ISSN 1195-8898

CMOS

BULLETIN

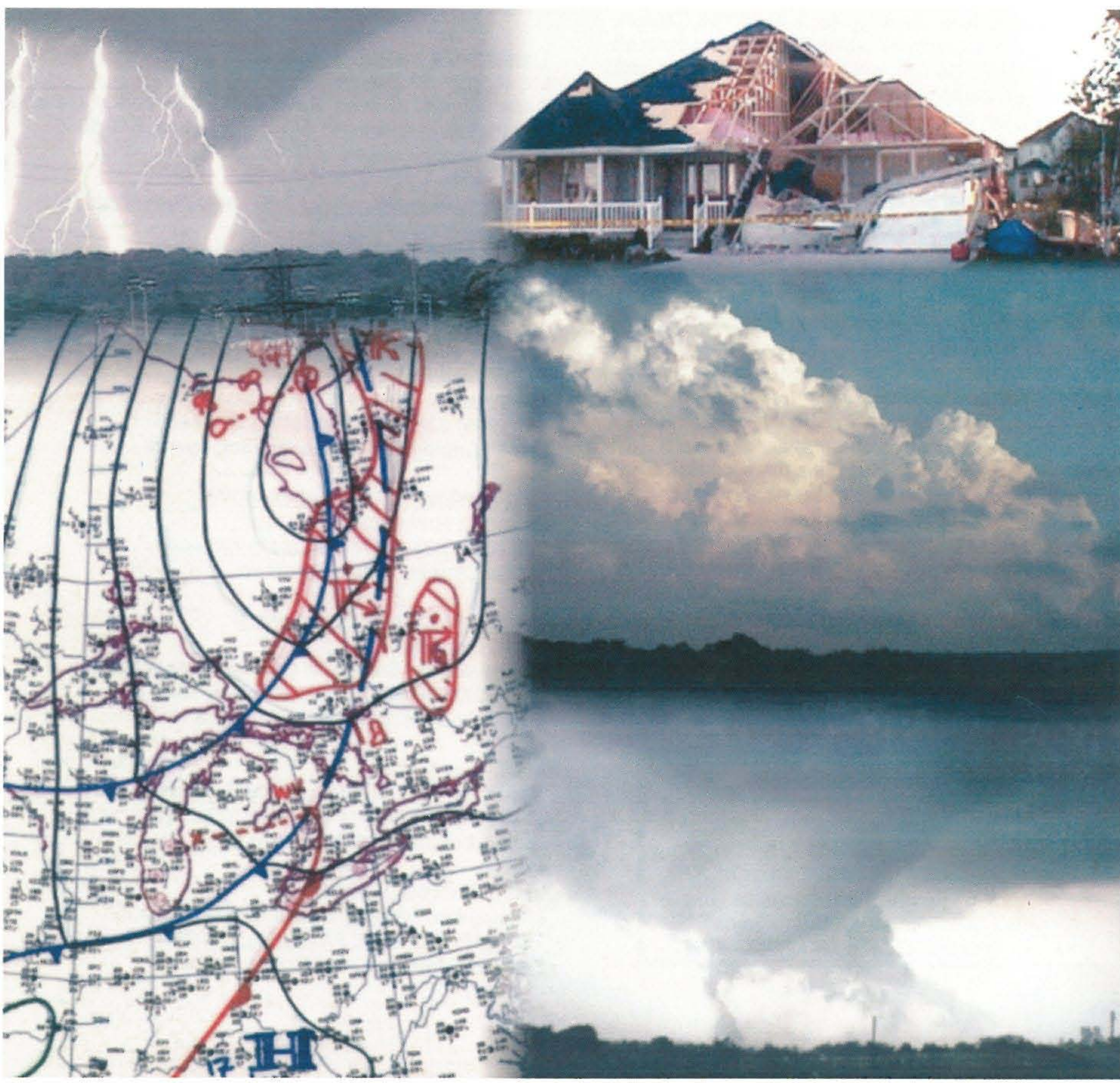
SCMO

Canadian Meteorological and Oceanographic Society

La Société canadienne de météorologie et d'océanographie

October / octobre 2000

Vol. 28 No. 5



CMOS Bulletin SCMO

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

Editor / Rédacteur: Paul-André Bolduc
Marine Environmental Data Service
Department of Fisheries and Oceans
12082 - 200 Kent Street
Ottawa, Ontario, K1A 0E6, Canada
☎ (613) 990-0300; Fax (613) 993-4658
E-Mail: paulandre.bolduc@sympatico.ca
Canadian Publications Product Sales Agreement #0869228
Envois de publications canadiennes Numéro de convention #0869228

Cover page: Composite picture. Top Left: Video capture by Bradley Ivany of the tornado in Guelph backlit by lightning (facing southeast). Bottom Left: 18Z surface analysis prepared by Phil Chadwick and Rob Kuhn showing isobars and the locations of fronts prior to the development of severe weather. Top Right: Photograph by Dave Sills of considerable structural damage to a house in Guelph. Centre Right: Photograph by Dave Sills of the supercell thunderstorm near Guelph while the tornado was still causing damage (facing southwest). The rear flank of the storm, including the main updraft region, is shown. Bottom Right: Photograph by Lesley Ord of the tornado in Guelph (facing northeast). The low-hanging cloud behind the tornado appears to be a tail cloud. To learn more, read the article on page **139**.

Page couverture: Composition d'images. En haut à gauche: Vidéo de la tornade de Guelph (vue vers le sud-est) sur un fond d'éclairs, tourné par Bradley Ivany. En bas à gauche: Analyse de surface à 18Z préparée par Phil Chadwick at Rob Kuhn montrant les isobares et la position des fronts avant que le temps violent se développe. En haut à droite: Photo par Dave Sills de dommage considérable à la structure d'une maison de Guelph. Au centre à droite: Photo par Dave Sills de la super-cellule orageuse près de Guelph au moment oû la tornade causait encore des dommages (vue vers le sud-ouest). On y voit le flanc arrière de l'orage, incluant la région du courant ascendant principal. En bas à droite: Photo par Lesley Ord de la tornade de Guelph (vue vers le nord-est). Les nuages bas traînant derrière la tornade ressemblent à un nuage de queue. Pour en savoir plus, lire l'article en page **139**.

CMOS Executive Office - Bureau de la SCMO

Suite112, McDonald Building
University of Ottawa
150 Louis-Pasteur Ave.
Ottawa, Ontario, Canada K1N 6N5
cmos@meds-sdmm.dfo-mpo.gc.ca
homepage: http://www.cmos.ca
page d'accueil: http://www.scmo.ca
Tel: (613) 990-0300; Fax: (613) 993-4658

Canadian Meteorological and Oceanographic Society (CMOS)

Société canadienne de météorologie et d'océanographie (SCMO)

Volume 28 No. 5
October 2000 - octobre 2000

Inside / En Bref

Articles

Our regular sections / Nos chroniques régulières

Printed in Ottawa, Ontario, by M.O.M. Printing
Imprimé sous les presses de M.O.M. Printing, Ottawa, Ontario.

....from the President's Desk

My first draft of the first paragraph of October's "from the President's desk" notes looked so much like the August article that I tore it up and started again - more "too much to do, too little time" whining. It does, however, highlight the fact that, for those of us involved in the Society's administration, at the national and local centre levels, and in committee and related activities, there is a lot to do, and that there are many opportunities for additional members to get involved.

The organisation of congresses is a big task for those Centres that take it on, and their success is totally dependent on the major volunteer effort that goes into them. Winnipeg Centre members have this task in hand right now for the 2001 Congress and I would urge all of our Winnipeg area members to offer their help to Jim Slipec and his core team as the event approaches.

Rimouski sera le lieu de notre congrès en 2002 et j'espère que l'exécutif du centre recevra l'aide de tous les membres de cette région. Les dix-neuf mois avant mai 2002 deviendront très actifs. Je veux remercier le centre d'avoir accepté l'invitation d'être l'hôte de ce congrès. Pour moi, un congrès à Rimouski offre l'opportunité de revoir l'emplacement de l'éolienne de Cap Chat (à quelque 100 km au nord de Rimouski). Avec les ingénieurs d'Hydro-Québec, j'étais membre de l'équipe qui a cherché un endroit pour le projet Éole à l'époque où l'énergie du vent était pris sérieusement au Canada - peut-être que cette époque va revenir? Un congrès à Rimouski est aussi une belle opportunité pour passer quelque jours en touriste dans la ville de Québec en route vers Rimouski pour ceux que ça intéresse.

Another activity where we really do need more volunteers is in outreach and school activities. Our committee on School and Public Education (SPEC) under Eldon Oja's leadership is busy with Project Atmosphere Canada - a joint MSC-CMOS activity to prepare new, and adapt existing American Meteorological Society materials for use at various levels in schools, and especially, to put on short courses to train teachers in the use of these materials. Translation of adapted AMS materials into French is another activity which will take a lot of work.

All local Centres should by now have members on SPEC, and many Centres are active in arranging school presentations and/or helping with Science Fair activities. See what you can do to help. On the Science Fair front many Centres use some of their subvention funds to donate prizes for Science Fair projects in our fields, and CMOS Council has recently approved a motion to allow the national executive to help with part of these costs.

"Outreach" has become an important issue in many ways. First in terms of the general public, there are many important environmental issues involving the atmospheric, oceanographic and hydrologic fields. Air and water quality and climate change immediately come to mind, but issues related to genetically modified foods also involve atmospheric transport of pollen, fisheries issues involve physical and chemical oceanography as well as marine biology, and so forth. Educating the public (e.g. through lecture presentations, letters to the editor, just talking to your friends and neighbours) is one aspect. Note that CMOS have issued press releases on topics such as climate change. On another front, I recently (Oct 4-5, 2000) attended a meeting of about 100 representatives of many of Canada's learned societies and scientific groups, called by Gilbert Normand, Secretary of State for Science, Research and Development. The meeting was held to discuss the creation of a "National Science Organisation", which, it is hoped, could provide government and especially the public with credible, independent assessments of the science involved in "the pressing issues of the day". It was an interesting meeting, with some divergence of opinion among many of the scientists present and those with a humanities or social science background. The main difference of opinion was whether assessments of science should be conducted by experts in that field, as input to the broader public debate (my own view), or by a broadly-based group addressing the issues from a wide scientific and societal perspective. We will see what evolves!

In terms of outreach to young people and schools, I have already mentioned the SPEC and local Centre activities, but individual members can also play an important role. If you have children at school, offer to talk to their classes on suitable, scientific topics. Most universities have speakers' lists of faculty who are prepared to go out to schools and talk. Through the York University program I gave talks this year in the context of a "literacy day" at one local high school (linking environmental issues to Salman Rushdie's book, Haroun and the Sea of Stories, and noting the fact that the real Colonel Bagnold of aeolian transport and sandstorm fame was a character in The English Patient by Michael Ondaatje). At York last year we entertained a class of about 80 Grade 5 students eager to see some meteorological measurements being made, and usually try and inject some atmospheric science into the faculty's Science Olympics program for high schools. In terms of my own 7-year old I noted that renewable energy is part of their Grade 2 program this year and have at least offered my services to make a presentation on that theme.

The October 2000 UCAR (University Corporation for Atmospheric Research) members meetings that I attended in Boulder last week also highlighted Education and Outreach, at all levels, from Pre-Kindergarten to Postgraduate. In particular, their web sites, Web Weather for Kids (www.ucar.edu/40th/webweather), and Windows to the Universe (www.windows.ucar.edu), are resources that we can all take advantage of in promoting science. At the individual level we can encourage our grandchildren, children or younger siblings to consider science as a rewarding career. Although I despair of my 7-year old's tendency to switch on the television at any opportunity, there are excellent science programmes designed for kids. Bill Nye's (NSF-supported) programme on the Hydrological Cycle happened to be on today and certainly had James' and my attention for half an hour.

An additional note on UCAR would be to congratulate Dalhousie on their acceptance as an Academic Affiliate. McGill, Toronto and York are other Canadian university members of UCAR. As the parent body for the National Center for Atmospheric Research, UCAR plays an enormous role in atmospheric science and climate studies in North America and worldwide. UCAR and its members are also extremely active and successful in promoting the interests of the sciences within US government circles and with members of Congress. I touched on this topic in the Canadian context in my August notes - and with the prospects of a federal election[1] in the near future, now is a prime time to remind MPs and candidates that science (government, university and private sector) in Canada needs their support.

On the topic of private sector meteorology, Ron Bianchi, Jim Salmon and I met with Marc Denis Everell and David Grimes of MSC to discuss, among other things, the problems that have arisen in the past over data access and competition between MSC and the private sector in bidding on commercial contracts. It was a constructive meeting and another, broader meeting is planned for later this month. I am certainly aware of the high level of frustration of some of our private sector members with MSC policies and actions, and also aware of the concerns of some of our MSC members that withdrawal from commercial activity would endanger the organisation's financial viability. From a University perspective, developing a bigger, financially healthier, private sector in meteorology and oceanographic services in Canada is highly desirable, but so is maintaining and improving the MSC. Both are our "customers" in the sense that they employ our graduates, and the "feast or famine" job market situation that has occurred in the past decade with MSC being almost the only employer, has caused, and continues to cause, problems in recruiting and retaining students in Atmospheric Science and related programs. Of course, the significantly higher salaries offered in the computing, "dot-com" and IT fields doesn't help in retaining good students either!

My impression of our first meeting was that many within MSC would like to focus on "public good" aspects of meteorology but that the Service is still partly dependent on income from the sale of data and other commercial activities. It also appears that MSC could be willing to enter into partnership arrangements with the Canadian private sector to develop markets for value-added meteorological and climatological services in Canada and abroad. My hope is that we can convince the new Assistant Deputy Minister to take advantage of the opportunity afforded by his recent appointment to create a climate of reconciliation and cooperation between MSC and the Private Sector. There are many in the private sector who have lost confidence in MSC's willingness to act in good faith, and many divisions of opinion within MSC on these issues, but it is time to resolve these conflicts.

Peter Taylor,
President / Président

1: Note from the Editor: At the time of writing, the Federal Election was not announced yet.

Letters to the Editor

16 October 2000

Summer 2000 in Canada:
The Summer that never was

The summer of 2000 was distinctly cooler than normal in most parts of Canada. For many residents of central and eastern Canada, the summer never arrived! Over southern and eastern Ontario, the summer 2000 was definitely on the cooler side and much wetter than normal. For Toronto and vicinity, there were only two days of 30°C-plus weather, a far cry from a normal of about 12-15 days of "hot summer weather" when temperature ranges from a low of about 18 to a high of about 32 or more. The Capital city, Ottawa, was struggling throughout the summer to reach 30°C and finally lost the struggle as cold air from Hudson Bay kept pushing southward week after week producing cooler and wetter weather over most of southern and central Ontario. East of Ottawa/Montréal, the months of July and August were on the cooler side, while September saw a couple of (short) warm spells for Newfoundland and New Brunswick with daytime temperatures in the mid-twenties.

The summer 2000 over western Canada was no different. It started as a wet Spring over central and eastern Prairies and later stayed relatively cooler. A small region of southwestern Alberta and parts of Saskatchewan remained very dry and warmed up moderately to produce almost drought-like conditions towards the end of summer. The westernmost province (British Columbia) saw lots of rain during early summer while the latter part of summer produced some warm weather with temperatures in the mid-twenties. Apart from a few days of "near 30°C weather" in the Okanagan valley, the summer was generally cooler over western Canada. The last week of the summer (17-24 September 2000) saw summer-like temperatures (25°C or more) over the Prairies, but those "hot" temperatures lasted only a couple of days before plummeting to low teens as another cold front pushed its way through the Canadian Prairies and spread the cooler air over southern Ontario to usher in the Fall season with temperatures in the low teens. Some localities in Northern Ontario experienced snow flurries and blustery wintry weather just two days before the official beginning of the Fall season, while several centimetres of snow blanketed the mid-western states of Montana, Wyoming and Utah on the first weekend (23-24th September) of the Fall season!

The cool summer of 2000 was somewhat reminiscent of the summer of 1992 when cooler and wetter weather prevailed over most of Ontario and eastern Canada. The cool summer of 1992 was blamed on Mount Pinatubo (in the Philippines) which erupted in June 1991 while its volcanic ash, travelling at about 20 km height along the equatorial stratospheric easterlies, spread over eastern and central Canada by the summer of 1992 producing a much cooler summer. There was, however, no simple explanation available for the cooler summer of 2000 over central and eastern Canada. According to some climatologists and operational weather forecasters, there were frequent outbreaks of cooler air from the Hudson Bay region which produced one of the wettest summers in Toronto and in many parts of southern Ontario. But it was not easy to explain why the northwesterly flow prevailed through the summer, while the southwesterly flow off Lake Ontario - which is typical of a summer weather pattern for southern Ontario - was more or less cut off. The seasonal forecast for the summer 2000 issued in early Spring 2000 by the Canadian Climate Centre in Victoria predicted a warmer summer for central and eastern Canada. Needless to say, *the forecast was a complete bust!* Without providing any explanation for the cooler summer of 2000 for the missed forecast, the climate modellers were merrily churning out trillions of numbers to predict mean temperature patterns for the year 2050 and 2100! It seems the climate modellers find it easier to predict weather patterns one hundred years into the future but not six months into the future. I wonder why?

