January Thaw

Unseasonably mild air pushed up into southern Ontario before travelling eastward across Quebec and Atlantic Canada. Daytime highs soared into the double digits in many locales including 14.6°C in Toronto on January 12, which was five degrees above the previous record set in 1995. Unfortunately, between 20 and 50 mm of spring-like rains accompanied the unseasonable warmth. Roofing and general contracting companies were flooded with emergency calls after frequent freeze-thaw cycling led to serious roof leaks. The rush of water also overwhelmed drainage systems and flooded basements and back yards. Under the spell of spring fever, many took the opportunity to wash their cars, play sports in shorts, barbecue or take down Christmas lights.

2. Highway Chaos

On January 25, a snow squall over Lake Ontario pushed onshore in the Oshawa-to-Brighton area. The ensuing near-zero visibility was a contributing factor in a 70-vehicle collision that occurred on Highway 401 resulting in five injuries. Cars were left sideways and upside down, closing all west- and east-bound lanes.

3. Another January Thaw

A second wave of thawing with double-digit temperatures returned to southern Ontario at the end of January. Temperatures more typical of late April and May hit Windsor (14.5°C), Sarnia (12.4°C), and five other sites. Heavy rains, record mild temperatures, and speedy snowmelt raised water levels on the Thames River in London causing flooding in low-lying areas and in basements. In Ottawa, a record high of 11.6°C was warm enough to shut down the Rideau Canal Skateway two days before the opening of Winterlude.

4. April Cruel

Three weeks into spring a final wintery blast of weather tracked across Ontario, bringing a tricky mix of ice pellets, snow, and freezing rain carried along by strong winds. Power outages occurred when downed tree limbs fell on ice-encased power lines. Across Ontario, 115,000 customers were without power with some remaining shut down for three days. Slick roads led to several crashes and shut schools.

5. Coming of Spring

Spring weather arrived in southern Ontario on April 18 but it featured some summer meanness. A line of strong thunderstorms featuring straight-line winds and a tornado inflicted property damage on parts of south-central Ontario. An EF-1 tornado, Canada's first of 2013, with winds between 135 to 175 km/h ripped through Dufferin County about 6 km northwest of Shelburne, knocking down hydro wires, ripping at a barn roof, and bringing down trees.

6. James Bay Flooding
A spring ritual on the shores of James Bay occurred on May 2 when flooding and backed-up sewers threatened the northern Ontario First Nations communities of Attawapiskat and Kashechewan. Sewage and water flooded forty homes and buildings. In the end, eight communities in Ontario's far north came under states of emergency warnings, including Moosonee, mostly due to rising waters.

7. A Tornado Swarm
On May 21, two thunderstorm clusters raced across southern Ontario bringing frequent lightning, hail, heavy downpours, strong and gusty winds, and three tornadoes – one south of Midland, another near Barrie, and a third near Glenarm in Kawartha Lakes. The Glenarm tornado was the most powerful; an EF-2 with peak winds between 180 and 200 km/h. In addition to the tornadoes, straight-line winds caused significant damage southwest of Fenelon Falls. Twisting winds were strong enough to debark trees and toss roofs into the air.

8. Torrential May Rains
A round of thunderstorms brought excess rains to Toronto and parts of southern Ontario on May 29. Port Stanley and Toronto East York reported the most rainfall, with 89.0 mm and 70.2 mm respectively. In Toronto, the rains were enough to flood the Don Valley Parkway, which became completely impassable during the morning rush hour with sections in both directions either under water or coated in mud and debris. Flood waters rose as high as vehicle doors in some spots and also inundated GO Transit tracks.

9. Windsor's Wettest Month on Record
July was the wettest month in history in Windsor – 262.2 mm – some three times the monthly normal of 82 mm. The previous all-time record was 244 mm set in 1969. It even beat the wettest month ever – September 1981 with 246.1 mm. It rained hard and often during the month with 21 wet days, which was also a record. The frequent deluges caused headaches for local farmers. As one grower said: "I just can't get on the field because the machinery doesn't float."

10. A Soaker in the North
A slow-moving low-pressure system gave parts of northern and central Ontario significant amounts of rain over the weekend of July 26 to 28. Thunderstorm rains totalled 92 mm in Nagagami, 64 mm in Armstrong, and 62 mm in Sault Ste. Marie, Geraldton, and Kapuskasing. With cooler air, conditions were favourable for the development of waterspouts. At least 12 funnel clouds and seven waterspouts were spotted over the Great Lakes and Lake Nipissing.

11. Four Tornado Days
A line of severe thunderstorms developed late on August 7 from Arthur to Orillia to north of Minden. The thunderstorms produced four weak tornadoes. The strongest twister, an EF-1, took out a swath of trees northwest of Haliburton.

12. Sault Soaker in September
Severe thunderstorms with up to 100-mm downpours and thousands of intense lightning strobes occurred on September 9 from Manitoulin Island to Sault Ste. Marie. Flooding waters, washouts, and mudslides closed sections of highways and city streets. Excessive rains led to evacuations, flooded basements, and washed away culverts, opening up sinkholes and blowing off manhole covers. On a sad note, a motorcyclist drowned in a washout. In Sault Ste. Marie's north end, flash flooding contributed to the collapse of a railway trestle.

13. Soggy September Weekend
A slow-moving cold front combined with moisture from the Gulf of Mexico produced heavy bands of rain and scattered thunderstorms across much of southern Ontario on September 20 and 21. Total rainfall exceeded 100 mm in London (Dorchester), Wellesley, New Hamburg, and Waterloo, while areas from southern Georgian Bay to Bancroft received nearly 50 mm of rain. The September soaker washed out several activities planned for the International Plowing Match near Mitchell and Stratford.

14. Record Wet Fall
The exceptionally wet fall had to be a huge disappointment to residents and tourists wanting to view the fall colours in all their splendour. Locations like Owen Sound experienced their wettest October on record with over 200 mm of rain or just over twice the normal rainfall. Between October 15 and November 2, every day in Owen Sound was wet. Indeed, the entire year broke wet weather records. By December 4, yearly precipitation in the city totalled 1294 mm beating the previous wettest year record set in 2011.

15. Swarm of Waterspouts over Lakes Ontario and Erie
On October 20, a spectacular number of waterspouts were sighted over the Great Lakes – 67 in total, with 54 and 13 over Lakes Ontario and Erie respectively. Many spouts lasted up to 15 minutes. It was a Great Lakes record (more than double the previous number). According to Wade Szilagyi, Environment Canada's authority on waterspouts, it was also a world record for a single-day total.

16. First-ever Snow-nado?
On November 23, a very rare late season tornado touched down north of Prescott when a sharp cold front tracked through Eastern Ontario. The EF-1 tornado featured winds around 150 km/h, which was strong enough to damage a farm silo and inflict other minor property damage. It was one of the latest tornadoes ever reported in Canada and occurred in a "blizzard" of snow and hail with freezing temperatures. Environment Canada's Dave Sills, a

Canadian expert on tornadoes, said it might be Canada's first recorded "snow-nado". [Note: Environment Canada confirmed 22 tornadoes in Ontario this year, which is almost twice the seasonal average of 12. Most, however, were weak and short-lived.]

17. Classic Lake-effect Snowstorms

Cold arctic air plunged across southern Ontario on November 23 and 24, turning on the lake-effect snow engine to the lee of the warm waters of Lake Huron and Georgian Bay. The weather station in London received 32 cm of snow, but areas farther west close to St. Thomas were hit by steady streamers that dumped as much as 70 cm. Police across the region responded to dozens of crashes on area streets and highways. To the north, near Barrie, a blast of heavy snowfall triggered a series of collisions involving up to 40 vehicles on Highway 400 in dangerous whiteout conditions that sent vehicles slamming into each other, careening into ditches and crashing into guard rails. Thankfully, no one was seriously injured.

Prairie Provinces - Regional Highlights

1. Powerful Prairie Blizzard

Icy roads, blowing snow, and piling snow drifts prompted rural school cancellations and flight delays across Manitoba and Saskatchewan as a nasty blizzard swept across the south on January 11. In Manitoba, ditches along Winnipeg's Perimeter Highway were littered with cars while Manitoba Hydro dealt with a rash of power outages. Winnipegers woke up to 10 to 15 cm of fresh snow and -25 wind chills in wind gusts of 70 km/h.

2. Three-province Storm

March began with lion-like weather roaring across the southern Prairies. A furious storm shut down many highways due to drifting snow, limited visibility, and icy roads. In Calgary, winds peaked close to 100 km/h and the storm dumped 27 cm of snow before barrelling into Saskatchewan. Conditions there led to the closure of the Trans-Canada Highway in the central and southern parts of the province. The storm then moved into Manitoba, where in excess of 20 cm of snow blocked roads and forced the closing of several schools. In the western Red River Valley at Miami MB, 56 cm of snow fell in 24 hours between March 4 and 5. Drifts in town were piled up to second-storey bedroom windows.

3. St. Patrick's Day Storm

A strong low-pressure system spread snow and blowing snow into the southern reaches of Saskatchewan and Manitoba on the afternoon of March 17. Coronach, Saskatchewan got 32 cm of snow. Behind the storm, very cold arctic air plunged temperatures to -28°C. Winnipeg got a 1-2 punch of heavy snow followed by -30 wind chills. The wicked weather prompted the closure of roads, schools, and cemeteries.

4. May Day Storm

May Day has historically been celebrated to mark the end of the harsh winter. Tell that to residents in the western and Interlake regions of Manitoba who were hit with a winter storm on May 1 that forced them to retrieve their snow shovels or stay at home because of treacherous road conditions. The community of Plumas, 200 km northwest of Winnipeg, got the biggest dump with up to 45 cm of snow.

5. A Tsunami of Ice

Several homes and cottages on Dauphin Lake were heavily damaged by fast-moving ice, which was pushed onshore by strong, gusty winds striking at 90 km/h in the second week of May. The ice tipped over some dwellings, while others had rooms full of ice that entered through doors and windows. Crushing ice also brought down several utility poles.

6. Two May Storms

A slow-moving, energetic low-pressure system over northeastern South Dakota brought significant rains to parts of southern Manitoba during the Victoria Day long weekend. The greatest three-day accumulations occurred south of the Trans-Canada Highway, including: Deerwood 97 mm, Morden 89 mm, Sprague 73 mm, Letellier 71 mm, Killarney 69 mm, Carman 68 mm, and Altona 67 mm. The heavy rains caused extensive overland flooding on farmland, significantly delaying field work and seeding.

7. Snowy November in Alberta

A winter storm at the beginning of November set the scene for a snowy month across southern and central Alberta. On November 2, much of the province from Edmonton southward was blanketed by snow after an intense low-pressure system moved in from the Pacific Coast. Central Alberta was hit the hardest, with some places reporting 20 to 30 cm. On November 4, when the storm hit Saskatchewan, a combination of warm roads, rain, freezing rain, wet snow, and the pressure from vehicles polished roads to an icy finish. Two weeks later another system dumped around 20 cm of snow on Edmonton and environs, and over 25 cm in Drayton Valley and Ponoka. In Red Deer, snow-clogged streets forced officials to cancel the Santa Claus Parade. More snow later in the month brought the city's total to 62.5 cm – a new record for November with observations spanning over 75 years.

British Columbia - Regional Highlights

1. Foggy Spell

An upper ridge of warm air over the British Columbia coast trapped cool moist air at the surface creating a spell of foggy, misty weather between January 7 and 22. There were 18 fog days in January totalling 153 hours with visibilities below 10 km. A string of seven consecutive days with fog occurred between January 18 and 24.

2. Sunshine Missing

The winter months of December 2012 and January and February 2013 were not only unusually dreary in Victoria, they combined to produce the least-sunny trio of winter months on record. December had 32.3 hours of sun, January 56.7 hours and February 53.6 hours for a total of only 142.6 hours of bright winter sunshine – well below the seasonal average of 216 hours.

3. Avalanche Weather

Around the first day of spring under sunny skies, the Canadian Avalanche Centre raised the avalanche danger risk from moderate to considerable in the Rockies because warmer temperatures had weakened snow crust, resulting in easy-to-trigger slides. A month earlier, the avalanche risk in the Revelstoke area was said to be the worst in 20 years owing to frequent 2 cm/hr snowfalls.

4. Spring Flooding Threat

Lower Mainland residents were warned to be careful around the Fraser River, as waters rose rapidly from late snowmelt and heavy spring rains. British Columbia's Forecast Centre issued a high streamflow advisory for the Fraser River, including Quesnel, Fraser Canyon, Hope, and the Lower Mainland. Watches and advisories were also sent out for the Birkenhead River near Pemberton and for the Squamish and Lillooet rivers and tributary creeks. By May 13, the flood threat had grown all along the Fraser River. Recent heat and rain combined to cause a rapid snowmelt that swelled the river. Two waterfront parks in Prince George were closed because of high water levels.

5. Wettest September on Record

British Columbia's wet season arrived early in 2013 with the province's south coast experiencing heavy rain and winds on September 28 and 29. Persistent storms packed strong winds over 100 km/h, leaving 8,000 customers without power after falling trees downed power lines and cut services. BC Ferries cancelled several sailings in and out of Vancouver. Peak wind gusts at Estevan Point reached 122 km/h. Owing to the nasty end-of-the-month soakers, Metro Vancouver received near record amounts of rainfall. In total, Vancouver Airport got 144 mm, making it the third wettest in 77 years. In Victoria, a new September rainfall record of 119 mm was set. More than half that total - about 70 mm and four times the city's average of 30 mm – fell in the last four days of the month. The Okanagan was also wet in September measuring in at the third wettest on record. Kelowna got 71 mm of rain when it usually only gets 33 mm and in the Kootenay region Castlegar recorded 91.4 mm, which is more than double its 43-mm average. Following the third-wettest September since 1936, the Lower Mainland recorded its sunniest October since 1991. Only 25.4 mm of rain fell in October (average is 113 mm).

6. Yukon Cold Makes B.C. White Gold

Arctic air from the Yukon in the -40°Cs pushed southwards into British Columbia between November 30 and early December leading to significant snowfalls over high mountain passes and valley locations. Snowfall totals included 61 cm at Kootenay Pass and 32 cm at the Coquihalla Summit, and around 20 cm at lower elevations in Cranbrook, Sparwood, and Fort St. John. The frigid air helped ski resorts make snow or keep up natural snow on their slopes for an early December opening.

The North - Regional Highlights

1. Fracturing Ice

This past spring, the ice in Canada's western Arctic ripped open in a massive "fracturing event" that then spread like a wave across 1,000 km of the Beaufort Sea. Huge leads of water – some more than 500 km long and as much as 70 km across – opened up from Alaska to Canada's Arctic islands as the massive ice sheet cracked. Pushed around by strong winds and currents, the majority of the ice was thinner and weaker, responding more readily to atmospheric-ocean forces.

2. Orcas trapped with nowhere to go

On January 8, shifting ice near Inukjuak on Hudson Bay trapped a dozen killer whales. The panicked and stressed whales attempted to come up to the surface all at once, gasping for air, but the breathing hole was too small for the number of whales. A cold snap two days before froze the bay, which was much later than normal. Most of the whales escaped within two days, much to the delight of residents and countless others from around the globe who had been following the saga through news reports and social media.

3. Good Ice Road Year

Colder-than-normal weather early in the winter meant more favourable ice conditions for constructing and maintaining winter ice roads. The ice was nearly one metre thick, much thicker than in most years at the roads' openings. January was the coldest in Yellowknife since 2004 with extreme lows dipping below –40°C on three days, including -42°C on January 31. Ice road users were able to carry heavier and fuller loads as a result. During the 2013 season, 230,000 tonnes of goods and equipment were driven along the Tibbitt-to-Contwoyto winter road to the Ekati diamond mines – 10 per cent more than 2012.