The weather-related news items of the past summer consisted of the usual stories on floods in various parts of India and Bangladesh (during their summer Monsoon season from June through September), floods in Cambodia, Malaysia and Vietnam (almost certainly due to the continued La Niña phase of the Southern Oscillation) and floods in Korea and southern Japan as a result of a couple of typhoon landfalls. Among the extreme temperature events were a prolonged (but not record-breaking) heat wave in southwestern USA and in parts of Greece, while on the other end of the temperature spectrum, noteworthy weather events were: coldest July in France in 20 years, heavy snowfall in Argentina's southwest province with temperatures dipping down to -25°C (during the week of 8-15th September 2000) and unseasonably cooler temperatures with a bit of snow near Sydney, Australia just three weeks before the beginning of the summer Olympics there during 15-30th September 2000. The balance of evidence seemed to suggest that the summer 2000 was on the cooler side over most land-areas of the Earth.

Whatever happened to Global Warming!

Madhav L Khandekar
Consulting Meteorologist
Unionville, ON, L3R 7Z5
E-mail: mkhandekar@home.com

September 29, 2000

To: Director of Publications

It would be most helpful if the book reviews contained the full bibliographic reference of the book being reviewed so that one can move quickly from the review to a purchase order. The review of the book by Lydia Dotto does not identify either the publisher or the data of publication. The book by Kagan identifies a series title and a year. I think that perhaps the series is published by Cambridge University Press but I don't understand the reference to St-Petersburg since the Shirshov is in Moscow. Is the report by Khandekar actually available or is this more in the way of an article?

I like the Bulletin; I offer this comment in the spirit of improving the publication.

Allyn Clarke
Bedford Institute of Oceanography
PO Box 1006
Dartmouth, NS
B2Y 4A2

Answer: You are absolutely right about the three reviews you mentioned. A set of instructions for the preparation of reviews, based on your remarks, has been prepared and are available in this issue (see page 151 in English and 152 in French) of the *CMOS Bulletin SCMO*. We appreciated your comments and positive evaluation of the *CMOS Bulletin SCMO*.

Next Issue - Prochain Numéro

Next issue of the *CMOS Bulletin SCMO* will be published in December 2000. Please send your articles, notes, workshop reports or news items at the earliest to the address given on page ii. We have an **URGENT** need for your articles.

Le prochain numéro du *CMOS Bulletin SCMO* paraîtra en décembre 2000. Prière de nous faire parvenir au plus tôt vos articles, notes, rapports d'atelier ou nouvelles à l'adresse indiquée à la page ii. Nous avons un besoin **URGENT** d'articles.

Science Fair

August 28, 2000

To: Canadian Meteorological and Oceanographic Society
150 Louis Pasteur, Suite 112
McDonald Building Ottawa ON K1N 6N5

Dear Sir or Madam:

My name is Anders Toivonen. I am nine years going on ten and I live in Barrhead, Alberta. I just finished Grade 3. This was my first year in the Science Fair. I got first place in our regional fair. My science project was on tornadoes. I like them because they are very interesting.

We had 21 twisters this year in Alberta this summer, just shy of the record of 26 in 1988. The worst one was the Pine Lake one and killed twelve people.

I am writing to you just to say thank-you because I won the first place award that the Canadian Meteorological and Oceanographic Society sponsored at the Edmonton Regional Science Fair in April 2000. My cheque for $75 was put into the bank (I won $100 at the Barrhead Regional Science Fair). My favourite channel on TV is "The Weather Network" - they talk about the weather 24 hours a day, 7 days a week. If my parents let me I would watch it for 4 hours a day. When I grow up I want to be a meteorologist. I am sending a picture of me from my local paper.

Thank you.

Anders Toivonen
Box 4554, Barrhead AB
T7N 1A4

Increased Frequency of Brief Intense Rainfalls in Vancouver, B.C.[1]

by Reg Dunkley[2]

Résumé: Des ingénieurs de la ville de Vancouver en Colombie Britannique ont noté que la fréquence des tempêtes de pluie, reliée à des épisodes d'inondation à l'intérieur de la ville, a augmenté au cours des années antérieures. Afin d'avoir une meilleure idée de ce qui se passe en rapport avec cette constatation, la Division du design des égouts a demandé à Environnement Canada de mettre à jour les courbes de référence des chutes de pluie en rapport avec l'Intensité, la Durée et la Fréquence (IDF), pour l'Aéroport international de Vancouver. Ces courbes de références évaluent la période de récurrence pour des durées et intensités de chutes de pluie variées. Les premières courbes de référence, établies à partir de données de 1953 à 1990, ont été mises à jour en utilisant celles de 1953 à 1995. Au lieu d'indiquer une tendance pour des périodes de récurrence plus courtes, la mise à jour des courbes de référence IDF a montré que les périodes de récurrence sont légèrement plus longues. Puisque les périodes de récurrence plus longues correspondent à une réduction d'inondation, les courbes de références mises à jour contredisent l'expérience faite par la Division du design des égouts. En conclusion, la ville de Vancouver a réclamé d'Environnement Canada de faire des études additionnelles en rapport avec la tendance des épisodes de fortes chutes de pluie pour Vancouver.

Introduction

Engineers from the City of Vancouver, British Columbia noticed that the frequency of rainstorm-related flooding episodes within the City had increased in recent years. In order to gain further insight into this behavior, the Sewer Design Division requested Environment Canada to update the standard Intensity Duration Frequency (IDF) rainfall statistics for Vancouver International Airport. These statistics estimate the return period for various rainfall intensities and durations. The initial statistics, based on data from 1953 to 1990, were updated using data from 1953 to 1995. Instead of indicating a trend to shorter return periods, the updated IDF statistics suggested that return periods were slightly longer. Since longer return periods correspond to a reduction in flooding, these updated statistics contradict the experience of the Sewer Design Division. As a result, the City of Vancouver requested Environment Canada to further investigate the trend of heavy rainfall episodes for Vancouver.

An Alternate Approach

The IDF values are derived from an "annual" statistical technique which, for a particular duration, only utilizes the greatest observed rainfall intensity for each year. This method can exclude major rainfall events where the reported intensities are below the annual maximum but are still significant. As an alternate approach, this study will examine the number of days each year when rainfall intensities exceed certain thresholds.

Meteorological investigations of some of the recent Vancouver flooding episodes found that these incidents were usually associated with intense downpours lasting less than one hour. As a result, this study focused on rainfall durations of 10 minutes, 15 minutes and 30 minutes in length. Vancouver International Airport was selected because it has a relatively long continuous record of high quality rainfall intensity data. The tipping bucket rain gauge site was unaltered during the 1961 to 1996 period and no large structures were constructed in the immediate vicinity. Consistent data quality control procedures were followed during this interval and a correction factor using daily measurements from an adjacent standard rain gauge was applied to the data.

Vancouver International Airport is situated at sea level on the Fraser River Delta just to the south of the City of Vancouver. A broad, low-level ridge lies between the Airport and Vancouver Harbour. The Coast Mountains abruptly rise from the North Shore of this harbour. The growing suburban municipality of Richmond is located on the Fraser Delta immediately to the southeast of the airport. Most precipitation events are associated with a southeasterly circulation and this results in an up-slope flow which also induces low level convergence. These effects enhance rainfall to the north of the airport and annual precipitation amounts in parts of North Shore are more than double those observed at the airport.

---

[1]Paper appeared in a slightly different form in the preprints of the AMS 11th Conference on Applied Climatology, 10-15 January, 1999 in Dallas, Texas. Paper presented at the CMOS Conference, Victoria, B.C. in May 2000.

[2]Environment Canada, Vancouver, British Columbia

The Data Analysis

The archived tipping bucket rainfall intensity data for Vancouver International Airport consisted of values of the daily maximum rainfall amounts for each of the standard duration periods (5, 10, 15, 30 and 60-minute intervals as well as 2, 6, 12 and 24-hour intervals). Data from the 36 year period 1961 to 1996 were used in this study. For each year, the number of days when the rainfall intensity exceeded 10 mm/hour was determined. Graphs of the "Number of Days When Rainfall Intensity Exceeded 10mm/hour vs Year" were plotted for each duration period (Figure I). An examination of Figure I reveals the following:

- Although the graphs appeared to be noisy, for each duration period, there tended to be a spike in the early 80s and a sustained period between 1988 and 1994 where the number of exceedances was well above normal.

- The number of exceedances tended to be lower than average during the early 1970s.

Some of the short-term fluctuations in the data were filtered out by applying a 5-year running mean to the series. The range of the data was reduced from the interval 1961-1996 to 1963-1994. The results for each duration are graphed in Figure II which reveals the following:

- There tended to be a greater number of occurrences after 1977.

- For each duration there was a peak in the early 1980s.

- There is an increasing trend in the late 1980s followed by plateau in the 1990s where the number of exceedances for 15-minute and 30-minute durations were nearly double the number experienced from the mid-1960s to the mid-1970s.

It is also of interest to analyze the data in terms of coarser time scales. For instance, when considering decade time periods, it is insightful to total up the number of exceedances for Vancouver Airport on a 10-year interval as was done in Table I.

Table I reveals some major trends. For all duration intervals, there was a substantial increase in rainfall intensity when the decade ending in 1976 was compared to the decade ending in 1986. For 15 and 30-minute durations, this increasing trend continued and the number of days for the decade ending in 1996 were nearly double the number of days for the decade ending in 1976.

Table I

Number of Days When Rainfall Intensity Exceeded 10mm/hr Vancouver International Airport

Duration	5-min	10-min	15-min	30-min	60-min
1967-1976	108	66	45	14	2
1977-1986	210	107	69	24	6
1987-1996	200	107	87	35	6

Figures I and II, together with Table I, indicate that the occurrence of intense rainfall at Vancouver International Airport for 15 and 30-minute durations since 1988 were well above normal. This supports the observations made by the Sewer Design Division.

Discussion

This trend toward more frequent intense rainfalls at Vancouver is intriguing. Could this change simply result from the randomness of convective weather? Perhaps it is a response to interdecadal variations in the climate. Could this be one of the signals of global warming? It is beyond the scope of this study to provide answers to these questions but some further examination has been included.

Trenberth (1990) detected an interdecadal variation in the climate when he compared a time series of mean North Pacific sea-level pressures and sea surface temperature anomalies between the intervals 1946-76 and 1977-87. He found that there was a significant difference between these two samples. Ebbesmeyer et al (1991) also identified forty environmental changes which occurred around 1976. An inspection of Figure I and Figure II suggests that intense rainfalls tended to be more frequent after 1976 and this coincides with the time when the North Pacific pressure pattern underwent a step-like change.

A standard normal test was used to compare the intervals 1961-76 and 1977-96 for 10-minute, 15-minute and 30-minute duration rainfalls. The standard normal test revealed that for 10-minute duration rainfalls the difference between these groups would occur by chance 5 times in 10000. For 15-minute duration rainfalls this difference would occur by chance 9 times in 10,000. For 30-minute duration rainfalls this difference would occur by chance 48 times in 10000. These values are lower than the generally accepted significance level of 500 times in 10,000 (5%) and therefore the standard normal test suggests that the differences between these intervals are indeed statistically significant.

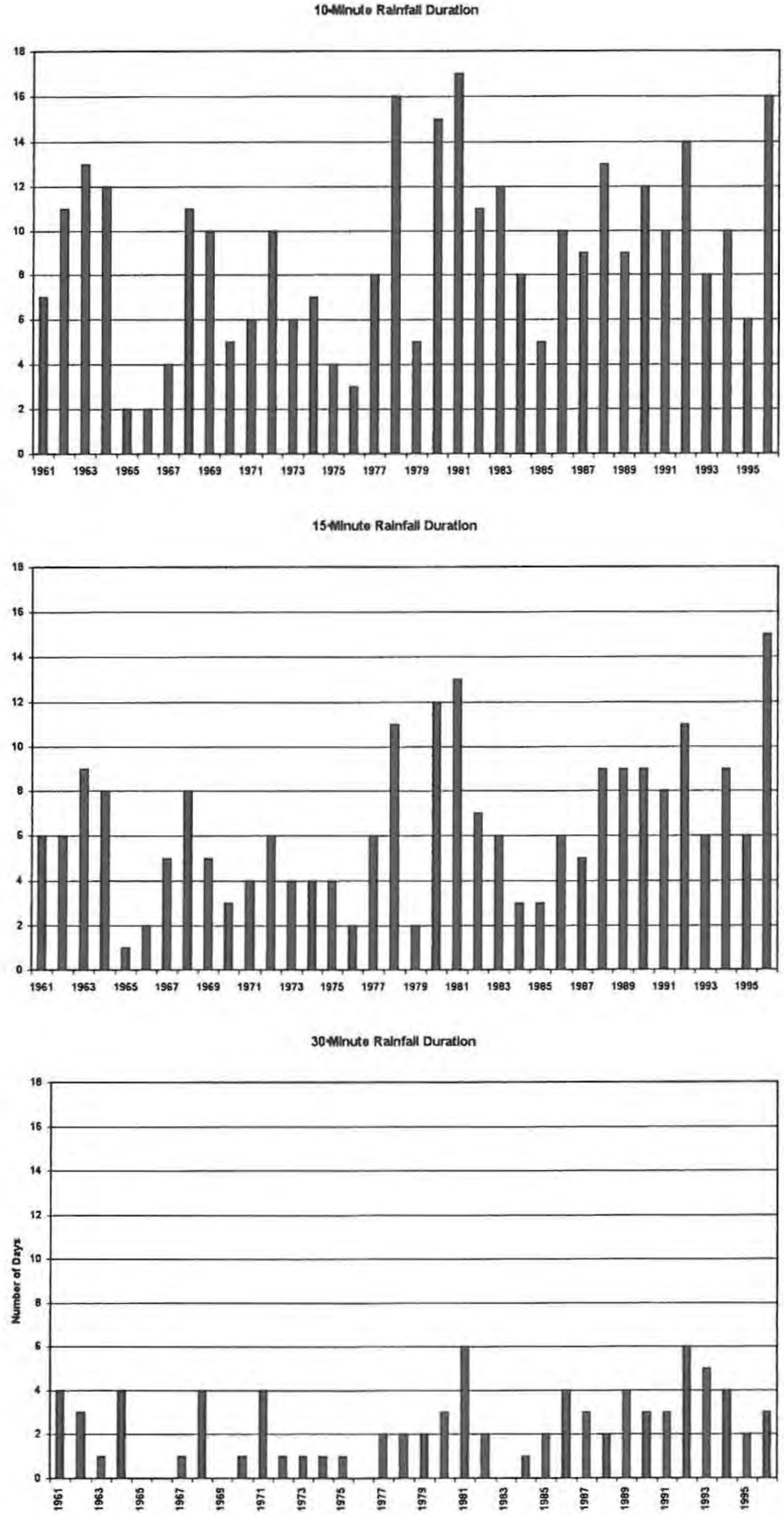


Figure I: Number of Days when Rainfall Intensity Exceeded 10mm/hr at Vancouver International Airport