4. Record Spring Snowfall

A persistent and extremely slow-moving low-pressure system over Hudson Bay brought streams of precipitation to parts of the Hudson Bay coast beginning in mid-May. A massive three-day snowfall dumped an incredible 92 cm of snow at Rankin Inlet – about 75 per cent of the hamlet's average annual snowfall. Equally important was that the snow was heavy and wet. Veteran Environment Canada meteorologist Yvonne Bilan-Wallace couldn't recall such a

dump of snow in the Arctic in her 33-year career as an Arctic meteorologist. Because of the snow, a radio station in Rankin was unreachable and a fishing derby was postponed.

5. Northern Heat Wave

Canada's North experienced record heat during the first half of August. Temperatures in Nunavut were particularly warm with Kugluktuk reaching 29.3°C on August 12 and 13, setting records for six consecutive days. Normal daily highs in the hamlet are about 13°C. Baker Lake also set a new record on August 12 with temperatures climbing to 26.7°C, only to exceed that with another record on August 15 at 29.2°C. Coral Harbour also beat its record high set in 1966 by about two degrees, averaging 22°C. In the Northwest Territories, the town of Inuvik exceeded 30°C on August 8, eclipsing the daily record by more than two degrees.

Source: "*Top Ten Canadian Weather Stories for 2013*", Meteorological Service of Canada - Environment Canada - Government of Canada. http://www.ec.gc.ca/meteo-weather visited on winter solstice day.

AVIS

Dans le texte intitulé "*Exploitation des hydrocarbures dans le golfe du Saint-Laurent : quel rôle pour les chercheurs gouvernementaux et universitaires?*" publié dans le *CMOS Bulletin SCMO* de février dernier (Vol.42, No.1, p.28) une référence était faite à un article soumis à *Atmosphere-Ocean* à propos d'Old Harry et co-écrit par D. Bourgault, F. Cyr, D. Dumont et A. Carter. L'article en question a finalement été récemment publié dans la revue **Environmental Research Letters**. Pour en apprendre davantage sur cette recherche vous êtes invités à visionner un résumé vidéo vulgarisé (anglais et français) que les auteurs ont produit et qui accompagne l'article à l'adresse suivante:

http://iopscience.iop.org/1748-9326/9/5/054001/article

Voici la référence exacte de l'article:

Bourgault D., Cyr F., Dumont D. et Carter A. (2014) *Numerical simulations of the spread of floating passive tracer released at the Old Harry prospect*. Environ. Res. Lett. 9 054001.

NOTE

In the article "*Oil and gas exploitation in the Gulf of St. Lawrence: what role for government and university researchers?*", published in the February issue of *CMOS Bulletin SCMO*, (Vol.42, No.1, p.30), a reference to an article submitted to *Atmosphere-Ocean* was mentioned. This article, discussing Old Harry, was co-authored by D. Bourgault, F. Cyr, D. Dumont, and A. Carter. This article was finally published in **Environmental Research Letters.** To learn more on this research, please view the short vulgarised video (English and French) produced by the authors along with the article at the following address:

http://iopscience.iop.org/1748-9326/9/5/054001/article

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Schedule

- Deadline for abstracts submission: May 30th, 2014;
- Acceptance notification: June 30th, 2014;
- Deadline for full manuscript submission and exhibition registration: August 31st, 2014;
- Deadline for payment to be included in the Final Program: September 30th, 2014;
- Final Program Publication: October 31st, 2014;
- International Conference: 12th - 14th November 2014.

For more information, please visit their website: http://www.ciifen.org

CIIFEN: Centro Internacional para la Investigación del Fenómeno de El Niño.

Intergovernmental Panel on Climate Change (IPCC) report confirms the high human costs of climate change

WMO urges governments to translate research findings into actionable information through climate services

Yokohama, 31 March 2014 – The IPCC's Climate Change 2014: Impacts, Adaptation, and Vulnerability, a comprehensive assessment report by leading scientists launched here today, offers policymakers and the general public a wealth of information about how climate change will affect the lives of current and future generations – and what governments can do to adapt and reduce vulnerabilities.

"*Over the coming decades, climate change will have mostly negative impacts on cities and infrastructure, migration, and security, ecosystems and species, crops, and food security, public health, water supplies, and much more. We will see more ocean acidification and extreme droughts, floods, and heatwaves. The poor and vulnerable will be most affected*," said Michel Jarraud, Secretary-General of the World Meteorological Organization (WMO) which, together with the UN Environment Programme, established the IPCC in 1988.

The IPCC report details these impacts and how they are expected to vary from region to region and to evolve over the coming decades. It describes the evidence and the uncertainties, and it confirms that, without urgent and ambitious efforts to reduce emissions, climate change will cause increasingly serious impacts over the course of the 21st century. The report also assesses various options for adapting to the new climate conditions.

"*This report provides invaluable guidance on how we can reduce climate vulnerabilities and adapt to the consequences of greenhouse gas emissions. The next step is to 'operationalize' some of the climate research assessed by the IPCC by transforming it into practical and actionable information. Working together, national meteorological services and other organizations will deliver increasingly sophisticated decision-support services aimed at building climate resilience, adapting to new conditions, and mitigating emissions,*" said Mr. Jarraud.

The report confirms that advances in seasonal and longer term climate prediction now make it possible to develop effective climate services. These services combine science-based climate information and forecasts with socio-economic data and sectoral information to empower decision-makers to manage climate risks and opportunities and adapt to climate change.

In addition to "downscaling" global climate models to produce regional climate scenarios and predictions with finer resolution, researchers are conducting more impacts, adaptation and vulnerability studies at the regional, sub-regional, national, and local levels. Climate services can now be fine-tuned and targeted more precisely to user needs thanks to researchers' continuing explorations of how climate change will affect people and communities in their particular region.

"*Together with the IPCC's Physical Science Basis report issued last September, this new assessment will help WMO Members to further reduce vulnerabilities to weather and climate trends and extremes. Continuing improvements in climate monitoring systems, operational forecasts, and adaptation policies will enhance the ability of meteorological services to contribute to reducing disaster risks and deliver advance warnings of storms, floods, droughts, and hot and cold extremes*," said Mr. Jarraud.

While the practical application of climate information and predictions is growing rapidly, some 70 developing countries still lack the resources and expertise to ensure that their citizens can benefit from climate services. Recognizing this, the international community established the Global Framework for Climate Services (GFCS) to promote operational climate services and build capacity at the national, regional, and global levels. WMO plays a lead role in this effort in cooperation with several UN and other international organizations.

For example, Africa is particularly vulnerable to climate change, but many African countries lack the capacity to produce and even to use climate information for adapting to climate variability and change. According to the IPCC, even if a low-emissions scenario leads to a global warming not exceeding 2°C by 2100, Africa's efforts to adapt will still be challenged by increases in droughts and other extreme weather events, shifts in ecosystems, reduced productivity of crops and livestock, changes in vector- and water-borne diseases, and other stresses. WMO and other service providers can assist African governments to meet these challenges by using the most up-to-date research findings on adaptation policies and measures to implement practical solutions.

Guided by these findings, and similar information about other regions and sectors, climate services can inform decisions on public health, agriculture, water management, disaster risk reduction, and other priority issues. The GFCS is mobilizing support from partner countries and institutions to advance the use of climate services in the African region, including through the Norway-funded Climate Services Adaptation Programme in Africa. With support from a number of other countries, it is also implementing activities in other regions, such as the Canada-funded programmes

for Implementing the GFCS at Regional and National Scales and Climate Services to Reduce Vulnerability in Haiti. The IPCC's Fifth Assessment Report promises to add further momentum to these efforts.

Reference: WMO Press Release No. 987; Website visited on Monday, March 31, 2014.

Le rapport du Groupe d'experts intergouvernemental sur l'évolution du climat (GIEC) confirme le coût humain élevé du changement climatique

L'OMM invite les gouvernements à traduire les résultats de la recherche en informations pertinentes diffusées dans le cadre de services climatologiques

Yokohama, le 31 mars 2014 – Le rapport du GIEC qui s'intitule Changements climatiques 2014: conséquences, adaptation et vulnérabilité, rapport détaillé rédigé par d'éminents scientifiques et rendu public aujourd'hui à Yokohama, constitue pour les décideurs et le grand public une mine d'informations sur la manière dont les changements climatiques se répercuteront sur les générations actuelles et futures, et sur les mesures que peuvent prendre les gouvernements pour favoriser l'adaptation et réduire la vulnérabilité à ces changements.

"*Dans les décennies à venir, le changement climatique aura surtout des conséquences néfastes pour les villes et les infrastructures, les migrations et la sécurité, les écosystèmes et les espèces animales et végétales, la santé publique et l'approvisionnement en eau, pour ne citer que quelques exemples. Nous assisterons à une acidification accélérée des océans ainsi qu'à des sécheresses, des crues et des vagues de chaleur extrêmes. Les populations démunies et vulnérables seront les plus touchées*", a déclaré Michel Jarraud, Secrétaire général de l'Organisation météorologique mondiale (OMM), qui est avec le Programme des Nations Unies pour l'environnement (PNUE) à l'origine de la création du GIEC, en 1988.

Le rapport du GIEC expose en détail ces incidences et leurs variations régionales probables, de même que leur évolution prévue dans les décennies à venir. Il présente les éléments de preuve et les incertitudes et confirme que sans un ambitieux programme de mesures immédiates de réduction des émissions, les conséquences du changement climatique deviendront de plus en plus problématiques dans le courant du XXIème siècle. Plusieurs scénarios d'adaptation aux nouvelles conditions climatiques sont par ailleurs analysés dans le rapport.

"*Ce rapport donne des indications très précieuses sur les mesures que nous pouvons prendre pour réduire notre vulnérabilité face au climat et nous adapter aux conséquences des émissions de gaz à effet de serre*", a souligné M. Jarraud. "*La prochaine étape consiste à "concrétiser" certains des résultats de la recherche sur le climat évalués par le GIEC en les transformant en informations pertinentes et faciles à exploiter. Grâce à une collaboration étroite, les services météorologiques nationaux et d'autres organismes compétents seront à même de fournir des services d'aide à la décision de plus en plus pointus visant à accroître la résilience et les capacités d'adaptation à l'évolution du climat et à limiter les émissions*."

Le rapport confirme qu'avec les progrès de la prévision climatique saisonnière et à plus longue échéance, il est désormais possible de mettre sur pied des services climatologiques efficaces, qui se fondent à la fois sur des informations et des prévisions à caractère scientifique et sur des données socio-économiques sectorielles. Il s'agit en effet d'aider les décideurs à gérer les risques et exploiter les opportunités liés au climat et à prendre des mesures d'adaptation au changement climatique.

Les chercheurs ne se contentent pas de réduire l'échelle des modèles du climat mondial pour obtenir des prévisions et des scénarios climatiques régionaux: ils conduisent de plus en plus d'études sur les conséquences, la vulnérabilité et l'adaptation au niveau régional, sous-régional, national et local. Il est désormais possible d'affiner les services climatologiques et de mieux les cibler en fonction des besoins des utilisateurs, car les chercheurs ne ménagent pas leur peine pour déterminer comment les changements climatiques se répercuteront sur les personnes et les communautés dans une région donnée.

"En même temps que le rapport du GIEC sur Les éléments scientifiques publié en septembre dernier, cette nouvelle évaluation aidera les Membres de l'OMM à mieux se prémunir contre les aléas et les extrêmes météorologiques et climatiques. Grâce à l'amélioration constante des systèmes de surveillance du climat, des prévisions opérationnelles et des politiques d'adaptation, les services météorologiques seront mieux à même de contribuer à la prévention des catastrophes et de diffuser des alertes précoces en ce qui concerne les tempêtes, les inondations, les sécheresses et les extrêmes de froid ou de chaleur", a ajouté M. Jarraud.

Alors que les applications concrètes des informations et des prévisions relatives au climat se multiplient, environ 70 pays en développement ne disposent toujours pas des ressources et des compétences voulues pour offrir des services climatologiques à leurs citoyens. Face à cette situation, la communauté internationale a établi un Cadre mondial pour les services climatologiques (CMSC) afin d'instaurer des services véritablement opérationnels dans

ce domaine et de renforcer les capacités au niveau national, régional et mondial. L'OMM joue un rôle de premier plan dans cette entreprise, avec l'aide de plusieurs organismes des Nations Unies et autres organisations internationales.

L'Afrique, par exemple, est particulièrement vulnérable au changement climatique. Or bon nombre de pays africains n'ont pas les moyens de produire ni même d'exploiter des informations climatologiques pour pouvoir s'adapter à la variabilité du climat et au changement climatique. Selon le GIEC, même si un scénario à faibles émissions de gaz à effet de serre permet de limiter à 2 °C le réchauffement du climat d'ici à 2100, les efforts d'adaptation de l'Afrique se heurteront toujours à des difficultés liées à la multiplication des sécheresses et autres phénomènes extrêmes, au bouleversement des écosystèmes, à la baisse de la productivité de l'agriculture et de l'élevage, à l'évolution des maladies à transmission vectorielle et d'origine hydrique et à d'autres facteurs de stress. L'OMM et d'autres prestataires de services peuvent aider les gouvernements africains à surmonter ces difficultés en tirant parti des derniers résultats de la recherche pour mettre en œuvre des solutions concrètes en matière d'adaptation.

Dans ce contexte, et en prenant aussi pour exemple d'autres régions et secteurs, il est possible de mettre sur pied des services climatologiques qui soient utiles à la prise de décision dans des domaines essentiels comme la santé publique, l'agriculture, la gestion de l'eau et la prévention des catastrophes. Le Cadre mondial bénéficie du soutien d'un certain nombre de pays et organismes partenaires qui entendent généraliser l'accès aux services climatologiques en Afrique, notamment via le Programme de services climatologiques pour l'adaptation en Afrique, financé par la Norvège. Grâce au soutien de plusieurs autres pays, des actions sont engagées dans d'autres régions au titre du CMSC: on mentionnera en particulier les programmes, financés par le Canada, qui portent sur la mise en œuvre du Cadre mondial à l'échelle régionale et nationale et sur les services climatologiques destinés à réduire la vulnérabilité en Haïti. Le cinquième Rapport d'évaluation du GIEC devrait donner une nouvelle impulsion à toutes ces initiatives.

Référence: Communiqué de presse 987 de L'OMM; site Web visité lundi, le 31 mars 2014.

DERNIÈRE NOUVELLE

D'après le dernier communiqué de presse de l'OMM, les concentrations de CO_2 dépassent 400 parties par million dans tout l'hémisphère Nord.

STOP PRESS

According to the latest WMO press release, CO_2 concentrations top 400 parts per million throughout northern hemisphere.

WMO Conference in Montreal

"*The Weather: What's the Outlook,*" is the theme of the World Weather Open Science Conference (WWOSC2014) which will bring together the entire weather science and user communities for the first time.

The conference, to be held in Montreal, Canada, 16 - 21 August 2014, will examine latest scientific advances and discuss how the benefits of this knowledge can best be used for the good of society. The World Meteorological Organization, international Council for Science, Environment Canada, and the National Research Council, Canada, are co-organizers.

There will be special sessions on high-impact weather such as heat-waves and droughts, cold spells, extreme rainfall and flooding, tornadoes and hurricanes which cause headlines on an all-too regular basis.

Conférence de l'OMM à Montréal

"*La météo, quel avenir?*", tel est le thème de la Conférence scientifique publique mondiale sur la météorologie, qui rassemblera pour la première fois l'ensemble de la communauté météorologique et des groupes d'usagers.