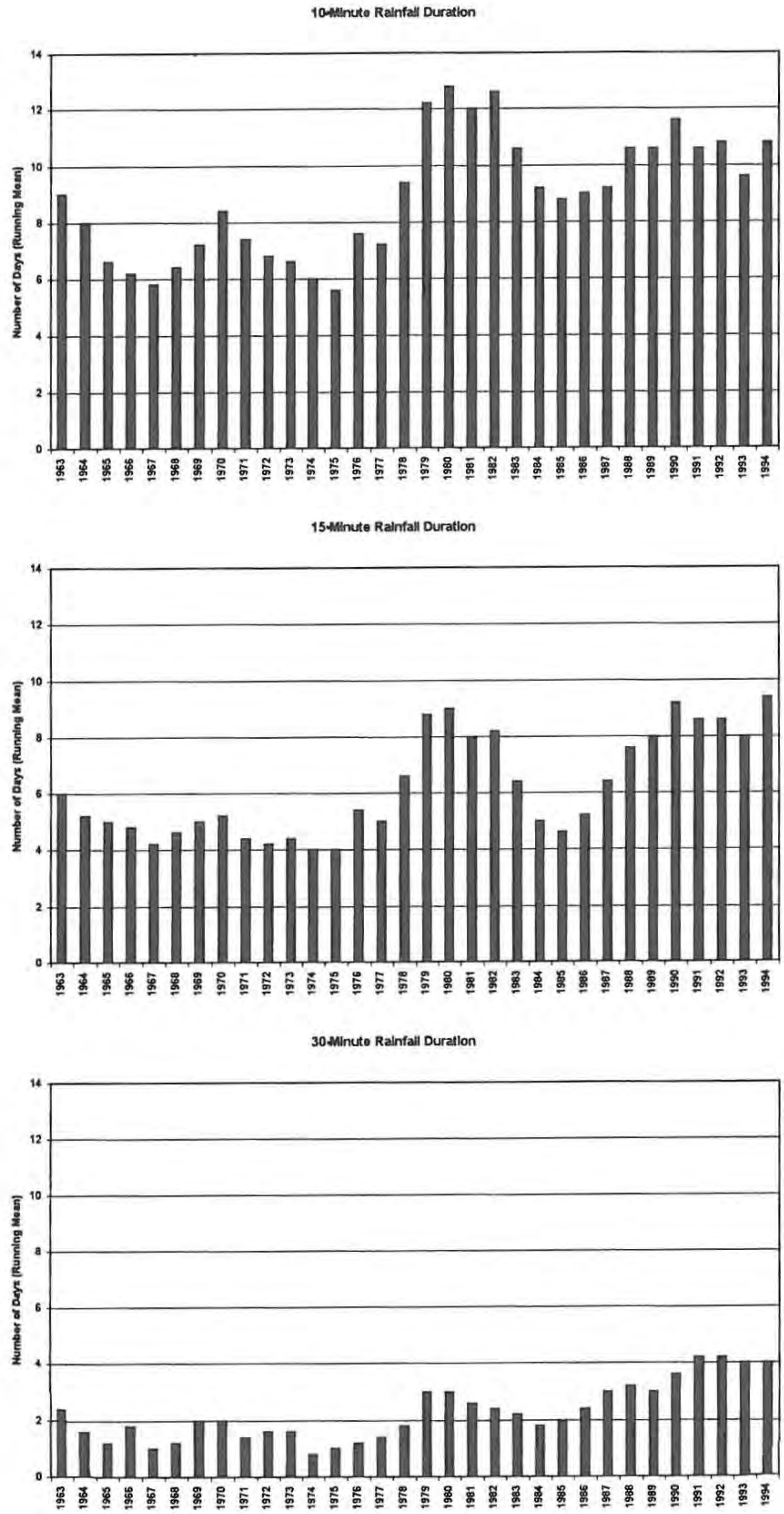
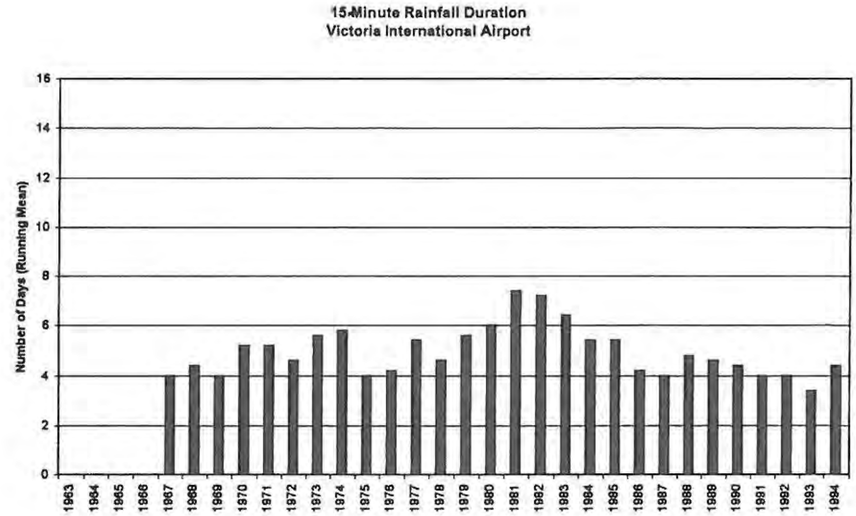
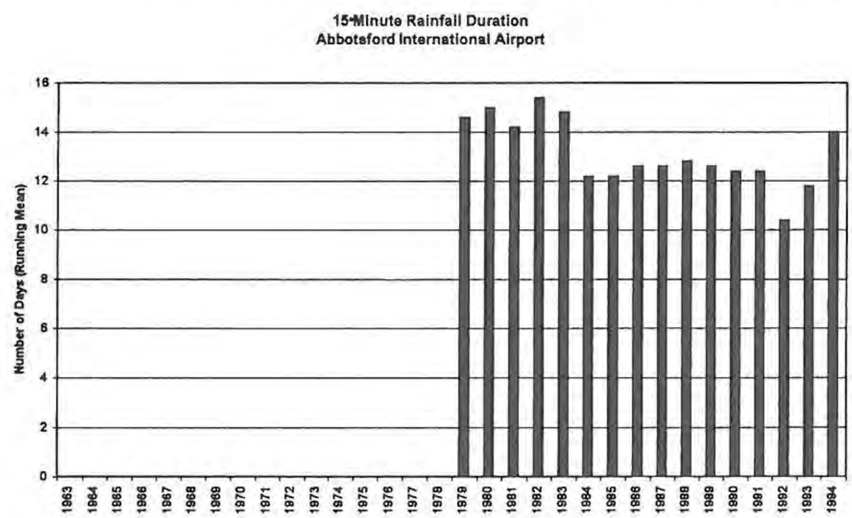


Figure II: Number of Days when Rainfall Intensity Exceeded 10mm/hr Using a 5-Year Running Mean at Vancouver International Airport





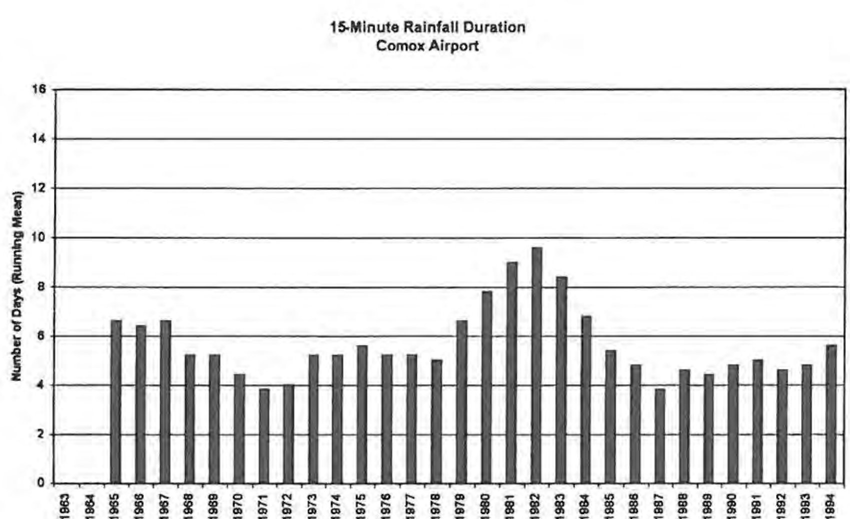


Figure III: Number of Days when Rainfall Intensity Exceeded 10mm/hr Using a 5-Year Running Mean and 15-Minute Rainfall Duration at Neighbouring South Coast Stations

It is conceivable that changes in North Pacific pressure patterns and corresponding circulation variations may have contributed to the observed change in the frequency of intense rainfalls at Vancouver Airport. If this was the case then one may expect that neighbouring stations would exhibit similar trends. To investigate this, 15-minute duration rainfall data for three nearby Environment Canada stations, Victoria International Airport, Abbotsford Airport and Comox Airport have been analyzed in the same manner as Vancouver Airport. The 5-year running mean of the "Number of Days When Rainfall Intensity Exceeded 10 mm/hr" have been plotted in Figure III. An examination of Figure III reveals that each station experienced a peak in the early 1980s but none of the other stations experienced the increasing trend in the late 1980s or the plateau in the 1990s that Vancouver International Airport measured.

While a change in circulation in complex terrain may affect stations differently, the lack of a similar increasing trend by neighboring stations is rather surprising. It suggests that the increased frequency of intense precipitation observed in Vancouver may be localized. One factor, which may have contributed to this trend, is the impact of urbanization and development. The rate and scale of development in the Greater Vancouver area is more pronounced than it is in Victoria, Abbotsford or Comox. For instance, increased pavement in municipalities surrounding Vancouver Airport may result in increased daytime heating, which could trigger more convective rainstorms.

Summary

This study demonstrated that it was beneficial to examine the daily maximum rainfall intensity values rather than just using a single maximum value for each year. The following conclusions and observations can be made from the data analysis:

- Analysis of the rainfall intensity data for Vancouver International Airport revealed that the frequency of rainfall intensity for the period 1988 to 1994 was well above normal. For 15 and 30-minute rainfall durations, the number of days when the intensity exceeded 10mm/hour was nearly double that experienced from the mid-1960s to the mid-1970s.

- A comparison with rainfall measurements taken at airports in Victoria, Abbotsford and Comox did not show a similar trend which suggests that the recent changes in Vancouver were localized. It remains unknown whether this observed increase in frequency at Vancouver involves an inter-decadal variation in climate or global warming.

- It is not obvious what elevated the frequency of intense rainfall events in the 1980s and through the 1990s in Vancouver but it is conceivable that increased urbanization and development played a role.

It would be interesting to conduct a similar analysis using rainfall intensity data from stations surrounding other urban areas.

Acknowledgments

I would like to acknowledge the statistical advice provided by John Bentley of Simon Fraser University, Burnaby B.C.

References

Ebbesymeyer, C.C. et al, 1976: *Step in the Pacific Climate: Forty Environmental Changes Between 1968-1975 and 1977-1984.* Proceedings of the Seventh Annual Pacific Climate (PACLIM) Workshop, California Dept of Water Resources. Interagency Ecological Studies Program Technical Report 26, 1991.

Trenberth, K.E., 1990: *Recent Observed Interdecadal Climate Changes in the Northern Hemisphere.* Bull. American Meteor. Soc., 71, 988-993.

Tornadoes Strike Southern Ontario - 17 July 2000

by Rebecca Schneider[1] and David Sills[2]

Résumé: Lorsqu'on parle de tornades, on pense tout probablement au corridor des tornades dans la région du Midwest des États-Unis. Cependant, comme la tornade de Pine Lake en Alberta l'a démontrée le 15 juillet 2000, le Canada possède sa part de conditions propices aux tornades. Ce fut le cas, lorsque le sud de l'Ontario a été frappé par plusieurs tornades, deux jours seulement après la tornade de Pine Lake.

La situation météorologique sur le sud de l'Ontario, le matin du 17 juillet, n'est pas apparue potentiellement violente de prime abord. Cependant, avant la fin de la journée, de multiples supercellules orageuses ont frappé le sud de l'Ontario dont quelques-unes ont provoqué des tornades. La première tornade a eu lieu près de Melduf situé sur le nord du comté de Simcoe près de la rive sud de la baie Georgienne (voir la figure 1 pour la localisation des lieux). Une seconde tornade s'est manifestée près de Beeton situé sur le sud du comté de Simcoe, à l'intérieur des terres à partir du lac Simcoe. Plus tard, une troisième tornade a frappé Guelph situé dans le comté de Wellington, à l'intérieur des terres à partir de l'extrémité occidentale du lac Ontario. Des photos de la supercellule et de la tornade de Guelph sont montrés sur la page couverture.

1. Introduction

At the mention of tornadoes, one probably thinks of 'tornado alley' in the mid-western United States. Yet, as the Pine Lake tornado in Alberta demonstrated on 15 July 2000, Canada also gets its share of tornadic activity. This was also the case a mere two days after the Pine Lake event when several tornadoes struck southern Ontario.

The weather situation on the morning of July 17th in southern Ontario did not at first appear to be potentially severe. However, by the end of the day, multiple supercell thunderstorms struck southern Ontario, some of which produced tornadoes. The first tornado occurred near Melduf, which is located in northern Simcoe County near the south shore of Georgian Bay (see Figure 1 for locations). A second tornado occurred near Beeton in southern Simcoe County inland from Lake Simcoe. A third tornado later struck Guelph, which is located in Wellington County inland from the western end of Lake Ontario. Pictures of the Guelph supercell thunderstorm and tornado are shown on the cover.

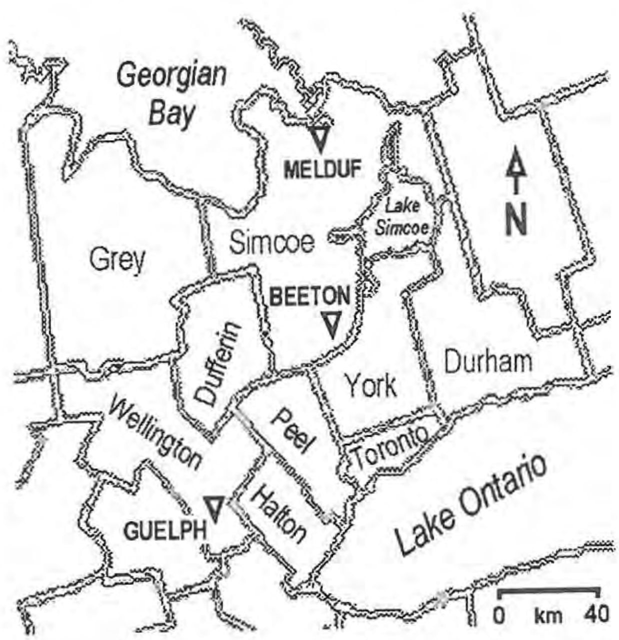


Figure 1. Map of selected counties / regions in southern Ontario. The locations of the Melduf, Beeton and Guelph tornadoes are labelled

2. Chronology of Events for July 17th

The 12Z map prepared by Environment Canada severe weather meteorologists Phil Chadwick and Rob Kuhn at RCTO (Regional Centre Toronto) (see cover page) shows a polar wave centred over southwestern Michigan with a narrow warm sector to the southwest and a trowal (trough of warm air aloft) extending to the northeast. The highest dew points in the warm sector were up to 21°C while surrounding dew points were no higher than 17°C. The wave was forecast to dive south of southern Ontario, and possibly be 'pinched off', so the meteorologists were not too concerned about its potential to cause severe weather. As well, pressure over southwestern Ontario was rising on the 12Z surface map supporting the forecast track of the wave (one would have expected falling pressures to precede the wave if it was going to track northeastward).

[1]MSC-Ontario Region (summer student), Environment Canada, Downsview, ON

[2]MSC-Meteorological Research Branch, Environment Canada, King City, ON

Time (EDT)	Bulletin Type	County / Region
16:21hour	Special Weather Statement	Southern Ontario
16:28 hour	Severe Thunderstorm Warning	Simcoe County
16:50 hour	Severe Thunderstorm Watch	Toronto, Waterloo-Wellington-Dufferin, Halton-Peel, York-Durham, Huron-Perth, Grey-Bruce, Barrie-Huronia
17:11 hour	Severe Thunderstorm Warning	York, Dufferin, Wellington, Eastern Grey, Simcoe
17:19 hour	Tornado Warning	Eastern Grey, Simcoe
18:22 hour	Tornado Warning	Dufferin, northern York, Simcoe
18:49 hour	Severe Thunderstorm Warning	Toronto, Peel, Durham, York, Wellington
19:11 hour	Severe Thunderstorm Watch	Hamilton-Wentworth, Brantford-Haldimand-Norfolk, Niagara, Toronto, Waterloo-Wellington-Dufferin, Halton-Peel, York-Durham, Huron-Perth, Barrie-Huronia
20:35 hour	Severe Thunderstorm Warning	Halton, Toronto, Peel, Durham, York, Wellington
20:53 hour	Severe Thunderstorm Watch	Toronto, Niagara, Hamilton-Wentworth, Halton-Peel, York-Durham
21:33 hour	Severe Thunderstorm Watch	Niagara
22:02 hour	General Weather Statement	Ontario

Table 1. Bulletins issued by RCTO for southern Ontario on 17 July 2000. Note that the table indicates the time at which a watch / warning was *continued* if a watch / warning had already been issued

Time (EDT)	Event Description	Location (County / Region)
16:30 hour	45 mm diameter hail	Penetang (Simcoe)
16:30 hour	25-50 mm hail seen by pilot and storm spotter	Midland (Simcoe)
16:45 hour	Numerous large trees down	Rugby (Simcoe)
17:30 hour	Several hundred trees down, large hay bales tossed up to 250 m, large aluminum shed moved	Melduf (Simcoe)
17:37 hour	Flash flooding and small hail	Rama (Grey)
18:00 hour	90 km/h winds, 12 mm hail	Ruskview (Simcoe)
18:50 hour	Funnel cloud spotted	Innisfil (Simcoe)
18:55 hour	20 mm hail	Beeton (Simcoe)
19:15 hour	Tornado spotted	Beeton (Simcoe)
19:20 hour	45 mm hail	Schomberg (York)
19:25 hour	Funnel clouds spotted	Maple (York)
20:00 - 20:35 hour	Tornado and funnel clouds spotted, trees down, cars damaged, homes and church damaged	Guelph (Wellington)
20:30 hour	50 mm hail	Richmond Hill (York)
21:00 hour	Funnel cloud spotted	Burlington (Halton)

Table 2. Selected severe weather reports received at RCTO on 17 July 2000

Between 16Z and 17Z, the convective available potential energy in the wave's warm sector was estimated to be approximately 2000 to 2500 J kg^{-1}. As well, dew points over the thumb of Michigan and southwestern Ontario were rising. After the 18Z surface map was analyzed, it was clear that the wave was pushing northeast, not southeast as forecast. In addition to the rising dew points and the incoming wave, lake breezes had developed over each of the Great Lakes as well as over Lake St. Clair and Lake Simcoe. Lake breezes suppress convection over the lakes and near-shore regions due to the extremely stable marine air they circulate. However, they also enhance lift, moisture and local vorticity along their leading edges or 'lake breeze fronts'. Thus, the combination of high buoyant energies, rising dew points in the warm sector, the incoming wave and the lake breezes, prompted the meteorologists to re-assess the situation as one that could become severe. Indeed, when the first thunderstorm developed over central Lake Huron in the mid-afternoon, the stage was set for the ensuing weather event. By the end of the day, RCTO had received numerous reports of severe weather including strong wind gusts, heavy rain, hail up to 50 mm in diameter, and several tornadoes.