La conférence portera sur les derniers progrès de la science et les moyens de les mettre au service de la société. Elle se déroulera à Montréal, du 16 au 21 août 2014, sous les auspices de l'Organisation météorologique mondiale, du Conseil international pour la science, d'Environnement Canada et du Conseil national de recherches Canada.

Des séances spéciales seront consacrées aux phénomènes météorologiques à fort impact tels que les vagues de chaleur ou de froid, les sécheresses, les précipitations extrêmes, les inondations, les tornades et les ouragans, qui font bien trop souvent la une de l'actualité.

CMOS BUSINESS / AFFAIRES DE LA SCMO

Call for Papers in a Special Issue of *Atmosphere-Ocean*

Summary
Atmosphere-Ocean plans to publish a special issue entitled "*Dynamics of the Gulf of St. Lawrence System and its Influence on the Ecosystem: Past, Present and Future*" in 2015. The Gulf of St. Lawrence is a semi-enclosed sea connected to the Grand Banks and the Scotian Shelf through Cabot Strait, and to the Labrador and northeastern Newfoundland Shelves through the Strait of Belle Isle. The Gulf of St. Lawrence is a unique marine ecosystem characterized by large freshwater runoff from rivers; landward flow of the North Atlantic waters in the deep layer along the Laurentian Channel, large seasonal changes in hydrography, high biological productivity and diversity of marine life. This special issue will focus on the latest advances in understanding of physical, chemical, biological, and geological processes in the Gulf of St. Lawrence and adjacent waters based on observational, numerical, and climate studies.

Please submit your papers online at http://mc.manuscriptcentral.com/a-o, indicating the special issue "Gulf of St. Lawrence and Adjacent Waters".

Tentative Schedule
- Submission of the full manuscript: August 2014.
- Completion of Review: February 2015.
- Publication: April 2015 or earlier.

Guest Editors
1) Dr. Jinyu Sheng, Professor and LRF Chair, Department of Oceanography, Dalhousie University, 1355 Oxford Street, PO Box 1500, Halifax, Nova Scotia, CANADA, B3H 4R2.
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Proposed Title and Abstract of your Paper
If you are interested in publishing your paper in this special issue, please contact the guest editors:

Jinyu.Sheng@Dal.Ca or
denis.lefaivre@dfo-mpo.gc.ca

with a proposed title and abstract and an indication whether you can meet the suggested deadline.

Appel de communications pour un numéro spécial d'*Atmosphere-Ocean*

Aperçu
Nous envisageons de publier en 2015 un numéro d'*Atmosphere-Ocean* intitulé "*Dynamics of the Gulf of St. Lawrence System and its Influence on the Ecosystem: Past, Present and Future*" (Dynamique du système du golfe du Saint-Laurent et son incidence passée, présente et future sur l'écosystème). Le golfe du fleuve Saint-Laurent est une mer semi-fermée, reliée aux Grands Bancs et à la plateforme de la Nouvelle-Écosse via le détroit de Cabot, ainsi qu'au Labrador et à la plateforme du nord-est de Terre-Neuve via le détroit de Belle Isle. Le golfe du Saint-Laurent constitue un écosystème unique, caractérisé par un important ruissellement d'eau douce, provenant de divers cours d'eau; par un écoulement vers le continent des eaux de l'Atlantique Nord via le courant profond du chenal Laurentien; par de grandes variations hydrographiques saisonnières; par une production biologique abondante, et une grande diversité de la faune et de la flore marines. Ce numéro spécial portera sur les dernières avancées de la compréhension des processus physiques, chimiques, biologiques et géologiques du golfe du Saint-Laurent et des eaux adjacentes, étayées par des observations, des simulations numériques et des études climatologiques.

Veuillez soumettre vos articles en ligne à l'adresse http://mc.manuscriptcentral.com/a-o, en mentionnant le numéro spécial : "Gulf of St. Lawrence and Adjacent Waters".

Dates préliminaires
- Soumission du manuscrit complet : août 2014.
- Fin de la révision : février 2015.
- Publication : avril 2015 ou plus tôt.

Rédacteurs en chef invités
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Courriel : denis.lefaivre@dfo-mpo.gc.ca.

Titre proposé et résumé de votre communication
Si vous êtes intéressés à publier votre communication dans ce numéro spécial, prière de contacter les rédacteurs en chef invités:

Jinyu.Sheng@Dal.Ca ou
denis.lefaivre@dfompo.gc.ca

en mentionnant le titre proposé et le résumé de votre communication. Prière d'indiquer également si vous pouvez rencontrer la date butoir.

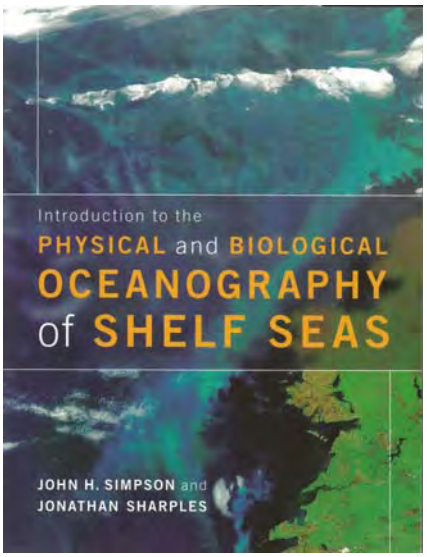
BOOK REVIEW / REVUE de LITTÉRATURE

Physical and Biological Oceanography of Shelf Seas

by J.H. Simpson and J. Sharples

Cambridge University Press, ISBN 978-052-170148-8
Paperback, 424 pages, C$65.95

Book reviewed by Marek Stastna



As its title suggests, this book considers the physical and biological oceanography of shelf seas, and does so at the level of a graduate course. The book is nearly completely self-contained, with mathematical pre-requisites at the level of an undergraduate degree in physical sciences. It is probably true that no higher mathematics is truly necessary to appreciate, and learn from, the presented material, though this is difficult for me to judge being based in an applied mathematics department.

The book consists of eleven chapters. Each chapter ends with a well organized summary and problems for the reader or the students. Brief numerical answers are provided at the back of the book. The first chapter succinctly reviews the history of shelf sea oceanography, its relation to its deep water cousin, and provides a clear statement of the book's underlying philosophy. This philosophy states that shelf sea oceanography is observationally based, with advances based on a blend of technological improvements to measurement techniques and careful interpretation of these measurements. Models play the role of providing support and organization to the interpretations. In the book's own parlance, models are thus "*first order*". While I personally struggled with precisely what a definition of a first order model is in the context of shelf seas, it is safe to say that in practice it means that the majority of models presented lead to analytical solutions.

The Introduction is followed by three chapters on the background of physical oceanography, with a focus on concepts that are directly relevant to the shelf seas. This is followed by a chapter introducing biological oceanography, again in a shelf sea context. The core material established, the authors move on to five chapters dedicated to detailed aspects of the shelf seas. Each of these chapters considers both the particular physics and biology of a given topic. The sections outlining the physics are followed by a *"physics summary box"*, something I found quite helpful, and something I can imagine being crucial were the reader to be coming from the biological oceanography side of the field. The topical discussions are not encyclopedic in nature, and I found that the interplay between physics and biology worked quite well. The book concludes with a speculative chapter on future directions.

The book's organization, typesetting, and graphics are all of high quality, with many excellent diagrams (particularly those that summarize many processes in a single "cartoon"), a summary of terminology and variable names in the front matter, and a Glossary in the back matter. The list of references struck me as somewhat slanted to papers that the authors have had some interaction with, though I doubt many students reading the book would find this problematic. The majority of the figures are rendered in black and white, with a central colour plates section. I found some of the colour plates vital to bringing out key points of a particular topic, while others struck me as perfectly OK in black and white. Given the cost of colour reproduction, this is a small quibble. Geographically the book is rooted in observational work in the Celtic and North Seas. This is natural given the authors' research focus, and an admirable effort is made in pointing out the geographic references in both Tropical and Arctic settings.