The chronology of this severe weather event as it was monitored on July 17th can be seen in the following two tables. These tables list the bulletins issued by RCTO for southern Ontario as well as selected severe weather reports received by RCTO during the event. The map in Figure 1 shows the locations of counties / regions and some of the damage sites referred to in the tables. Both a severe thunderstorm warning and a tornado warning were issued prior to the Melduf and Beeton tornadoes in Simcoe County with lead times of about 60 and 180 minutes, respectively, for the severe thunderstorm warning, and about 10 and 120 minutes, respectively, for the tornado warning. A severe thunderstorm warning was first issued for Wellington County at 1711 EDT giving a lead time of about 180 minutes for the Guelph tornado. Note that a tornado warning was not issued prior to this event. However, a standard mention of the possibility of tornadoes was included with the severe thunderstorm warning.

3. Damage Investigations

A team from Environment Canada (Dave Sills, Phil Chadwick, Caroline Floyd, Paul Campbell) was sent to investigate the damage in Guelph. Evidence of tornadic activity included a narrow damage path with indications of rotation and photographs and video of the tornado. The heaviest damage, consistent with F2 intensity on the Fujita scale (Fujita, 1981), began just south of Arkell Road and included considerable structural damage to houses (see example on cover page) and barns as well as numerous large trees snapped and uprooted). Damage from missiles was also evident in this area.

The tornado track was found to begin in central Guelph near Silvercreek Park. Video evidence puts the tornado at this location near 2012 EDT. The tornado moved from approximately 310° through southern Guelph and northern Puslinch Township and dissipated shortly after 2035 EDT just north of Highway 401. The entire track was approximately 13 km in length and its maximum width was 600 m.

From photo and video evidence, it appears that for most of its life, the tornado consisted of a cone-shaped funnel that extended about half way from the cloud base to the ground. Only occasionally did the funnel cloud make contact with the surface (examples are shown on the cover page). However, dust and debris could be seen under the funnel cloud through much of its track. There were several other low-hanging clouds that nearly reached ground level but did not appear to rotate. These may have led to the many reports of multiple funnel clouds with this storm. Initially, damage tracks and witness reports appeared to indicate two separate tornadoes but video evidence obtained after the initial investigation confirmed that the damage was the result of only one.

One person reportedly suffered a minor injury although one witness described seeing a cyclist thrown from his bicycle by the tornado. Damage was estimated by Guelph officials at over $2 000 000. Damage survey reports were prepared (Sills and Campbell, 2000; Chadwick and Floyd, 2000) and are available via the Toronto weather office.

Another damage investigation by Dave Sills found a narrow damage path and evidence of rotation about 2 km southeast of Melduf. No photograph or video evidence was available for this event. Damage included several hundred trees, including large trees, that were snapped or uprooted, a large aluminum shed that was destroyed, and large bales of hay weighing several hundred kilograms that were lifted and moved several hundred metres. It was concluded that the damage was consistent with a tornado of F1 intensity on the Fujita scale. It appears that the tornado occurred near 1730 EDT with a path length of approximately 3 km and a maximum path width of 400 m. The tornado moved from 315°, nearly the same direction as the Guelph tornado. Damage from this tornado was estimated at $10 000 and there were no injuries.

Only very minor damage was reported with the tornado near Beeton so no investigation was undertaken. However, the witness account clearly describes a very weak and brief tornado. We have thus assessed this tornado at F0 intensity.

A third on-site investigation was conducted in Burlington since a storm spotter reported a funnel cloud in the area but no damage could be found.

4. Discussion

Looking at these events climatologically, the F2 tornado in Guelph was only the second F2 tornado to hit Ontario so far this year (a tornado on May 23rd in Appin, southwest of London, was also assessed at F2 and caused over $1 000 000 in damages). As well, no tornadoes of F3 intensity or higher have occurred in Ontario since 1996.

However, strong tornadoes in the Guelph area are not unusual. On 4 August 1999, an F2 tornado tracked from south of Guelph to Burlington. Further, on 2 June 1998, an F2 tornado hit Norwich, located roughly 70 km to the south-southwest of Guelph. Later that year, on 30 June 1998, Guelph was hit by an F2 tornado. In fact, this F2 tornado struck the same subdivision as the 17 July 2000 F2 tornado. An F3 tornado also struck Wellington County on 20 April 1996 in Arthur, situated approximately 40 km to the north-northwest of Guelph. Additionally, from 1979-1998 the region of Waterloo-Wellington-Dufferin recorded 98 severe thunderstorm events. (See the Appendix for the definition of severe thunderstorm as used at RCTO). Of these events, 25 were reports of tornadoes, 24 of which were confirmed and ranged in intensity from F0 to F3.

The tornadoes in Melduf and Beeton, both in Simcoe County, were also not rarities. In fact, the public region of Barrie-Huronia (which encompasses Simcoe County) has 136 severe thunderstorm events recorded from 1979-1998. Of these 136 events, 21 are reports of tornadoes, 16 of which were confirmed and ranged in intensity from F0 to F4. On 2 June 1998, an F2 tornado hit Elmvale, located 30 km north-northwest of Barrie. As well, the infamous Barrie tornado occurred on 31 May 1985. This tornado was identified as having F4 intensity on the Fujita scale. It claimed eight lives and left tens of millions of dollars in damage in its wake.

One of the most interesting aspects of this event is the significant role that appears to have been played by lake breezes. On days with a moderate southwest synoptic-scale wind (including July 17th), convective suppression due to lake breeze circulations tends to confine most severe convective activity to a swath running roughly from Windsor to Barrie. Lake breeze fronts, stretched far inland by the southwesterly winds, have a strong influence on where within that swath storms develop and are most intense. Also, it is possible that enhanced vertical vorticity along these fronts and other low-level boundaries may have been critical to tornado formation. Indeed, at least two of the tornadoes on this day appear to have occurred in the vicinity of a lake breeze front. A more detailed investigation of the role of lake breezes on this day will be undertaken. In addition, a pilot research project was conducted in 1997 to investigate the role of lake breezes in severe weather in this area (King *et al.*, 1999) and an expanded project is being planned for summer 2001.

5. Summary

Supercell thunderstorms that occurred over southern Ontario on 17 July 2000 generated three tornadoes: an F1 tornado near Melduf, an F0 tornado near Beeton, and an F2 tornado in Guelph. The Melduf tornado occurred near 1730 EDT, and left behind an estimated $10 000 in damages, though no injuries were reported. The Beeton F0 tornado occurred at about 1915 EDT and was associated with only very minor damage. Guelph's F2 tornado was the most destructive of the day and left behind $2 000 000 in damages and one minor injury. Both the Melduf and Beeton tornadoes were preceded by a tornado warning (by 10 and 120 minutes respectively). A severe thunderstorm warning was disseminated before the Guelph tornado with a lead time of about 180 minutes. Climatologically, these tornadoes were not unusual since this region experiences several F0-F2 tornadoes per year. Lake breezes appeared to play a significant role in the development of the severe thunderstorms, and possibly even the tornadoes, on this day.

Acknowledgements

Thanks to Fred Conway, Phil Chadwick, Rob Kuhn and Caroline Floyd for assistance with this document.

References

Fujita, T.T. 1981. Tornadoes and Downbursts in the Context of Generalized Planetary Scales. *J. Atmos. Sci.* **38**: 1511-1534.

Floyd, C. and P. Chadwick. 2000. 17 July 2000 Guelph Tornado Damage Survey Report #2. Internal HTML Document.

King, P. and D. Sills, D. Hudak, P. Joe, N. Donaldson, P. Taylor, X. Qiu, P. Rodriguez, M. Leduc, R. Synergy and P. Stalker. 1999. ELBOW: *An Experiment to Study the Effects of Lake Breeze on Weather in Southern Ontario. CMOS Bulletin* **27**:35-41.

Sills, D. and P. Campbell. 2000. *17 July 2000 Guelph Tornado Damage Survey Report #1.* Internal HTML Document.

Sills, D. 2000. *17 July 2000 Melduf Tornado Damage Survey Report*. Internal HTML Document.

Appendix

In Ontario, the criteria used for severe thunderstorms are:

- Tornadoes;
- Hail greater than 20 mm or more in diameter;
- Damaging thunderstorm wind gusts or, if winds measured, gusts greater than 90 km h^{-1};
- Flooding downpours of 50 mm or more in one hour or 75 mm or more in three hours, or damaging flooding.

UBC neural network model forecasts near normal winter conditions in the tropical Pacific

by William W. Hsieh and Benyang Tang[3]

Résumé: Après deux hivers La Niña, les températures de surface de la mer (SST) dans le Pacifique équatorial de la région Niño 3.4 demeurent légèrement froides et on prédit qu'elles resteront légèrement froides pour l'hiver qui vient. La Figure 1 illustre notre dernière prédiction des anomalies de SST pour la région Niño 3.4 pour des délais de 3, 6, 9, et 12 mois, utilisant un modèle réseau neuronal en employant des données jusqu'au mois d'août 2000. Les prédictions avec un délai de 9 et 12 mois indiquent que les conditions légèrement plus froides que la normale dans le Pacifique équatorial demeureront jusqu'au milieu de l'an 2001. Les prédictions sont mises-à-jour à tous les trois mois sur notre site web: www.ocgy.ubc.ca/projects/clim.pred.

After two La Niña winters, the sea surface temperatures (SST) in the equatorial Pacific Niño3.4 region remain slightly cool, and are forecasted to be normal to slightly cool for this coming winter. Fig.1 shows our latest forecast of the Niño3.4 SST anomalies at leadtimes of 3, 6, 9, and 12 months, using a neural network model trained with data up to the end of August 2000. Forecasts at 9 and 12-month leadtimes indicate that normal to slightly cool conditions in the tropical Pacific will remain until the middle of 2001. The forecasts are updated quarterly on our web site: www.ocgy.ubc.ca/projects/clim.pred.

This forecast model uses neural networks (NN) as nonlinear regression. Recently, NN models for nonlinear principal component analysis (NLPCA), i.e. nonlinear EOF analysis, and nonlinear canonical correlation analysis (NLCCA) have been developed. We plan to make them freely downloadable from our web site by the end of this year. Meanwhile, work is underway to upgrade the current forecast model to an NLCCA model, which will allow us to forecast the whole tropical Pacific SST field instead of just the SST in the Niño3.4 region.

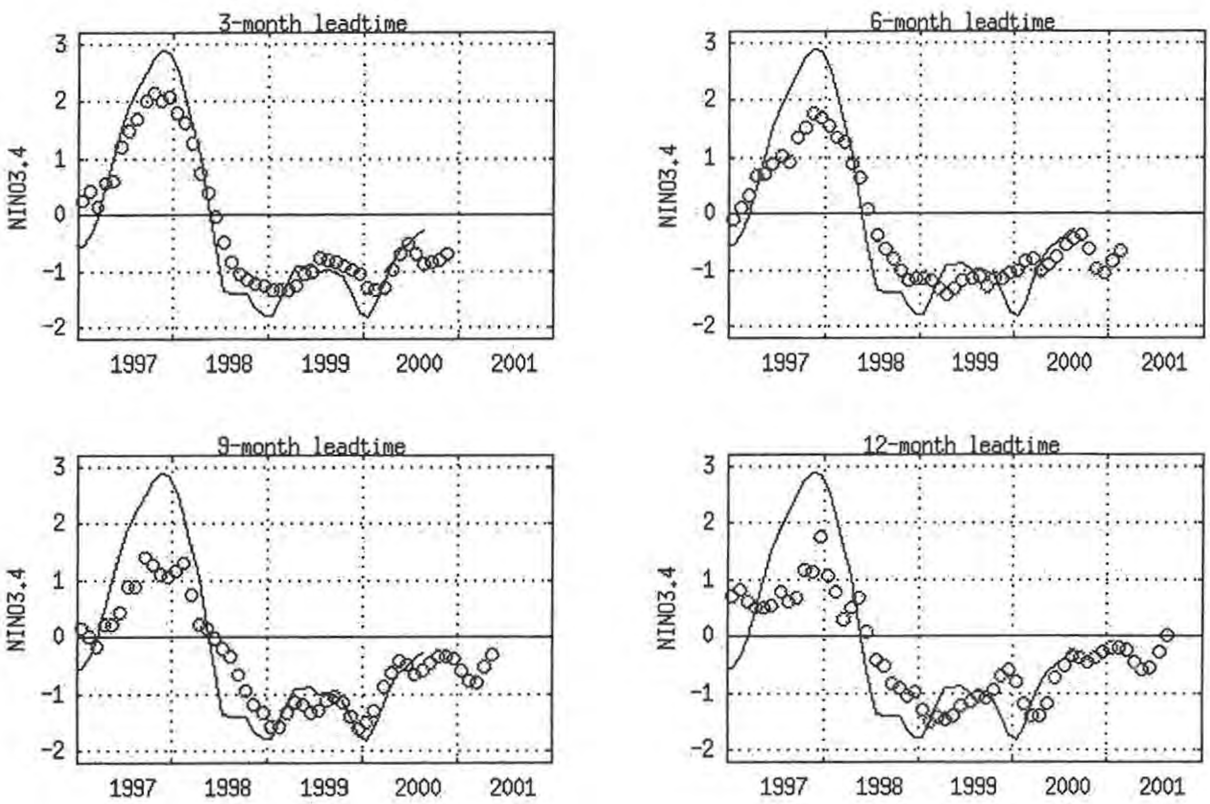


Figure 1: Forecasts of the Niño3.4 SST anomalies (in degrees Celsius) at 3, 6, 9, and 12-month leadtimes. The solid curve shows the observed values and the circles, the predicted values.

---

[3] Oceanography/EOS, University of British Columbia, Vancouver, B.C.

The Canadian Climate Research Network[4]

by Ian Rutherford[5]

Résumé: Pour plusieurs dans la communauté canadienne de la recherche sur le climat, le Réseau de recherche du climat est bien connu. D'autres, dont le travail ne les amène pas en contact direct avec le Réseau, ne sont peut-être pas au courant du rôle prédominant qu'il joue dans la recherche du climat au Canada. Le Réseau fonctionne relativement dans le silence de sorte qu'il est important de temps à autres de mettre en lumière sa vision et ses réalisations dans l'optique de comprendre ses contributions aux plusieurs questions importantes entourant le changement et la variabilité climatique qui envahit de nos jours tout processus décisionnel.

To many in the Canadian climate research community, the Climate Research Network is well known. Others, whose work does not bring them into contact with the network, may not be aware of the prominent role it plays in Canadian climate research. The network carries out its work relatively quietly so that from time to time it is important to revisit its focus and accomplishments with a view to understanding its contribution to the many important questions surrounding climate change and climate variability that pervade decision-making today.

Priorities

The research agenda for the Climate Research Network (CRN) is established by an independent Scientific Advisory Panel and in consultation with the Meteorological Service of Canada (formerly the Atmospheric Environment Service) of Environment Canada, the source of the funding. The panel, composed of respected Canadian and US scientists working in the field of climate research from both government and academic institutions, was reconstituted with broadened membership as an advisory body to the Canadian Institute for Climate Studies (CICS) in 1998. The Institute manages the network on behalf of the MSC. The current scientific priorities are to:

1. Develop computer models of the climate system that can:

> a) provide regional scale (50 km resolution) information;
> b) take into account the dynamic interaction between the ocean and the atmosphere;
> c) incorporate chemical processes;
> d) simulate the climates of previous epochs;
> e) incorporate an exchange of carbon between the atmosphere and the land/ocean surface; and
> f) resolve eddies in regional-scale ocean circulation.