The book's web page, maintained by Cambridge Press, presents a variety of downloads, including data sets, a Windows only biology model, and an extensive library of Matlab based exercises. The Matlab scripts cover the majority of the material in the book and could make an interesting supplement to a course. The documentation provided, while extensive, appears to have missing equations in a number of places, but overall this is not a very serious issue and the Matlab material is a very positive addition to the overall package.

Overall the book is a tremendously enjoyable read. It is clear that care was put into writing, graphics, and editing. I found only one example of a reference that did not seem to appear in the list of papers, have looked up several of the references to dig a bit deeper, and I plan to return to certain

sections in the future to explore the topic in more detail. I do wonder, however, precisely who would use this book as a teaching tool. I can imagine giving the book to one of my applied mathematics students as an exercise in broadening their horizons, but the reality is that the formula based approach to the turbulent flows the authors adopt got rather old for me. On the other hand, I lack the experience to gauge what a biological oceanographer might gain from reading the book. It is certainly an easier read than the classical textbooks such as Gill's "*Atmosphere-Ocean Dynamics*", but I am not sure if that is enough to secure adoption as part of the graduate curriculum in biological oceanography.

Thus, in summary, Cambridge University Press has produced another fine book. I recommend it to all practicing researchers, and hope that some out there will find a way to integrate it into graduate training. For my part, I will use it to motivate students to broaden their horizons, and for myself as a brake on the high speed world of trying to keep up with papers that came out this month, and as a reminder that for the generation that prefers the numerical model to the analytical formula, the great introduction to physical oceanography remains to be written.

Eruptions that Shook the World

by Clive Oppenheimer

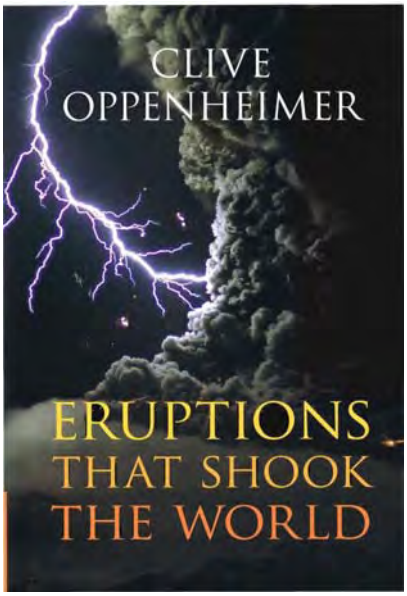
Cambridge University Press, 2011, 978-0-521-64112-8,
392 pages, Hardback : $30

Book reviewed by Richard Asselin

When I first noticed the title of this book sent to CMOS for review, I did not think anyone from our community would be offering to review it. I took it out by personal curiosity, but I was pleasantly surprised by its relevance to meteorology and climate change in particular.

Clive Oppenheimer is Professor of Volcanology at the University of Cambridge. His CV states that his main research interests are the controls of volcanic degassing on differentiation and redox state of magmas, and on eruptive processes; the atmospheric chemistry of volcanic plumes; the environmental, climatic, and human impacts of volcanism in antiquity; and development of environmental sensing techniques and applications.

The book has 14 chapters. The first two chapters explain how volcanoes work, the different types of explosions, and the general impacts on the ecosystem. We are introduced to the volcanic terminology, including intensity and magnitude measurements. The numbers are gigantesque: plumes up to 40 km in the atmosphere, and ejections of up to hundreds of cubic kilometers of magma.



Chapter 3 deals with **Volcanoes and Climate Change**, using the fairly recent and well-documented Pinatubo (Philippines, 1991) event as example. There are many gases involved, but the two key gases are CO_2 and SO_2, which transform into sulfuric acid aerosol particles. Estimates of sulfur yield reach 10 or more gigatonnes in a single event. These particles can circle the globe and have a major impact on solar absorption for a few years. On the question of climate change, the chapter deals with effects on light and heat radiation, cooling and warming effects, oceanic response, and ozone depletion among others. The explanations are clear and simple.

Chapters 4 and 5 explain how volcanoes are dated, their magnitude, intensity, and gas yields deducted etc., based on all kinds of observations and indices, including digs, ice cores, tree rings, and oral history. Chapters 6, 7, and 8 relate the evolution of life, extinction of dinosaurs, origin of mankind and exodus from Africa to volcanoes, sulfur emissions, and climate changes.

Chapters 9 to 11 examine the impacts of some of the most destructive eruptions on the surrounding population and around the world. Again, there is much emphasis on sulfur emissions and climate impacts, including historical famines and pestilence.

Finally, chapter 14 examines the questions of risk and risk control, including geo-engineering.

The book is very well written and easy to read. Sometimes, it is like a suspense novel: arguments are presented in support of one theory, and then counterarguments are developed. A very wide range of sciences is utilized, from DNA analysis to anthropology, chemistry, meteorological modeling, oceanography, archeology, statistics, and everything in between. The book attempts to be as factual as possible, based on the latest research, and avoids speculation other than in reviewing the various theories put forward by other scientists. There are several subtitles and each chapter is well summarized.

There is a list of the largest eruptions, their dimensions and of the most notable eruptions and their claimed impacts. There is a very minimum of equations, a few maps and

graphs, and several photos. The B&W photos are too small to be examined comfortably, but some of them are available in colour on the web. Only the key references are listed in the book, but a complete list is available with links on the book website

www.geog.cam.ac.uk/research/projects/eruptions.

In summary, this is a very informative, easy to read, and solid book. It deals a lot more about climate change than the title or the back cover would lead one to expect. I would recommend it to anyone who is curious and interested about our natural large-scale environment and climate change. At $30, it is a very good value.

Books in search of a Reviewer (Partial list)
Livres en quête d'un critique (Liste partielle)

Latest Books received / Derniers livres reçus

2013-05) *The Weather and Climate, Emergent Laws and Multifractal Cascades*, by Shaun Lovejoy and Daniel Schertzer, Cambridge University Press, ISBN 978-1-107-01898-3, Hardback, 475 pages, CDN$132.95.

2013-06) *The Self-Potential Method, Theory and Applications in Environmental Geosciences*, by André Revil and Abderrahim Jardani, Cambridge University Press, ISBN 978-1-107-01927-0, Hardback, 369 pages, CDN$121.95.

2014-01) *Biogeochemical Dynamics at Major River-Coastal Interfaces, Linkages with Global Change*, 2014, Edited by Thomas S. Bianchi, Mead A. Allison, Wei-Jun Cai, Cambridge University Press, 978-1-107-02257-7, Hardback, 658 pages, CDN$146.95.

2014-02) *Double-Diffusive Convection*, by Timour Radko, Cambridge Unviversity Press, ISBN 978-0-521-88074-9, Hardback, 342 pages, CDN$125.95.

2014-03) *Essentials of the Earth's Climate System*, Cambridge University Press, ISBN 978-1-107-62049-0, Paperback, 259 pages, CDN$67.95.

2014-04) *Transport in the Atmosphere-Vegetation-Soil Continuum,* Arnold F. Moene, Jos C. van Dam, Cambridge University Press, ISBN 978-0-521-19568-3, Hardback, 436 pages, CDN$78.95.

À lire absolument!

Supercalculateurs et simulation du climat : quelle vision pour 2020 ?

par Jean-Claude André

Ancien directeur du Centre européen de recherche et de formation avancée en calcul scientifique (Cerfacs)

La Météorologie - n° 84 - février 2014, page 49.

Résumé: Cet article présente brièvement les perspectives d'évolution des supercalculateurs au cours de la décennie en cours, tant du point de vue de leur puissance de calcul que de celui de leur architecture informatique et de leur utilisation. Les modèles du climat nécessitant de recourir à des puissances de calcul de plus en plus grandes, ils pourront bénéficier de ces nouvelles machines et de leur puissance de calcul, au prix d'évolutions de leur structure numérique, dont certaines sont déjà amorcées. Ils seront alors à même, via une augmentation de leur résolution spatiale, de conduire à des simulations dont la convergence mathématique aura été vérifiée et qui seront encore plus réalistes du point de vue physique.

Note: URL: http://hdl.handle.net/2042/53187
DOI: 10.4267/2042/53187

Interesting article

Supercomputers and climate simulation: what vision for 2020 ?

by Jean-Claude André

Former Director, Centre européen de recherche et de formation avancée en calcul scientifique (Cerfacs)

La Météorologie - n° 84 - février 2014, page 49.

Abstract: This paper briefly presents the likely evolution of supercomputers during the present decade, from the points of view of computing power, architecture, and easiness of use. As climate models require access to ever increasing computing power, they will benefit from these new supercomputers and their increased capabilities, provided some evolution of their numerical structure takes place, a process that has already started. They will then be able, through an increase of their spatial resolution, to lead to simulations which will be both mathematically justified and even more realistic from the physical point of view.

Note: This article is available on the web in French only.

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BRIEF NEWS / NOUVELLES BRÈVES

People on the Move

Claire Martin leaves TV

Claire Martin has been in the television broadcast industry for more than 25 years and as Anaïd Productions Managing Director, she oversees the company's day-to-day operations and communications. Claire works closely with Anaïd's producers on various projects including the critically acclaimed OLN series, The Liquidator, featuring master negotiator Jeff Schwarz.

Prior to joining Anaïd Productions, Claire was a senior meteorologist at CBC News working along side The National's chief correspondent Peter Mansbridge and other newscasters, enlightening the country with her wealth of knowledge about the weather. Before this, she was with Global News Edmonton and Environment Canada.

Claire Martin receiving her second Citation award in 2011 from CMOS President, David Fissel; photo credit: CMOS photo archive

CMOS gave two citations to Claire Martin; one in 2011 for her excellence in producing Radio and Television Weather presentations, especially in hosting of two CBC Radio hour-long weather programming specials which were instrumental in educating the public in the science of meteorology and forecasting. In 2004 she received a CMOS citation for showing outstanding skills in bringing day-to-day weather and its impacts to people in a clear, simple, and entertaining manner on Global TV in Edmonton AB. It is also of note that Claire was one of the first weather broadcasters endorsed by CMOS.

Claire Martin was also a regular contributor to the *CMOS Bulletin SCMO* with four very interesting and timely articles including *Vancouver Olympics 2010 - My Perspective*, Vol.38, No.2, pages 55-59, *The Future Role of a TV Weather Presenter*, Vol.37, No.6, pages 182-183, *First World Conference on Broadcast Meteorology, Barcelona, Spain, June 3-5, 2004*, Vol.32, No.4, pages 124-127, *The Evolving Field of Broadcast Meteorology in Canada - from a Woman's Perspective*, Vol.31, No.2, pages 46-47 and a letter to the Editor *Thank God Einstein wasn't pretty*, Vol.31, No.2, page 34 where she was debating a question still valid today: "*How many of us with solid academic backgrounds, fluent in forecasting, and articulate in atmospherics have been told to check our science at the door and do weather the old showbiz way?*"

Martin's career includes a number of accolades including "*Best Weather Presenter in the World*" from the International Weather Festival in 2000, 2001, and 2003. She was also the first person in Canada to receive the "*Certified Broadcast Meteorologist*" designation by the American Meteorological Society in 2005, and was the first on-air meteorologist in Canada to earn the *"Professional Meteorologist*" or PMet designation.

Originally from England, Claire Martin moved to Canada in 1989 and has since travelled around the world with the UN's World Meteorological Organization, meeting locals and teaching them the sciences of weather prediction and good science communication.

Biometeorology International Congress

The 20th International Congress of Biometeorology (ICB) will be held in Cleveland, Ohio, USA on 28 September – 1 October 2014. The ICB is a triennial meeting of biometeorologists from around the world, organized by the International Society of Biometeorology (ISB). These professionals work across various interdisciplinary fields that comprise biometeorology. This year's theme is "***Adaptation to Climate Risks***."

Prior to the conference, ICB will host two workshops. The first will be focused on GIS and biometeorology while the second is for students and new professionals. You can find more information at http://www.icb2014.com; this website will be updated over the coming months to provide further info on the conference, including keynote speakers, excursions, and preliminary programs. The abstract deadline was 28 May, and abstract submission is free. The Executive Board looks forward to welcoming you to ICB in September!

Scientists react to the transfer of the Experimental Lakes Area to new operator

Winnipeg's International Institute of Sustainable Development takes over as of April 2014

REGINA – Canadian scientists are relieved to learn that Winnipeg's International Institute for Sustainable Development (IISD), with help from the Ontario and Manitoba governments, will move to preserve the world renowned Experimental Lakes Area (ELA). In May 2012, the federal government announced the closure of the world's foremost freshwater research station which for forty years has provided studies on the impacts of aquatic pollutants on lakes. The takeover by the IISD culminates a two year struggle by scientists and citizens to save the ELA. This current agreement will allow the ELA to reopen to scientists performing whole lake experiments that have been on hold for almost two years. This work is important, say scientists, because ELA is the one place in the world where a pollutant can be added to lakes, in a controlled way, in order to understand with certainty the changes that occur due to the pollutant. As well, the ELA will now be able to resume its role in training the brightest aquatic scientists in the world.

It is with mixed emotions that prominent scientists react to this new agreement. Dr. Dave Schindler (OC, AOE, FRSC, FRS) is encouraged. "*The move to IISD should be good for ELA, and for water research in Canada. In recent years as federal Department of Fisheries and Oceans' (DFO) interest in research has declined, ELA has been increasingly strangled, never able to reach its full potential. Hopefully, with DFO out of the picture, that will change for the better*", says Dr. Schindler, founding director of the ELA.

However, while the general consensus is relief that ELA will not be closed, others lament the current treatment of science in Canada. "*Today is a bittersweet victory — while we rejoice in the hope that ELA will live on, we remain discouraged by the reality that the Canadian government refused to reinstate its funding for ELA as a public science program"*, says Dr. Diane Orihel, co-founder of the Coalition to Save ELA. "*Although we believe that the IISD is fully committed to running the ELA in a manner it deserves, there are significant hurdles the facility needs to overcome (such as long term funding stability) to ensure its future*" says Dr. John Smol (OC, FRSC). *"Thankfully the IISD and the governments of Ontario and Manitoba appear to be concerned about evidence-based policy when it comes to water issues*".

"*The announced closure of ELA initiated a movement of advocacy for science and provides a unique example of how individuals can change a government's course of action"* says Dr. Britt Hall, director of the **Coalition to Save ELA**. "*Without the collective work of many, the Harper government would have closed this unique facility that provides vital data on our invaluable freshwater ecosystems*." The Coalition to Save ELA is grateful to the many science societies, environmental organizations, lake stewardship groups, First Nations, federal and provincial politicians, public service unions, journalists, and citizens for their tremendous support (see www.saveela.org/thank-you).

Réactions des chercheurs face à la nouvelle gestion des Lacs Expérimentaux

L'Institut international du développement durable prend la relève à partir du mois d'avril 2014

RÉGINA – Plusieurs chercheurs canadiens soulignent l'importance de la prise en charge de la Région des lacs expérimentaux (RLE, ou Experimental Lakes Area: ELA) par l'Institut international du développement durable (IISD) de Winnipeg. Le subventionnement de la part de l'IISD sera épaulée par les gouvernements de l'Ontario et du Manitoba. La RLE, laboratoire naturel de grande renommée internationale pour la recherche en écologie, fut abandonnée en mai 2012 par le Gouvernement Conservateur (Pêches et Océans Canada). Le nouveau contrat cumule deux ans de négociations menées par chercheurs et citoyens unis, ensemble visant la sauvegarde du centre, l'un des seuls lieux où l'expérimentation des impacts écologiques de la pollution est mesurée à l'échelle des bassins versants entiers. Notamment, le centre constitue également un lieu important pour la formation de chercheurs en sciences de l'eau.