2. Understand a range of processes that need to be incorporated in climate models including:

> a. how the atmosphere interacts with land surfaces;
> b. the role of clouds, aerosols and radiation.

3. Assess the nature of climatic variability on a variety of time scales.

These priorities are addressed through nine network nodes or major projects, each of which is led by a Principal Investigator at a Canadian university. Most of the nodes involve a number of sub-projects with co-investigators at other universities and a few government labs. The individual researchers are funded through Collaborative Research Agreements (CRAs) with UVic/CICS. During the past two years there have been CRAs in place with 23 principal investigators at twelve Canadian Universities, for a total value of $2.165 million. The Meteorological Service of Canada has provided this funding through a contribution agreement with the Canadian Institute for Climate Studies at the University of Victoria. The funding goes only to university-based researchers, some of whom are government scientists with adjunct appointments. The following paragraphs give a brief update on the progress of each node and the status of the funding.

Regional Climate Model: The RCM project is in the final year of a two-year extension of funding which brings it to the seventh and final year of the model development phase. A new convective adjustment scheme has been implemented and many other improvements made, including greater computational efficiency allowing extension of the domain. A new method of forcing the large scales in the RCM to agree with the forcing GCM was developed and tested. The "policy" run for Western Canada made with an earlier version has been repeated with the new version and a new one is underway for Eastern Canada. The model now has interactive lakes in order to permit simulation of the effect of the Laurentian Great

---

[4] "First published in Summer 2000 issue (Vol.6 No.2) of 'The Climate Network' published by the Canadian Institute for Climate Studies"; reproduced here with the permission of the publisher and the author.

[5] Manager Research, Canadian Institute for Climate Studies, University of Victoria.

Lakes, an important aspect of climate in eastern Canada. Additional funding was obtained from the Climate Change Action Fund in order to facilitate these policy runs. Funding approval for the current work ends in March 2001. The group has applied this year for further support from both NSERC and the CRN.

The Arctic Ocean and its Role in Climate Change/Variabilty: This research is aimed at developing an understanding of the Arctic Ocean and its role in climate change and climate variability. The ultimate goal is to develop an improved representation of the Arctic Ocean, its sea ice cover and their coupling, to be implemented in the coupled general circulation model (CGCM) of the Canadian Centre for Climate modeling and analysis (CCCma). In working toward this goal, two phenomenological questions will be addressed:

1) What processes drive interannual variability in the Arctic freshwater export and how does this variability affect the global ocean and climate;

2) Is the recent observation of warm, subsurface North Atlantic water intrusion into the Arctic consistent with the response expected from enhanced anthropogenic greenhouse gas radiative forcing, or is it simply the Arctic response to low frequency variations in atmospheric circulation?

The approach will involve the analysis of output from the CCCma coupled model and the systematic testing of improved parameterisations and representations of sea ice and its interaction with the Arctic Ocean using the UVic coupled model. Further analysis of the most important aspects of these experiments will be examined through a reduced set of experiments using the more sophisticated CCCma coupled model.

Carbon Cycle: Although CRN funding of the carbon node ended earlier, the work continues under new principal investigators and two new post-doctoral fellows. The focus of their work is on the development, testing and calibration of the ocean carbon cycle in the ocean component of the CCCma GCM. Eventually this will be coupled to atmospheric and land components in order to be able to simulate the complete carbon cycle. This next phase of the work is the subject of a new submission for expanded future support from the CRN and other funding sources.

Middle Atmosphere Model: As a result of the MAM project, currently in its final stages, Canada now has a state-of-the-art climate model extending from the surface of the earth up to the lower thermosphere (about 130 km), based on the CCCma Atmospheric GCM version 3. It includes a detailed representation of the neutral (i.e. non-ionized) atmosphere dynamics, thermodynamics and chemistry, suitable for global chemical climate and data assimilation studies. Phase 2 of MAM development ended in March 2000 but last fall the node applied for and received, on the advice of the CRN Science Advisory Panel, a one-year extension in order to provide time to prepare and process a submission to NSERC for a new activity on *Global Chemistry and Climate*. Support from both the MSC/CICS/CRN and the Canadian Space Agency (CSA) has been sought.

Paleoclimate: Analyses of the onset of glaciation in paleoclimate runs with the AGCM2 model were carried out and have demonstrated that the model can initiate glaciation realistically. They have also led to an explanation for the deep southward penetration of the southeastern lobes of the Laurentide ice sheet, which has to do with the influence of the ice-sheet itself on the atmospheric flow. Extended funding for this node (which is part of a larger paleoclimatology network funded by NSERC) was obtained last year, as well as significant new computer resources from the Canada Foundation for Innovation. The new U of T computer, a NEC SX-5 with four processors, will allow paleoclimate runs with a fully coupled AOGCM. CRN funding approval runs until 31 March 2001.

High Resolution Models of the North Atlantic Ocean: This research has several components:

(i) the development and testing of improved numerics in ocean models;

(ii) eddy-permitting model integrations using North Atlantic geometry and bottom topography;

(iii) experiments to examine the thermohaline adjustment in a high resolution North Atlantic Basin and;

(iv) the development of global and North Atlantic models of intermediate resolution for coupling to an AGCM and to provide boundary conditions for higher resolution models.

The direction and aims of the project are to develop a high resolution, eddy-permitting model of the North Atlantic Ocean. The North Atlantic is viewed as a test bed for the development of such models because it is the ocean basin for which we have the most data from observations. One of the difficulties with large-scale, high-resolution models is that they are very cumbersome to run. Consequently, more efficient, simpler versions on which to test ideas (for example, different formulations for the surface and side boundary conditions) are needed. Intermediate resolution models also offer information that can be used in formulating the treatment of the open boundaries of the higher resolution models (e.g. by embedding a high resolution North Atlantic model inside a coarser resolution global model). Carsten Eden has shown that a 1-degree model of the North Atlantic can reproduce the large scale features of the time evolution of the sea surface temperature field over the past 40 years when driven by realistic surface flux forcing. The basic result is unchanged by repeating the calculation at eddy-permitting resolution.

Work on the intermediate models is ongoing and will continue into the next year. Both global and regional North Atlantic 1-degree models are being set up. Acceleration techniques, used to speed the model's approach to thermodynamic equilibrium, are presently being tested in an idealized box geometry.

Land Surface Processes: Seven separate collaborative research agreements with sub-project investigators at seven universities have been in place for the past two fiscal years. Most of the model developments have appeared in papers in a special issue of *Atmosphere-Ocean*. A version of CLASS has been implemented in AGCM3. CLASS has been coupled to other models, notably the RCM and the MC2 model of the MSC where it has been used for simulating stream-flow for several different hydrologic basins including a simulation of the Saguenay River flood. This year the work will concentrate on documenting and implementing the latest improvements. The CLASS node was given a two-year extension of funding last year and it will end in March 2001. Many of its researchers will continue their work in collaboration with the expanded carbon cycle node.

Aerosols (NARCM): The ultimate objective of the aerosols node is to implement a more physical treatment of the effects of atmospheric aerosols in climate models, which up to now have been highly parameterised. Progress has been made in all aspects of this work, including definition of sources, calculation of atmospheric transport, chemical interactions and transformation, washout by precipitation, direct effects on radiative energy transfer and indirect effects through the modification of cloud properties. FY 99/00 was the third year of the original approval for CRN funding and a two-year extension was approved in the autumn of 1999. Some of the NARCM work on cloud processes will be shifted to the proposed new CRN node on GCM cloud parameterisation. CRN funding for this phase of NARCM will continue until March 2002.

Climate Variability: The work of this node aims to understand the fundamental mechanisms of climate variability and to devise techniques of exploiting whatever predictability is uncovered. It involves researchers at McGill, Dalhousie, UBC and UVic. Considerable success in predicting seasonal climate averages has been achieved through ensemble runs of the GCM and the CMC NWP models. Studies have shown that improved results can be obtained by using larger ensembles (up to 12 or so) and several different models. Procedures based on these results have been implemented at CMC.

The group has studied the evolution of and the sources of forcing for persistent patterns of atmospheric flow, such as the Pacific North America Oscillation, the Arctic Oscillation and the North Atlantic Oscillation. The latter two appear to be different manifestations of a single global mechanism. The Arctic stratosphere (polar night jet) seems to be intimately involved with evidence for downward propagation of some effects taking about one month. This gives a glimmer of hope for some predictability on the time scale of a month or so but there appears to be little hope for predictability on longer time scales. The group has developed a series of simple coupled models that have been used to examine some fundamental aspects of these irregular climate system oscillations. This node has completed its final year of CRN funding but last fall was granted a one-year extension to seek new funding for an expanded activity focused on becoming the heart of the Canadian contribution to the international CliVar program. Funding has been sought jointly from NSERC and the CRN. Funding approval for the current work ends in March 2001.

Backgrounder

The Climate Research Network was established in 1993 by the Meteorological Service of Canada (formerly the "Atmospheric Environment Service") of Environment Canada, as part of the Federal Government's Green Plan. Its activities were included as one of Canada's scientific commitments in the National Action Program on Climate Change tabled with the Conference of the Parties to the Framework Convention on Climate Change. In these commitments, Canada undertook to contribute research to the World Climate Research Programme to provide more complete answers to a number of key policy questions. In September of 1995 the AES entered into an agreement with the University of Victoria and through it the Canadian Institute for Climate Sciences to co-ordinate the work of the Climate Research Network for a period of two years ending in March 1997. Subsequent contribution agreements to manage the network, including the establishment of a more independent Scientific Advisory Panel to advise CICS and a Network Support Group to be run by CICS, were signed annually in March each year. With the establishment by CMOS of the Canadian Foundation for Climate and Atmospheric Studies (CFCAS), the MSC has made it clear that it will gradually phase out its direct funding of the CRN. The CRN will seek replacement and additional funding from the CFCAS. Ian Rutherford, Manager of Research for CICS, oversees the functioning of the network.

Flash Info

Nombre de personnes frappées par la foudre chaque année au Canada: **60**.
Nombre de décès: de **4** à **6**.

Number of persons hit by lighting each year in Canada: **60**.
Number of deaths: between **4** and **6**.

Environmental Prediction and Global Change: CMOS Perspectives on the NSERC Reallocation Exercise

Address given by Peter Taylor, President of CMOS, on behalf of CMOS during the NSERC reallocation session at the GeoCanada 2000 meeting in Calgary on May 31, and Dick Peltier's town hall meeting on June 1 during the Victoria CMOS Annual Congress.

Introduction

The atmospheric and oceanic sciences have developed an impressive research capability in Canada. Despite its relatively small population compared to other industrialized countries, university and government researchers in Canada have made significant impact on an international scale in this area. For example, the weather prediction and climate research groups in the Meteorological Service of Canada, Environment Canada, are among the best in the world. The academic community has also played a critical role in contributing to research in the atmospheric and oceanic sciences. This takes the form of basic and applied research at universities, collaborative research with government scientists and the training of highly qualified personnel. Much of this research has been applied to environmental prediction and global change problems that are important to society and thus contributes to the well-being of Canadians.

The benefits of environmental prediction to society are enormous. For example, the Bureau of Economic Analysis of the US Department of Commerce has estimated that industries sensitive to weather and climate contribute 42% of the Gross Domestic Product, amounting to $2,530 billion for 1996. These industries include agriculture, forestry and fisheries, transportation and public utilities, insurance and real estate. More specific examples in the US include the damage caused by adverse weather at $18 billion/year in 1991-95, and the cost of weather-related delays of airline traffic at $1 billion/year. Impacts to the Canadian economy are equally significant. In 1998, governments and insurers paid over $3 billion in claims due to natural disasters. Contemporary society is increasingly vulnerable to extreme environmental conditions, as a result of increasing wealth, population growth and increasing dependence on infrastructure such as communication, transportation and power distribution networks. Loss payments by governments and insurers around the world are doubling every 5-10 years, evidence of the global trend of more costly natural disasters. The combined effects of climate change and human activity are particularly pronounced in the coastal zone where there is strong interaction of atmospheric, land surface and oceanic processes. Major problems include extreme sea level surges and waves, erosion, transport of pollutants, shifts in fish stock migration and harmful algal blooms. An improvement of short- and medium-term prediction of maritime conditions could improve significantly the value of maritime industries and services.

Progress in the atmospheric and oceanic sciences continues today as improved observational and remote sensing capabilities provide more accurate depictions of the atmosphere and ocean. In addition, enhanced understanding of physical, chemical and biological processes, more sophisticated numerical models and powerful computers combine to provide improved simulations and predictions. This leads us to the following vision for the atmospheric and oceanic sciences in the early part of the twenty-first century.

Major improvements in our capability to observe and monitor our atmosphere and oceans, further understanding of processes at work, and rapid advances in data assimilation methods, modelling strategies and computer technology will continue to enhance the accuracy of analysis and prediction of the atmosphere and ocean. This in turn leads to better environmental prediction on the short time scale (minutes to days), as well as a better understanding of global change on the long time scale (months to decades and longer). The reductions in uncertainty will lead to a more reliably informed society on environmental and global change issues, allowing us to act more effectively and decisively.

The scientific agenda of this vision is to fully address over the next decade the highly interactive physical, chemical and biological atmospheric and oceanic environments. The study of this interaction involves not only research on the atmosphere and ocean, but on hydrology and the role of the land surface as well. A multi-disciplinary and integrative approach will be needed to synthesise the large amount of observational and model data that will become available in the next decade.

Role of the academic community

A strong academic research community is essential to realize the above vision. Canadian university members have a long and distinguished history of research in the atmospheric and oceanic sciences. Examples of internationally-recognized contributions include climate and paleoclimate studies, ocean and shelf studies, ocean-climate interaction, atmospheric chemistry, air quality studies, boundary layer and radar meteorology. In addition to carrying out individual research, members of the community are active in a wide range of international programs, including WOCE (World Ocean Circulation Experiment), CLIVAR (Climate Variability), JGOFS (Joint Global Ocean Flux Study) and GEWEX (Global Energy and Water Cycle Experiment). There is also active collaboration between university and government research groups. For example, the Canadian Centre for Climate modelling and analysis (CCCma) and the Environmental Prediction Research Initiative (AEPRI) groups of Environment Canada are co-located respectively with the School of Earth and Oceanic Sciences at the University of Victoria, and the Department of Oceanography at Dalhousie University.

We believe it is important to continue to have a strong university research component in the traditional areas of meteorology and oceanography, and at the same time, to strengthen research that addresses the inherently multi-disciplinary areas of environmental prediction and global change. For example, how will improved weather prediction help with forecasts of air quality, hazardous flight conditions for air travel, and floods? How will terrestrial and marine ecosystems respond to climate change? What will be the effects of changes in climate-related disturbances such as fires and weather extremes on agriculture and human health? In this way, the academic community can build upon an already existing strong base of research to help realize the vision described above.

Environmental Prediction

The modern era of weather prediction started about 50 years ago with the formulation of a mathematical framework for the prediction problem and the development of the electronic computer. There has since been a steady improvement in the forecast skill of atmospheric parameters, such as the 12-36 hour forecast of precipitation. On the short time scales of minutes to days, weather prediction provides the basis for many aspects of environmental prediction. An important aspect is clearly the weather itself. Other aspects involve environmental parameters dependent on weather, but which are not usually thought of as being part of weather itself. These include the forecast of air quality and stream flow, which involves the coupling of meteorological processes with those involving atmospheric chemistry and hydrology respectively. Research groups at the University of Waterloo have refined the coupling of precipitation and topographic data in streamflow models, while groups at York and Dalhousie Universities are at the forefront of research on the chemistry and physics of atmospheric aerosols. These examples underline the inherently inter-disciplinary nature of many aspects of environmental prediction.

The occurrence of extreme events is a steadily increasing problem for society. The statistics on economic loss and human suffering in Canada are staggering. For example, the Saguenay flood of 1996 resulted in property damage and related costs of over $1 billion. The snowstorm that struck Victoria and B.C.'s lower mainland at the end of 1996 resulted in $200 million in losses, caused 1700 people to seek emergency food and shelter. Tornadoes in July 2000 caused deaths in Alberta and damage in Ontario. The January 2000 storm in Atlantic Canada is estimated to have caused damage of tens of millions of dollars through the combined effects of storm surges and strong waves. Much of the B.C. lower mainland is protected by dykes, which are subject to storm damage. Tsunami risk on the west coast is very real. The most destructive single weather event to date in Canada, was the ice storm of January 1998 in eastern Ontario and western Québec, which left 25 dead, stranded nearly 3 million people without heat or electricity, and caused an estimated $2 billion in damage. Our vulnerability to such extreme events is also increasing. It is thus clear we need to devote more scientific effort to attempt to better forecast the occurrence of extreme events. This would result in longer lead times, which would in turn reduce the material loss and human suffering. Research groups at the Universities of British Columbia and Alberta have developed expertise in high resolution weather forecast models and process studies to understand such extreme weather events.

Knowledge of the current state of the atmosphere and ocean is essential for the prediction of their future evolution. Modern technologies such as satellite remote sensing and satellite-borne instrumentation platforms, land-based radar systems for weather and surface currents, aircraft measurements and in situ oceanographic monitoring devices provide detailed knowledge of the atmosphere and ocean. Canada has made significant contributions in this important area of instrumentation. For example, the MOPITT (Measurements Of Pollution In The Troposphere) instrument was developed at the University of Toronto to measure carbon monoxide and methane. Carbon monoxide can show how chemicals are transported in the troposphere and give information about chemical reactions; methane is a greenhouse gas. MOPITT was successfully launched on December 18 1999, onboard the Terra satellite, the flagship of NASA's EOS (Earth Observing System) program. Another example is the J.S. Marshall Radar Observatory of McGill University. The Observatory houses a meteorological bistatic Doppler radar network that is unique in Canada. The radar scans the atmosphere continuously, providing wind velocity and precipitation information on an operational basis that can be used to study storm dynamics and precipitation physics.

Observed and numerical model data can be combined to yield a better estimation of the state of the atmosphere or ocean. There is insufficient research in Canadian universities in this area of research, known as data assimilation. The assimilation of observed data in numerical models can provide better initial conditions, which in turn leads to more accurate predictions of the evolution of the atmosphere or ocean. It can also give better open boundary conditions for limited area regional models. An important problem in oceanography is the assimilation of large amounts of data from satellites, ships and buoys. These data are now available in near real time, and research is needed on how best to use them in understanding and predicting the ocean. The move to predictive modelling is a particularly exciting development in oceanography. The atmospheric science community has a long history of predictive modelling due to the operational demands of weather forecasting. The oceanographic community is now heading in this direction as well. This "coming of age" in oceanography is an important development. For example, data assimilation would help with the prediction of the response of the Pacific ocean off western Canada to El Niño events. This would in turn provide lead times of several months on changes of coastal temperatures and nutrient distribution, with accompanying socio-economic benefits. Data assimilation is now used routinely in a number of operational coastal ocean models that generate useful products such as 2-day forecasts of sea level and surface currents.

Global Change

On the longer time scales (months to decades and longer), global change becomes an important issue. Global change encompasses natural and human-induced changes in the Earth's environment. This includes variations of climate, land productivity, oceans and water resources, chemical composition of the atmosphere, and ecological systems which may affect the planet's ability to sustain life. Questions related to global change include seasonal and interannual climate fluctuations, climate change and variability over decades to centuries, stratospheric ozone depletion and ultraviolet radiation, and changes in land cover and in ecosystems. An important challenge is to distinguish between natural climate variability and the human-induced changes due to increasing emission of greenhouse gas and land use changes. Increased scientific knowledge of global change can reduce our vulnerability to large-scale changes in the environment and allows for easier adaptation, thus contributing to society's well- being and reducing the costs of the impacts due to the expected changes.

The climate system consists of the atmosphere, oceans and sea-ice, land surface and biosphere. Each of these components interacts with the others through complex physical, chemical and biological processes. It is thus important to conduct scientific process studies that increase our understanding of this interaction. Key processes include the role of clouds and aerosols, and oceans and sea-ice on climate variability. There has been significant progress in the development of climate models over the past several decades. A climate model represents the components of the climate system in a mathematical framework, and is the most sophisticated tool available for the understanding of the climate system and its evolution. Canadian university researchers have made significant contributions in this area. For example, research groups at the University of Victoria, Dalhousie and McGill Universities have made important contributions to the role of the thermohaline circulation and sea-ice on interdecadal climate variability, and to paleoceanography. Groups at the University of Toronto and York University have collaboratively developed the Middle Atmosphere Model, which treats the interacting dynamical-radiative-photochemical processes of the middle atmosphere. Such feedbacks are important for understanding the behaviour of the ozone layer.

In addition to improved understanding and representations of key climate processes and interactions, further advances will depend in part upon the development of finer resolution models. Global models are needed to capture the interactions of the components of the climate system, which necessarily take place on the global scale. Due to constraints on computing resources, global atmospheric models have a typical spatial horizontal resolution of a few hundred kilometres. This resolution is often too coarse to identify climate variability on a regional scale. It is thus important to "downscale" the information from the global models to the regional scale. This can be accomplished through a regional climate model, where the latter is driven at the lateral boundaries using information from the global model. In this way, the spatial resolution can be downscaled from hundreds to tens of kilometres. A group at the Université du Québec à Montréal has developed such a regional model, driven by the global climate model of the Canadian Centre for Climate Modelling and Analysis. The regional climate model is the most sophisticated way to obtain information on climate variability for a local domain. It can be used to obtain insight on, for example, how climate variability on a local scale would be affected by global warming.

Another important area is the modelling of interactions between long-term global warming due to increases in greenhouse gases and patterns of seasonal, interannual and interdecadal variability, such as the El Niño-Southern Oscillation (ENSO), Arctic Oscillation (AO) and Pacific Decadal Oscillation (PDO). The latter are fundamental modes of variability of the atmosphere-ocean climate system that explain a significant fraction of the observed variance. An important question is the effect of global warming on the frequency and intensity of these dominant patterns of variability. A related issue is the effect of global warming on the occurrence of extreme events such as precipitation extremes, coastal flooding and wave height. Extreme events have already been discussed in the context of environmental prediction. They are also important for climate change for two reasons. Firstly, it has been hypothesized that the frequency and intensity of extreme events may change as a result of global warming. Secondly, most impacts on the environment are determined by both the occurrence of extreme events and by changes in the average climate.

A multi-disciplinary and integrative approach

We note the science of environmental prediction and global change is inherently multi-disciplinary. The coupling of traditional disciplinary sciences is needed to examine environmental and global change problems on both the short and long time scales. For example, coupled atmosphere-ocean modelling is required to study the genesis and evolution of hurricanes from warm sea surface temperatures, as well as the long-term evolution of climate. Atmospheric chemistry and modelling of air flow can be used to provide forecasts of air quality in an urban setting, and to investigate the effect of aerosols on global climate variability. The coupling of meteorology and hydrology is needed to predict floods due to an intense precipitation event, such as the 1996 Saguenay event in Quebec. On the climate time scale, this coupling provides the long-term water balance of a watershed. The combination of physics, chemistry and biology is needed to examine biogeochemical cycles and pollutant transport on different time scales.

Given the interdisciplinary nature of environmental and global change science, a challenge is to encourage interdisciplinary research that takes advantage of existing expertise to help solve relevant problems. An example is the Canadian contribution to the international program GEWEX (Global Energy and Water Experiment). This is a field and modelling study of the energy and water balance of the Mackenzie Basin (MAGS – Mackenzie GEWEX Study). The goal of this research program is to understand the many interacting atmospheric and hydrological physical processes of the Mackenzie region. The program is supported by Environment Canada and NSERC, and involves the close collaboration of university and government scientists in both meteorology and hydrology. The international GEWEX program focuses on selected watersheds around the world with different temperatures and humidity levels, including the Mackenzie. Thus Canada's participation in international GEWEX not only yields insight into problems of interest to Canada, but at the same time takes advantage of and contributes to the global effort to better understand the meteorology and hydrology of watersheds under different physical regimes.

In the next 5-10 years, the amount of operationally available data from different observational platforms will increase significantly. For example, the PALACE float system promises to provide high density in situ observations of the global oceans down to 1000 metres. Scatterometers will provide high quality surface winds. New types of satellite data should be available through active sensors, such as radars and lidars. New integrative methods will be needed to extract the maximum amount of useful information from the large amount of data. For example, a multivariate approach that uses multiple satellites will be needed for the estimation of the properties of the ocean, atmosphere and land surface characteristics. In the coming decade, increasing computer power is expected to give global-scale model predictions at a spatial resolution of the order of 1-10 kilometres. It will thus be important to examine scientific questions associated with the enhanced resolution, such as the parameterization of physical processes in models. The diagnostic approach based on observed data must be combined with the predictive numerical modelling, to provide a synthesis of the observations and a better understanding and predictive capability of the atmosphere and ocean.

Conclusions

In recent decades, the atmospheric and oceanic sciences have moved simultaneously in two directions: toward the smaller space and time scales with emphasis on local prediction, and toward the global scales with emphasis on the simulation of climate change. There is also an increasing interdisciplinary dimension in this move, with atmospheric chemistry, hydrology and biogeochemical cycles playing important roles. In all cases, observations, theory, and computer models combine to provide new understanding and predictive capability. As a result, society will have greater confidence in environmental prediction and global change issues, and will thus be able to act more decisively and effectively. Building upon an existing strong base of research in the atmospheric and oceanic sciences, the Canadian academic community is well positioned to contribute to this vision.

Finally, it is important for Canadian universities to continue to train new scientists in the atmospheric and oceanic sciences at the graduate and postdoctoral levels. This need will become especially pronounced in the coming decade in view of the expected large number of retirements of university and government scientists, and the increasing importance of environmental and global change problems that involve the atmosphere and the ocean.

NOTE - NOTE - NOTE

Don't miss reading in the next issue: **"A Quick Look at the Pine Lake Storm"** written by Paul Joe and Dennis Dudley, both from Meteorological Service of Canada.

AVIS - AVIS - AVIS

Ne manquez pas de lire dans le prochain numéro: **"A Quick Look at the Pine Lake Storm"** écrit par Paul Joe et Dennis Dudley, tous deux du Service météorologique du Canada.

First Announcement and Call for Abstracts

1st International Conference on Global Warming and The Next Ice Age

19-24 August 2001
Halifax, N.S. Canada

The International Conference on Global Warming and The Next Ice Age, co-sponsored by the Atmospheric Science Program at Dalhousie University, the Canadian Meteorological and Oceanographic Society and the American Meteorological Society will be held 19-24 August, 2001 at Dalhousie University in Halifax, Nova Scotia, Canada.

The subject areas to be addressed at the Conference on Global Warming and The Next Ice Age include: natural and anthropogenic climate change and variability, effect of variations in the solar constant, climate change in the Arctic, paleoclimate data analysis and model results, estimates and predictions of the next glacial period, interpretation of the observational record and comparison of model predictions of climate change with observations.

The program will consist of invited and contributed oral and poster presentations with ample time reserved for discussions.

One of the objectives of this conference is to provide a forum for an unfettered and lively discussion of the issues, controversial and otherwise, associated with the science of climate change.

Intention to attend and/or present a paper must be emailed by February 28, 2001. Deadline for submission of short (up to a half page) abstracts is April 1, 2001. The authors of accepted abstracts will be asked to provide an extended abstract of up to four pages by May 15, 2001. A volume of reviewed extended abstracts will be published by the time of the Conference.

A limited number of grants to cover a part of travel expenses for graduate students and scientists from developing countries, who otherwise would not be able to attend, will be available.

Intention to attend and short abstracts should be submitted by email to Petr.Chylek@noaa.gov with a copy to Glen.Lesins@Dal.Ca. Further information concerning the conference location, registration procedures, accommodations, etc. can be found by following the link at the Web site: www.atm.dal.ca

CAIMS/SCMAI 2001

First Announcement

June 7-9 2001
Victoria, B.C. Canada

The annual meeting of the Canadian Applied and Industrial Mathematics Society will be held June 7-9, 2001 at the University of Victoria, in Victoria, British Columbia. There will be 6 sessions, with plenary speakers as follows:

- Applied Dynamical Systems: (Jerold Marsden, Caltech);
- Mathematical Biology: (Hal Smith, Arizona State);
- Computational Biology: (T.B.A.);
- Neural Networks & Neural Dynamics: (Nancy Kopell, Boston);
- Geophysical Fluid Dynamics: (Grae Worster, Cambridge);
- Data Compression: (Bin Yu, Berkeley).

A limited number of fellowships for graduate students and post-doctoral fellows will be available (details to follow in later announcements).

For information please contact the heads of the organizing committee, R. Edwards (edwards@math.uvic.ca) or D. Leeming (leeming@uvvm.uvic.ca), the chair of the scientific committee, F. Diacu (diacu@math.uvic.ca), or consult the web site:

http://www-sci.pac.dfo-mpo.gc.ca/osap/CAIMS2001/

IAPSO and IABO Joint Assembly

Mar del Plata, Argentina
21-28 October 2001

CALL FOR PAPERS

The Joint Assembly of the International Association for the Physical Sciences of the Oceans (IAPSO) and the International Association for Biological Oceanography (IABO), to be held in Mar del Plata, Argentina, on 21-28 October 2001, with Joint Symposia of the International Association of Meteorology and Atmospheric Sciences (IAMAS), the World Ocean Circulation Experiment (WOCE), the Climate Variability and Predictability Program (CLIVAR), the Joint Global Ocean Flux Study (JGOFS), the Global Ocean Ecosystems Dynamics Program

(GLOBEC), and the International Association of Geodesy (IAG), has issued a call for papers.

Abstracts must be submitted electronically, and must be in the format given on the Joint Assembly Web page at:

http://www.criba.edu.ar/2001_ocean

Details of the symposia are on the Joint Assembly Web page. The abstract deadline is **28 February 2001.**

Abstracts from IAPSO related symposia at Assemblies in 1997 (Melbourne, Australia) and 1999 (Birmingham, England) will be found on the IAPSO Web page at:

http://www.olympus.net/IAPSO

Long-Range Weather and Crop Forecasting Working Group Meeting IV

March 5-6, 2001
Regina, Saskatchewan, CANADA

The *ad hoc* Long-Range Weather and Crop Forecasting Working Group Organizing Committee warmly invites you to attend a workshop at Regina, Saskatchewan, CANADA from March 5 to 6, 2001.

The purpose of this year's workshop is to unite representatives from the scientific and user communities for discussions on seasonal weather forecasting and its application to agriculture and water resources. Researchers, meteorologists, operational forecasters, agronomists, producers, and user representatives from across Canada and beyond will gather in Regina to address the latest issues in seasonal climate prediction and crop forecasting. In addition to individual presentations, the meeting will feature distinguished keynote speakers and working group sessions covering a broad array of topics.

Topics for presentation at the Regina 2001 workshop include:

- Progress in seasonal forecasting in the past 10 years;
- Science/user dialogue;
- The impact of global warming on climate variability and seasonal forecasting; and
- Causes of the North American growing season conditions in 1999 and 2000.

The two day workshop in Regina will be the fourth in a series of *ad hoc* meetings organized by the **Long-Range Weather and Crop Forecasting Working Group**. The first meeting was held in 1993 at the National Hydrology Research Centre in Saskatoon. The Canadian Wheat Board hosted the second meeting in 1995 at Winnipeg. The third, and most recent, workshop was held in 1997 at the Canadian Meteorological Centre in Dorval, Québec. These meetings have been highly successful in bringing together representatives from the research, forecasting, and user communities to review the progress of seasonal climate predictions.

If you wish to participate in this year's workshop, please contact **before November 15, 2000**:

Iain Stewart, Prairie Farm Rehabilitation Administration, Prairie Agroclimate Unit, Regina, Saskatchewan, Tel. (306) 780-7264, Email: stewarti@em.agr.ca

For more information on the workshop, visit our website:

http://www.agr.ca/pfra/climate

Sponsoring Agencies

Prairie Farm Rehabilitation Administration (PFRA)

Canadian Meteorological and Oceanographic Society (CMOS)

Saskatchewan Research Council (SRC)

Members of the Organizing Committee

Ted O'Brien, PFRA, AAFC, Prairie Agroclimate Unit, Regina, Saskatchewan, E-mail: obrient@em.agr.ca

Virginia Wittrock, Saskatchewan Research Council, Climatology Section, Saskatoon, Saskatchewan, E-mail: wittrock@src.sk.ca

Madhav L. Khandekar, Consulting Meteorologist, Unionville, Ontario, E-mail: mkhandekar@home.com

Iain Stewart, PFRA, AAFC, Prairie Agroclimate Unit, Regina, Saskatchewan, E-mail: stewarti@em.agr.ca

E. Ray Garnett, University of Saskatchewan, Department of Geography, Saskatoon, Saskatchewan, E-mail: erg415@mail.usask.ca

Ron Hopkinson, CMOS Chairperson, Saskatchewan Centre, Regina, Saskatchewan, E-mail: ron.hopkinson@ec.gc.ca

Harris B. Stewart Jr.
1922 - 2000

Harris B. Stewart Jr., the much beloved founder and first director ot the Atlantic Oceanographic and Meteorological Laboratory, died on 25 April 2000 at his home in Naples, Florida. He was 77 years old. Stewart, or "Stew" as many called him, leaves behind a remarkable career in marine science that spanned more than 40 years and a multitude of caring friends and colleagues.