La nouvelle est encourageante, selon le Professeur David Schindler (OC, AOE, FRSC, FRS), premier directeur de la RLE. Toutefois, Schindler souligne une perte totale dans l'intérêt de la part de Pêches et Océans Canada vis-à-vis la recherche, allant jusqu'à dire que le centre est en bonnes mains sans intervention du Gouvernement Fédéral.

Malgré la nouvelle que la RLE restera active au plan de la recherche pour le moment, on lamente plus largement la trajectoire du Gouvernement du Canada quant à l'appui financier de l'activité scientifique en environnement. Puisque la RLE représentait jadis un programme de service publique, le Gouvernement Fédéral actuel jugerait alors de basse priorité le subventionnement de la recherche environnementale, ainsi que la communication au public de son message scientifique. Diane Orihel, fondatrice de

l'initiative "**Coalition to Save ELA**", ainsi que le Professeur John Smol (OC, FRSC), soulignent ensemble que la gestion de l'eau devrait, en principe, être appuyée directement par les données scientifiques livrées par la recherche, que cela soit à la RLE ou ailleurs.

La professeure Britt Hall, directrice de la Coalition, mentionne que la majorité du grand public, voire les gouvernements provinciaux et térritoriaux, les Premières Nations, et les organisations non gouvernementales, tous souhaitent un investissement durable en matière de recherche scientifique dans les domaines touchant l'environnement.

Registration Open for Wendy Schmidt Ocean Health XPRIZE

The XPRIZE Foundation, the leading non-profit that's solving the world's Grand Challenges through large-scale incentivized prize competitions, is collaborating with ocean philanthropist Wendy Schmidt to offer $2 million dollars in prizes to address ocean acidification through the development of breakthrough pH sensor technology. The winning pH sensor(s) of the Wendy Schmidt Ocean Health XPRIZE will be radically more accurate, durable, and affordable to spur global research and industries within ocean services and to address ocean acidification.

There are two prize purses available (teams may compete for, and win, both purses):

1. $1,000,000 Accuracy award - Performance focused (First Place: $750,000, Second Place: $250,000): To the teams that navigate the entire competition to produce the most accurate, stable, and precise pH sensors under a variety of tests.

2. $1,000,000 Affordability award - Cost and Use focused (First Place: $750,000, Second Place: $250,000): To the teams that produce the least expensive, easy-to-use, accurate, stable, and precise pH sensors under a variety of tests.

We are looking for teams of innovators to compete in this once-in-a lifetime competition! Would you or someone you know, be interested in forming or joining a team? Skills as diverse as engineering, materials science, data science, and chemistry could be part of the winning team.

Registration is now open, and we encourage you to fill out the Intent to Compete form today. By submitting your intent to compete form, you can build or join a team made up of innovators like yourself. This is your chance to apply your skills to help improve our understanding of one of the oceans greatest threats, ocean acidification, and win up to $2 million dollars in the process! We hope to see you compete. Fore more information: oceanhealth@xprize.org

New Development Modules from COMET Program

The COMET program has recently announced the development of the following new modules.

1) VIIRS Imaging and Applications

The COMET Program is pleased to announce the publication of "*Introduction to VIIRS Imaging and Applications*." This lesson which is less than an hour long, introduces the VIIRS imager that operates on the current U.S. Suomi NPP satellite and is planned for future JPSS environmental satellites. VIIRS has many advanced features that improve both spectral and spatial resolution and enable the delivery of consistent, high quality, and high resolution data to users worldwide. The lesson covers its enhanced capabilities and highlights some of its applications. These include single channel and multispectral products used to monitor dust, volcanic ash, convection, fog and low clouds, sea surface temperature, tropical cyclones, contrails, and ocean color. A special feature on VIIRS, the Day Night Band low-light visible channel, is also introduced although learners are referred to another COMET lesson, "Advances in Space-Based Nighttime Visible Observation" for more information. This material is intended for operational forecasters, scientists, students, and all others interested in the imager and its uses and applications.

Please follow this link to the MetEd description page that provides additional information and a link to begin the lesson: Introduction to VIIRS Imaging and Applications, https://www.meted.ucar.edu/training_module.php?id=1075. This will work for html email and those using Pine.

2) Nowcasting for Aviation in Africa

The COMET Program is pleased to announce the publication of the new lesson, *"Nowcasting for Aviation in Africa*". This one-hour lesson summarizes techniques and best practices for developing area-specific forecasts at very short (0-6 hour) timescales. The information is presented in a case study context, providing the learner the opportunity to practice interpreting observations to develop a nowcast for airports in Gauteng Province, South Africa. In completing the case, the learner will assess the state of the atmosphere, develop the nowcast, monitor conditions, and update/create appropriate nowcast products for aviation stakeholders.

The intended audience for Nowcasting for Aviation in Africa includes any operational forecaster wanting to become more familiar with nowcasting techniques. Although the case study and content are focused on a nowcasting exercise in Africa, the information can be applied to nowcast development in any part of the globe. Please follow this link to the MetEd description page that provides additional information and a link to begin the lesson: Nowcasting for

Aviation in Africa (https://www.meted.ucar.edu/training_module.php?id=1020#.Unw2nOJGa9g).

3) WRF-EMS Aviation Products

The COMET Program is pleased to announce the publication of the new lesson, *"WRF-EMS Aviation Products*." This one-hour lesson illustrates how numerical guidance from the Weather Research and Forecasting Model - Environmental Modeling System (WRF-EMS) can be added to surface observations, satellite graphics, and conceptual models of important aviation phenomena, to produce TAFs in Africa. Specifically, the lesson describes how visibility, cloud ceilings, and the flight categories variables provide guidance for TAF forecast values.

The intended audience for WRF-EMS Aviation Products includes all operational forecasters tasked with providing information for aviation operations in Africa. The lesson includes a case study for an event impacting Jomo Kenyatta Airport in Nairobi, Kenya to provide practice using the products in real-life forecast situations. Please follow this link to the MetEd description page that provides additional information and a link to begin the lesson: http://www.meted.ucar.edu/training_module.php?id=1002

4) How Satellite Observations Impact NWP

The COMET Program is pleased to announce the publication of the new lesson, "How Satellite Observations Impact NWP". Satellite observations have played a crucial role in the improvement of data assimilation, analyses, and forecasts by numerical weather prediction (NWP) models. This 90-minute lesson provides meteorologists with an understanding of satellite data, NWP models, data assimilation systems, and how and why satellite data is so important for good NWP model forecasts. The lesson discusses how new satellite observations are vetted for inclusion as observational data suitable for data assimilation and covers how data assimilation uses this data to create an analysis of initial conditions from which to run an NWP forecast. The lesson ends with a discussion of potential future advances in using data from new and planned satellite sensors in data assimilation systems and the expected improvements in NWP forecasts that could result.

The intended audience for this lesson includes operational forecasters unfamiliar with just how significant the use of satellite observations are for creating initial conditions for NWP models and/or those unfamiliar with data assimilation in general. The lesson is well-suited for faculty teaching meteorology students about how satellite observations are vital for high-quality data assimilation system analyses and NWP guidance. Please follow this link to the MetEd description page that provides additional information and a link to begin the lesson: https://www.meted.ucar.edu/training_module.php?id=1016

5) General Information

All COMET lessons and the MetEd website rely on JavaScript, and some lessons rely on Adobe® Flash® for navigation, animation, and/or presentation of multimedia elements. Ensure that you have a browser updated to its latest version with JavaScript enabled and the latest version of the Adobe Flash Player installed (http://get.adobe.com/flashplayer/). For technical support for this lesson please visit our Registration and Support FAQs at https://www.meted.ucar.edu/resources_faq.php

We welcome any comments or questions you may have regarding the content, instructional approach, or use of this lesson. Please e-mail your comments or questions to Liz Page (epage@ucar.edu) or Amy Stevermer (stevermer@comet.ucar.edu).

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