Born in Auburn, New York, in 1922, Stewart entered Princeton University in 1941. After the bombing of Pearl Harbor on 7 December of that same year, Stewart interrupted his academic studies to enlist in the U.S. Army Air Corps. During his four years with the Air Corps as a transport pilot flying above the broad expanses of the Coral Sea and the islands of the southwest Pacific Ocean, he developed a deep respect and love for the sea. After the war, he returned to Princeton to earn a degree in geology and went to work for the U.S. Navy Hydrographic Office, participating in survey cruises in Kuwait and the Persian Gulf.

Stewart's love of the sea led him to the Scripps Institution of Oceanography in the early 1950s, where he earned a doctoral degree in oceanography. He became a certified scuba diver, participated in marine geology expeditions in the Gulf of Alaska and South Pacific, and also worked as a diving geologist for a group that performed underwater geological mapping off the coast of California. In 1957 he was called to Washington, D.C., to become the U.S. Coast and Geodetic Survey's chief oceanographer. His seafaring days continued with oceanographic research expeditions to the Caribbean Sea, South China Sea, and the Atlantic, Pacific and Indian Oceans.

The Department of Commerce created a new agency in 1965, the Environmental Science Services Administration (ESSA, forerunner of NOAA), formed primarily by merging the functions of the U.S. Coast and Geodetic Survey and the Weather Bureau. Stewart became director of ESSA' s new Institute of Oceanography. When ESSA announced its intention to build a multimillion dollar oceanographic research laboratory and ship base along the eastern seaboard in late 1965, Stewart was appointed chairman of its site evaluation committee. From 1966 to 1967, Stewart and committee visited 115 sites from Maine to the Virgin Islands. With ESSA's announcement that Virginia Key—Dodge Island had been chosen as the new home for its oceanographic lab in 1967, he moved to Miami, Florida. Over 100 marine scientists and researchers relocated to Miami with Stewart, director of the new facility.

The building of the Atlantic Oceanographic and Meteorological Laboratory, however, was a difficult task. A last-minute cut from President Johnson's FY1970 federal budget eliminated funding that was to begin construction of the facility. Stewart successfully appealed to Miami's community leaders for help to get the funds reinstated, and on 9 February 1973 AOML officially opened its doors. If not for the dedication of these individuals and their belief in Stewart, construction of the lab would have never begun or been completed. According to Jack Kofoed, Stewart's former deputy director, "The depth of loyalty and respect of his friends was unbelievable, and it was true all the way back to his school days. Stew achieved the near impossible goal of being both a brilliant scientist and charismatic manager."

Stewart served as director of AOML until October 1978, at which time he retired from federal service. His next four years were spent as director of the Center for Marine Studies at Old Dominion University in Norfolk, Virginia, before retiring altogether from his career with the sea.

In 1998, Stewart was reunited with many of his old friends and colleagues when he visited Miami to participate in AOML' s Silver Anniversary celebration. He was AOML's honored guest, much praised for the vision, leadership, and political savvy that took the concept of AOML from the realm of mere creative potential to that of full-blown reality—a dream manifested.

He was a prolific writer, publishing over 120 scientific articles during his years as a marine scientist. He also authored 12 books with topics ranging from oceanography to poetry to humor. Stewart is survived by daughter Dorothy Barrett, son Harry, brother John, and countless numbers of colleagues, admirers, and friends.

Note from the Editor

The above Necrology of an American oceanographer well known to many Canadian oceanographers appeared in the September 2000 (81/9) issue of the Bulletin of the American Meteorological Society, and is reprinted here with its permission.

Network Manager Job Advertisement

The Mackenzie GEWEX (Global Energy and Water Cycle Experiment) Study (MAGS) is seeking a Network Manager.

MAGS is a Research Network consisting of government and university scientists, research partners and users of research results from across Canada. The Network's mission is to better understand the high latitude water and energy cycles that play a major role in the global climate system and to improve our ability to assess changes to Canada's water resource that arise from climate variability and climate change. The MAGS Research Network is jointly funded by the Natural Sciences and Engineering Research Council of Canada and by Environment Canada.

The Network Manager we seek will be responsible for the day-to-day management of the Research Network. This individual will work in close consultation with the Chair of the MAGS Scientific Committee while exercising the independence and initiative needed to maintain the effective operation of the Research Network. This is a five-year term, full-time position, commencing on January 1, 2001. The responsibilities of the Network Manager will include:

Research coordination and liaison with research partners
(Business) management of MAGS operations
Promotion of MAGS
Supervision of staff

The individual filling this position should have the following qualifications:

A graduate degree with training in the hydrological or atmospheric sciences.
Well-developed verbal and written communication skills.
Strong organizational skills and the ability to effectively prioritize activities.
Personnel management skills with an ability to supervise staff and delegate responsibility.
The ability to work independently to solve problems as they arise.
Experience with basic office and scientific computer software.
Willingness to travel as required.

Further information on the MAGS Research Network is available at http://www.msc-smc.ec.gc.ca/GEWEX/. Applications, including the names of three references, should be submitted by November 1, 2000, to:

Joan Parker
School of Geography and Geology
McMaster University
1280 Main Street West
Hamilton, Ontario
CANADA, L8S 4K1
E-mail:parkerj@mcmaster.ca
Fax: (905) 546-0463

In accordance with Canadian Immigration requirements, this advertisement is directed in the first instance to Canadian citizens and permanent residents of Canada.

JOB - EMPLOI - JOB - EMPLOI - JOB - EMPLOI - JOB - EMPLOI

Uri Schwarz celebrated his 80th Birthday

Uri Schwarz, CMOS Executive Director Emeritus, recently celebrated his 80th birthday with a party at his home. Relatives aged 7 to 87 from the four corners of the world

came to help him pass this milestone. Uri always manages to keep busy, including giving regular assistance in the CMOS office where he has worked for over a decade as Executive Director. He enjoys this work and his contacts with CMOS friends and colleagues, many of whom signed a much appreciated birthday card at the Victoria Congress which was given to him at his birthday. Not long ago he told Dr. Gordon McBean, the long-time Director of the Meteorological Service of Canada, at the latter's retirement party, how grateful he was to the CMOS Council for having named him Executive Director Emeritus; this had encouraged him to keep active, which in turn helped to keep him alert and healthy. He hoped Gordon would do likewise. (Indeed, not long after that, Dr. McBean took on the Chairmanship of the CFCAS Board of Trustees, in addition to teaching at the Institute for Catastrophic Loss Reduction of the University of Western Ontario.

Project Atmosphere 2000

(The following is a report by Andrew Young, a Secondary School Teacher, Geography, from Courtenay, B.C. He was this year's Canadian participant at the Project Atmosphere Workshop organized yearly by the American Meteorological Society jointly with the National Oceanic and Atmospheric Administration and the National Science Foundation).

A call for applications by Canadian teachers wishing to attend the 2001 Workshop is expected to appear in the next issue of the *CMOS Bulletin SCMO*. The applicant is selected and his/her attendance financially supported jointly by CMOS and the Canadian Council for Geographic Education.)

There we were at 10,700 metres flying over southwestern North Dakota. To the north of the plane, lay a well-formed mesoscale convective complex in its mature stage. I looked to my left and my flying compatriot was blissfully snoring away, completely unaware of the beauty outside of the cabin. I was desperate, I wanted to flex my new found knowledge, and I wanted to run to the front of the plane and ambush the public address system, "Good evening ladies and gentlemen, this is not your captain speaking, but if you look to the north of the plane you'll see something really, really cool". Alas, all I did was strain my neck muscles trying to watch the lightning show as we continued on our journey westward. What had Project Atmosphere done to me? Two weeks at the National Weather Service Training Center in Kansas City had changed me, I had become something different, I had become a weather zealot.

I am sure the same could be said of the other twenty-four participants, three of whom came from South Africa, one from Croatia, and the rest from throughout the United States. We had just spent two weeks of intense workshops covering a wide variety of topics, ranging from weather radar, through to air masses, past satellite imagery, on to severe weather, including everything in between. We spent time in the classroom, in the computer room, and out in the field becoming familiar with topics in the atmospheric sciences, getting a better picture of the three dimensional atmosphere, and learning how to train other teaching professionals about the atmospheric sciences. Of course, the educational arm of the American Meteorological Society brought together not only an expert staff, but also flew in experts and specialists in order for us to learn from the "leaders" in the field of atmospheric science. The who's who list included Max Mayfield (Director of the National Hurricane Center), Louis Uccellini (Director of the National Centers for Environmental Prediction), Joe Schaefer (Director of the Storm Prediction Center), and John Jones (Deputy Director of the National Weather Service), to name a few.

Now what? I sit at home and have a few weeks of summer left before I begin the new school year. I have gathered an incredible amount of information and teaching aids to help both myself, and my colleagues, to present weather topics to our students in exciting and relevant ways. My time in Kansas City, however, gave me a broader experience. I am continually amazed at how much professionals bond together when they have the opportunity to do so. The friends I've made will stick for a long time. I learned, I laughed, and I finally got to find out who owned the rogue alarm that went off every day at precisely 8:14 am. A grade 10 student of mine, Kim Legrand, asked me every day last year, "So what's up weatherman?" With my experiences at Project Atmosphere I know I can give a more complete answer to her and all my other students.

For all this I have an "Oscars" list of people I am compelled to thank. I wish to thank both the C.C.G.E. and the C.M.O.S. for giving me the opportunity to attend Project Atmosphere. Both organizations are clearly looking ahead, showing a great deal of foresight, and the network of professionals that you are building will no doubt bring geography and atmospheric sciences to the forefront of education in Canada. To Ira Geer and the American Meteorological Society I also give thanks. Making a connection across the border was a bold leap in cooperation; what you have started will only grow, and the benefits will be great. To John Vogel I give thanks for opening up both the NWS Training Center and your own home to us, your hospitality made us feel right at home. Thanks to the staff: Rich McNulty, Jerry Griffin, Bob Weinbeck, Joe Morgan, and Pat Warthan. You treated us as equals and with respect and without you there simply wouldn't be a Project Atmosphere. Finally my thanks go to my fellow colleagues at Project Atmosphere. We all learned a great deal and we drew strength from each other. It is clear that the responsibility to push the atmospheric sciences rests upon our shoulders now. I have no doubt that across the United States, in South Africa, in Croatia, and here in Canada, many students will be caught saying, "that's cool".

Project Atmosphere will be repeated again next year. Apply! Trust me, you won't regret it if you get to go. If you would like any further information about the summer institute or want access to information about weather and atmospheric education please feel free to contact me at:

Andrew Young
Georges P. Vanier Secondary School
Box 3369, Courtenay, British Columbia V9N 5N5
e-mail: ayoung@vanier.sd71.bc.ca
or: grizzfan99@hotmail.com

Guidelines for Preparation of Book and Other Reviews

A review should contain the following:

1. Title, author, publisher, date, number of pages, kind of cover, price, and where available if not from a major publisher.

2. Name and address of reviewer (including e-mail address).

3. General description of sections, chapters.

4. Brief summary of content and critique of several or of each chapter, noting new ideas, strengths and weaknesses.

5. Note on style, organisation and readability.

6. Overall appreciation.

7. Recommendation for specific audiences.

8. For publication in the CMOS Bulletin SCMO, a review should be about a page, or about 800 words.

Call for Nominations for CMOS Fellows

An opportunity now exists for members or non-members to submit nominations for CMOS Fellows and Honorary Fellows, keeping in mind that nominees for Fellow must be members in good standing. Consideration should be given to the contributions of the nominees to the scientific, professional and educational fields in atmospheric or ocean sciences or services as well as to Canadian society as a whole, as illustrated by the following:

- Research;
- Teaching;
- Technology;
- Professional Services;
- Administration in academia, industry, government or other institutions;
- Communication and interpretation of atmospheric and oceanographic phenomena;
- Weathercasting;
- International meteorological and/or oceanographic affairs; or
- Other.

Each nomination should be signed by the primary sponsor and supported by two others, at least one of whom must be from an establishment other than that of the nominee. Further information and criteria are available for viewing on the CMOS web site (under "About CMOS") at http://www.cmos.ca

Application forms are available on the web site or from the Executive Director, Dr Neil Campbell. Nominations are to be postmarked no later than **April 15, 2001** and may be sent to the office of the Executive Director or (by e-mail) to the Chair of the Fellows Committee, Dr Ian Rutherford, at **iruther@istar.ca**

United Nations Oceans and Coastal Areas Report

The session report of the Administrative Committee on Coordination on Oceans and Coastal Areas (The Hague, 19-21 January 2000) is available. The report features updates on activities including: the United Nations Atlas of the Oceans; Implementation of the Global International Waters Assessment (GIWA); Creation of the new consultative process on oceans established by the General Assembly on 24 November 1999 and implications for the United Nations system; etc. To obtain a copy of the report, access http://ioc.unesco.org/soca/meetings.htm

Appel de candidatures pour les Fellows de la SCMO

Les candidatures pour les Fellows de la Société sont maintenant acceptées. Les personnes mises en candidature doivent être des membres en règles de la Société. On devra considérer les contributions des candidats dans les domainess scientifiques et professionnels des sciences de l'atmosphère et océanique ainsi qu'à la société canadienne, tel qu'illustré par les points suivants:

- recherche;
- enseignement;
- technologie;
- services professionnels;
- administration dans les universités, l'industrie, le gouvernement et dans les autres institutions;
- communication et interprétation des phénomènes atmosphériques et océaniques;
- prédiction de la météo;
- les affaires internationales en météorologie et/ou océanographie; ou
- autres.

Chaque candidature doit être signée par le commanditaire principal et doit être endossée par deux autres, dont au moins une personne venant d'un établissement autre que celui de la personne mise en nomination.

Les formulaires d'application sont disponibles au bureau du directeur exécutif ou sur le site internet de la SCMO. Les soumissions doivent respecter la date butoir du **15 avril 2001** et doivent être expédiées au bureau du Directeur exécutif ou (par courriel) au président du Comité des Fellows, Dr Ian Rutherford à **iruther@istar.ca**

New Editor (Oceanography) for Atmosphere-Ocean

Diane Masson obtained a B. A. Sc. in Engineering Physics at Université Laval in 1983. She then completed a Ph. D. in Physical Oceanography at the University of British Columbia in 1987, under the supervision of Prof. Paul H. LeBlond, for which she received the CMOS graduate student prize. After a brief post-doctoral assignment at the Bedford Institute of Oceanography, Halifax N.S., she took a position as a research scientist at the Institute of Ocean Sciences, Sidney B.C. Her research activity which was focused initially on ocean surface waves has broadened over the last several years to include various aspects of coastal oceanography. She is an active member of CMOS and serves as the vice-chair of the Vancouver Island CMOS centre. Diane has many personal interests beside oceanography, including skiing, gardening, woodworking and horseback riding.

Lignes directrices pour la préparation des critiques de livres et rapports

La critique doit comprendre les items suivants:

1. Titre, auteur, maison d'édition, date, nombre de pages, type de couverture, prix, l'endroit de disponibilité sinon de la maison d'édition principale.

2. Nom et adresse du critique (incluant son adresse électronique).

3. Description générale des sections ou des chapitres.

4. Sommaire bref du contenu, critique de plusieurs ou de tous les chapitres, identifiant les idées nouvelles, les points forts ainsi que les faiblesses.

5. Note sur le style, l'organisation et la facilité de lecture.

6. Appréciation globale.

7. Recommendation des auditoires ciblés.

8. Pour publication dans le CMOS Bulletin SCMO, la révision doit comporter approximativement une page ou 800 mots.

150th Anniversary of the Formation of the Royal Meteorological Society

On Wednesday 3 April 1850, ten gentlemen assembled in the library of Hartwell House, near Aylesbury, Buckinghamshire. According to the minutes of the meeting, they gathered "to form a society the objects of which should be the advancement and extension of meteorological science by determining the laws of climate and of meteorological phenomena in general". They called the society the British Meteorological Society and appointed as its president Samuel Charles Whitbread, a grandson of the founder of the famous brewing firm. The society they formed still exists and flourishes. It became The Meteorological Society in 1866, when it was incorporated by Royal Charter, and the Royal Meteorological Society in 1883, when Her Majesty Queen Victoria granted the privilege of adding `Royal' to the title.

To mark the 150th anniversary of the Society's foundation, a two-day meeting was held at the Royal Society of London. This meeting covered the history of the Society, its antecedents, its contemporaries and the societies with whom it has shared many interests and members, namely the Royal Society, the Scottish Meteorological Society, the British Rainfall Organization, the Royal Astronomical Society, the Royal Geographical Society and the Institution of Civil Engineers.

Announcement

The Versatile Soil Moisture Budget (VB 2000) Reference Manual ECORC # 001553 July 2000

by W. Baier (Honorary Research Associate, Eastern Cereal and Oilseed Research Centre), J. B. Boisvert (Program Director, Eastern Region, Agriculture and Agri-Food Canada), and J. A. Dyer (Private Consultant)

Since its introduction in 1966, the Versatile Soil Moisture Budget (VB) has been widely used under a variety of soil and climatic conditions in Canada and abroad. Based on these extensive applications and additional tests, several improvements were partially incorporated in earlier versions but these were not fully documented.

The present VB 2000 version was redesigned to include effective modifications and to make the computer program Year 2000 compliant.

Two major features were added: a dynamic root growth and a water table function, but the fundamentals that make the VB versatile and simple were kept. The VB can be employed in dry and moist soils and under a variety of environmental conditions. It simulates variations in soil moisture distribution, drainage and actual evapotranspiration. The current reference manual is divided into three parts: Part A describes the fundamentals of the conceptual model; Part B explains how to use the software; and Part C deals with technical aspects relating to programming. The Eastern Cereal and Oilseed Research Centre and the Soil and Crop Research and Development Centre cosponsored the processing of the manual. Copies of the manual and of the software are now available free of charge from the communicating author: Dr. Johanne Boisvert, Program Director, Eastern Region, Central Experimental Farm, Room 761 SJC Building, Ottawa, Ont., K1A 0C6, Canada. Fax: (613) 759 7771, e-mail: boisvertj@em.agr.ca

Nouveau Directeur scientifique (océanographie) pour Atmosphere-Ocean

Diane Masson a obtenu en 1983 un B. Sc. A. en Génie Physique de l'Université Laval. Elle a par la suite complété un PhD en Océanographie Physique sous la direction de Paul H. LeBlond, à l'Université de la Colombie-Britannique en 1987, et qui lui valu le prix à l'étudiant gradué SCMO. Après un bref post-doctorat à l'Institut d'Océanographie Bedford, Halifax N.-E., elle a assumé un poste de chercheur à l'Institut des Sciences de la Mer, Sidney C.-B.. Ses activités de recherche, qui furent d'abord concentrées sur la houle, incluent maintenant différents aspects de l'océanographie côtière. Elle est membre de SCMO et occupe présentement le poste de vice-présidente du chapitre local SCMO de l'Ile de Vancouver. En plus de ses intérêts professionnels, Diane est une fervente adepte du ski, du jardinage, de la menuiserie et de l'équitation.

Wednesday, August 23, 2000

TEACH Great Lakes: New gateway for students and teachers

http://www.great-lakes.net/teach/

ANN ARBOR, MICH. -- Students and teachers now have a new source for Great Lakes educational materials, thanks to a product recently released by the Great Lakes Commission. The Education and Curriculum Homesite (TEACH Great Lakes) features mini-lessons on Great Lakes topics. Geared for elementary through high school students, the lessons include links to a glossary to help explain scientific terms and acronyms.

Current modules focus on water levels, Areas of Concern, urban sprawl and nonindigenous invasive species.

TEACH resides on the Great Lakes Information Network (GLIN), a Great Lakes Commission-managed gateway to Great Lakes information on the Internet that now averages nearly 2 million visits per month. Online since 1993, GLIN has received awards and high praise as the premier resource on the Web for Great Lakes-related news, issues, organizations and activities.

"As a teacher that likes to make connections between different subject areas, I am very impressed that TEACH includes sections on history, geography and science concepts," says Tim McDonnell of Rochester, N.Y. "This way, teachers working as a team can do an interdisciplinary unit. I will definitely use TEACH in my classroom."

In the TEACH Chat section, "Ask and Win" lets kids submit questions about the Great Lakes and enter a drawing to win a prize.

(See www.great-lakes.net/teach/forms/ask_form.html)

One question is featured each month, and all answers are archived in the "Great Lakes Vault of Knowledge."

Upcoming TEACH modules will focus on shoreline geography, shipping, the Great Lakes fishery, endangered species and human health issues. The site also will feature environmental stewardship projects in Great Lakes communities, image and map galleries, a speakers bureau, and a directory of Great Lakes-related field trip opportunities. The TEACH project is funded by the U.S. Environmental Protection Agency-Great Lakes National Program Office (U.S. EPA-GLNPO).

GLIN is supported by grants from the Ameritech Foundation; the U.S. Department of Commerce, National Telecommunications and Information Administration; U.S. EPA-GLNPO; U.S. Army Corps of Engineers, Detroit District; and Environment Canada. GLIN design, development and maintenance services are provided by the Great Lakes Commission.

The Great Lakes Commission is a nonpartisan, binational compact agency created by State and U.S. federal law and dedicated to promoting a strong economy, healthy environment and high quality of life for the Great Lakes-St. Lawrence region and its residents. The Commission consists of state legislators, agency officials and governors' appointees from its eight member states. Associate membership for Ontario and Québec was established through the signing of a "Declaration of Partnership." The Commission maintains a formal Observer program involving U.S. and Canadian federal agencies, tribal authorities, binational agencies and other regional interests. The Commission offices are located in Ann Arbor, Michigan.

For more information, contact:

Christine Manninen
Project Manager, Communications and Information Management
Great Lakes Commission Tel: (734) 665-9135
e-mail: manninen@glc.org
Web site: http://www.glc.org/

New Appointments at the Institute for Catastrophic Loss Reduction

From the Globe and Mail, Tuesday August 15, 2000

Dr. Paul Davenport, President, The University of Western Ontario (UWO), is pleased to announce two academic appointments in association with the Institute for Catastrophic Loss Reduction (ICLR), a partnership between the Insurance Bureau of Canada (IBC) and UWO. Dr. Gordon McBean has been appointed Professor in the Departments of Geography and Political Science, Faculty of Social Science, and has been named to the Chair in Policy for Catastrophic Loss Reduction in the ICLR. Dr. Slobodan Simonovic has been appointed Professor in Civil and Environmental Engineering, Faculty of Engineering Science, and has been named to the Chair in Earthquake and Severe Weather in the ICLR.

Core funding for the ICLR comes from insurers who are members of the IBC, UWO, and the Ontario Research and Development Challenge Fund.

The ICLR is championing research to reduce the loss of life and property damage caused by severe weather and earthquakes. Under the leadership of Paul Kovacs of the IBC, the ICLR is assembling one of the strongest hazards research teams in the world today.

Dr. McBean has been the Assistant Deputy Minister of the Meteorological Service of Environment Canada for the past six years. Prior to that, he was a Professor of Atmospheric and Oceanographic Sciences at the University of British Columbia. He is Chair of the Board of Trustees for the Canadian Foundation for Climate and Atmospheric Sciences and is a Fellow of the Royal Society of Canada, the Canadian Meteorological and Oceanographic Society, and the American Meteorological Society. He is also a member of the International Council for the Science Advisory Committee for the Environment.

Dr. Simonovic has 25 years of research and teaching experience in water resources engineering. Presently, he is a Professor in and Director of the University of Manitoba's Natural Resources Institute. He is a member of the International Joint Commission's Red River Task Force and a member of the Board of the International Water Resources Association. He is the Science editor of Water International, associate editor of three journals in his field of interest, and is very active in the organisation of national and international meetings. He has taught special courses for water resource professionals in more than a dozen countries around the world.

The Hornstein-Tully Fund

A Hornstein-Tully Fund has been created from the existing voluntary contributions to the Hornstein Prize and the Tully Medal by balancing the Tully fund to that of the Hornstein from the Development fund. The combined sum is now such that the investment return will cover the annual cost of casting the two medals in perpetuity. Contributions are still welcome but members are being urged to consider contributing to the Development or any of the Scholarship funds.

Neil J. Campbell
Executive Director

Fonds Hornstein-Tully

Un fonds Hornstein-Tully a été créé à partir des contributions volontaires faites au fonds pour le Prix Hornstein et la Médaille Tully en accordant le fonds Tully au fonds Hornstein du fonds de Développement. La somme combinée est maintenant telle que le retour en investissement couvrira le coût annuel du moulage des deux médailles pour l'avenir. Les contributions volontaires sont toujours acceptées mais les membres sont priés de contribuer au fonds de Développement ou à une des bourses de la SCMO (Premier et deuxième cycle).

Neil Campbell
Directeur exécutif

A-O 38-4 Paper Order

Tidal Circulation and Buoyancy Effects in the St. Lawrence Estuary by FRANÇOIS J. SAUCIER and JOËL CHASSÉ

Verification of a Coupled Ice Ocean Forecasting System for the Newfoundland Shelf by T. YAO, C. L. TANG T. CARRIERES and D. H. TRAN

An Examination of the Spring 1997 Mid-latitude East Pacific Sea Surface Temperature Anomaly by RANDY G. BROWN and LEE-LUENG FU

Atmospheric Teleconnection Patterns and Severity of Winters in the Laurentian Great Lakes Basin by SERGEI RODIONOV AND RAYMOND ASSEL

CMOS-ACCREDITED CONSULTANTS
EXPERTS-CONSEILS ACCRÉDITÉS de la SCMO

CANADIAN METEOROLOGICAL AND OCEANOGRAPHIC SOCIETY
LA SOCIÉTÉ CANADIENNE DE MÉTÉOROLOGIE ET D'OCÉANOGRAPHIE

112-150 Louis Pasteur, Ottawa, ON K1N 6N5
Tel - Tél: (613) 562-5616 Fax - Téléc: (613) 562-5615
E-mail - Couriel: cap@physics.uottawa.ca
Web: www.meds-sdmm.dfo-mpo.gc.ca/cmos/

MEMBERSHIP APPLICATION / RENEWAL FORM
DEMANDE D'ADHÉSION / RENOUVELLEMENT

☐ NEW APPLICATION / NOUVELLE DEMANDE ☐ RENEWAL / RENOUVELLEMENT

MEMBER SINCE / MEMBRE DUPUIS

MEMBERSHIP EXPIRES / ADHÉSION SE TERMINE

Name/Nom:

TITLE / TITRE ☐ DR. / DR. ☐ MR. / M. ☐ MS / MME ☐ OTHER / AUTRE

MAILING ADDRESS / ADRESSE POSTALE ☐ RESIDENCE / RÉSIDENCE ☐ BUSINESS / BUREAU

POSTAL CODE / CODE POSTAL

TEL (B) FAX (B)

TEL (R) FAX (R)

E-MAIL - COURIEL

HOMEPAGE - PAGE D'ACCUEIL

LANGUAGE PREFERENCE / LANGUE PRÉFÉRÉE ☐ ENGLISH ☐ FRANÇAIS

OPTIONAL / FACULTATIF ☐ MALE / MASC. ☐ FEMALE / FÉMININ D.O.B. / D.D.N. (Y-A - M-M - D-J)

AREA OF WORK / SECTEUR D'EMPLOI ☐ INDUSTRY / INDUSTRIE ☐ GOV'T / GOUV. ☐ UNIV. / UNIV. ☐ RES. INST. / INST. RES. ☐ OTHER / AUTRE

MAIN INTEREST / INTÉRÊT PRINCIPAL ☐ METEOROLOGY / MÉTÉOROLOGIE ☐ OCEANOGRAPHY / OCÉANOGRAPHIE

SPECIAL INTEREST / INTÉRÊTS SPÉCIAUX
- ☐ HYDROLOGY / HYDROLOGIE
- ☐ FISHERIES OCEANOGRAPHY / OCÉANOGRAPHIE DES PÊCHES
- ☐ AGRICULTURE & FOREST / AGRICULTURE ET FORÊT
- ☐ MESOSCALE METEOROLOGY / MÉTÉOROLOGIE DE L'ÉCHELLE MÉSO
- ☐ FLOATING ICE / GLACES FLOTTANTES
- ☐ GLOBAL CHANGE / CHANGEMENT GLOBAL
- ☐ OPERATIONAL METEOROLOGY / MÉTÉOROLOGIE D'EXPLOITATION
- ☐ OTHER / AUTRE

LOCAL CENTRE or CHAPTER / CENTRE ou SECTION LOCALE ☐ INSERT CODE / INSÉRER LE CODE

VIS	VANCOUVER ISLAND CENTRE	MTL	CENTRE DE MONTRÉAL
BCM	B.C. MAINLAND CENTRE	QUE	CENTRE DE QUÉBEC
KEL	KELOWNA CHAPTER	RIM	CENTRE DE RIMOUSKI
ALT	ALBERTA CENTRE	HFX	HALIFAX CENTRE
SSK	SASKATCHEWAN CENTRE	NFD	NEWFOUNDLAND CENTRE
WIN	WINNIPEG CENTRE	NBK	NEWBRUNSWICK CHAPTER
TOR	TORONTO CENTRE	INT	INTERNATIONAL & USA
OTT	OTTAWA CENTRE		

☐ DO NOT PUBLISH MY NAME IN DIRECTORY / NE PAS PUBLIER MON NOM DANS LE RÉPERTOIRE

☐ DO NOT CIRCULATE MY NAME OUTSIDE CMOS / NE PAS FOURNIER MON NOM À D'AUTRES ORGANISMES

FOR OFFICE USE ONLY - À L'USAGE DU SECRÉTARIAT

*	√	MEMBERSHIP FEES - FRAIS D'ADHESION	RATE TARIF	REMITTANCE REMISE
		REGULAR - RÉGULIER	45.00	
		STUDENT - ÉTUDIANT *	20.00	
		CORPORATE - CORPORATION * (FIRMS - CORPORATIONS, INSTITUTIONS)	225.00	
		SUSTAINING - DE SOUTIEN * (INDIVIDUALS ONLY - PARTICULIERS)	170.00	
		RETIRED - RETRAITÉ	30.00	
		* INCLUDES ALL PUBLICATIONS - DONNE DROIT À TOUTES PUBLICATIONS		
*	√	MEMBER'S PUBLICATIONS FEES / FRAIS DES PUBLICATIONS - MEMBRES		
		ATMOSPHERE - OCEAN	35.00	
		CMOS BULLETIN SCMO (INCL.)	GRATIS	
		PROGRAM & ABSTRACTS (ON REQUEST) / PROGRAMME ET RÉSUMÉS (SUR DEMANDE)	GRATIS	
		SUB TOTAL - SOUS TOTAL		
*	√	VOLUNTARY CONTRIBUTIONS * / CONTRIBUTION VOLONTAIRES *		
		CMOS SCHOLARSHIPS (UNDERGRADUATE AND GRADUATE - BOURSES SCMO (PREMIER ET DEUXIÈME CYCLE)		
		DEVELOPMENT FUND - FONDS DE DÉVELOPPEMENT		
		*TAX DEDUCTIBLE - DONNE DROIT À DÉGRÈVEMENTS D'IMPÔT		

TOTAL NOTE: GST & HST EXEMPT - EXEMPT DE TPS ET TVH $

I WISH TO PAY BY: / JE DÉSIRE PAYER PAR: ☐ CHEQUE / CHÈQUE ☐ MONEY ORDER / MANDAT

OR / OU CHARGE MY / CARTE ☐ MASTERCARD ☐ VISA

CARD N° / NO DE CARTE

EXPIRY DATE - DATE EXP.

X SIGNATURE

If this is a student application please provide the name and signature of one of your professors. For records only; please indicate the institution and year studies will be completed and degree anticipated.

Si vous désirez devenir membre étudiant, S.V.P. obtenir le nom et la signature d'un de vos professeurs. Pour nos dossiers seulement; S.V.P. indiquez le nom de votre institution, l'année où vous finirez vos études et le diplôme attendu.

PROFESSOR'S NAME - NOM D'UN PROFESSEUR X SIGNATURE

YEAR - ANNÉE INSTITUTION

☐ BSc ☐ MSc ☐ PhD

X SIGNATURE OF APPLICANT - SIGNATURE DU DEMANDEUR DATE

CMOS-SCMO
Suite 112, McDonald Building
University of Ottawa
150 Louis-Pasteur Ave.
Ottawa, Ontario
K1N 6N5

Canadian Publications
Product Sales Agreement
0869228

Envois de publications
canadiennes Numéro de

Please send address changes to the above address. / Prière d'envoyer les changements d'adresse à l'adresse ci-haut.

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

35th Annual Congress / 35e congrès annuel

EXtreme Weather / Temps Violent

Winnipeg, Manitoba, Canada

May 27 - June 1, 2001
27 mai - 1 juin 2001

Contact: Jim Slipec (jim.slipec@ec.gc.ca)
Pat McCarthy (patrick.mccarthy@ec.gc.ca