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Canadian Meteorological and Oceanographic Society

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

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Cover page: The cover shows a photograph of a family of four waterspouts over Lake Huron near Kincardine, Ontario on September 9, 1999. Off the right hand side of the photograph (not shown) was a sailboat that was actually being chased by these waterspouts. The boat made it to the harbour safely but not before the captain considered beaching the vessel! The paper by Szilagyi (**page 160**) in this issue discusses waterspouts similar to these that were part of an event which turned out to be the largest waterspout outbreak in recorded history over the Great Lakes. Photo courtesy of Dwight Irwin, Kincardine News.

Page couverture: En page couverture, on voit une photographie d'une famille de quatre trombes marines, prise le 9 septembre 1999 sur le lac Huron près de Kincardine en Ontario. Hors photo, à la droite, il y avait un voilier qui était poursuivi par ces trombes marines. Le voilier s'est rendu sans encombre jusqu'au port, mais pas avant que le capitaine ait tiré le bateau sur la terre ferme. Dans ce numéro, l'article par Szilagyi (**à la page 160**) discute des trombes marines semblables à celles qui font partie de l'événement rapporté comme l'éclosion du plus grand nombre de trombes marines de toute son histoire sur les Grands Lacs. La photographie est une gracieuseté de Dwight Irwin, de Kincardine News.

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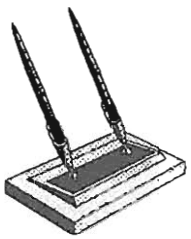
Canadian Meteorological and Oceanographic Society (CMOS)

Société canadienne de météorologie et d'océanographie (SCMO)

Executive / Exécutif

....from the President's Desk

CMOS friends and colleagues:



This is the final issue of the Bulletin for 2003. I have read a number of e-mails giving evidence that Geoff Strong and his committee are planning an exciting Congress in Edmonton. I hope many of you are planning to be there.

This issue of the Bulletin contains the call for nominations for CMOS prizes and awards. Have you ever been part of a coffee break conversation in which you listed several people who were as deserving or perhaps more deserving of a prize than the winners just announced? Have you wondered why your favourite colleague has not won a prize? It is probably because they were never nominated. CMOS Prizes and Awards begin with members nominating worthy candidates. Nominations are due by mid-February and more information can be found on page 175.

David Phillips is fond of saying that Canadians love talking about their weather. The past year has provided us with a number of new conversations. Farmers, fishers, seafarers, truckers, bus drivers and pilots have never doubted the power of weather to disrupt their lives, but this year, weather systems brought our urban environments to a halt.

Fires swept through subdivisions in Kelowna, BC and later in San Diego, California in spite of the efforts of hundreds of fire fighters and modern equipment, until the winds stopped and the atmosphere moistened.

Hurricane Juan, in a few short hours, tore a swath of destruction through Halifax city, its surrounding residential and fishing communities and the transportation and agricultural corridor leading north to Truro, the Northumberland Strait and Prince Edward Island. The synchronicity of Juan's landfall at Halifax and the high spring tide resulted in wide-scale damage to shoreline infrastructure. The impact is in the details; delivering those details in a timely manner is the challenge of the whole of our CMOS community.

I hope that you have taken the time to read the Vision document published in the last Bulletin and now posted on the web. Please send your comments; this document will guide our new Executive Director when he takes the reins from Neil Campbell following the Edmonton Congress.

Allyn Clarke
President / Président
CMOS / SCMO

Volume 31 No.6
December 2003 - décembre 2003

Inside / En Bref

Articles

Our regular sections / Nos chroniques régulières

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

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

Letters to the Editor

October 14, 2003

Subject: Halifax Hurricanes

Bob Jones' interesting account of Ginny in 1963 prompts the following - somewhat delayed, as I've had computer trouble and have been very busy paving (the road to you know where).

My first posting as a Met Officer was also to HMCS Shearwater, in 1949. In the fall of 1950 the eye of a fading hurricane passed over Halifax-Dartmouth. To put forecasting that 1950 storm in context, we had no fax, no CAO/CMC, no radar, no satellites, no NWP support. Weather reports were entered on the teletype circuits manually. Jet streams were unknown in operational meteorology, and the very few jet planes were fighters like the RAF Vampire. The naming of hurricanes didn't start until 1953.

I was off duty and my wife had a medical appointment in Halifax the afternoon of the storm. The rain was heavy and easterly winds were quite strong although the storm doesn't make the Green Lane list of tropical cyclones with winds over 50 kts at landfall. We did not cancel. Just before leaving our apartment in Dartmouth to walk to the ferry (no bridges in 1950) the winds dropped and the rain ended. Eery weather on the ferry trip - hazy blue sky, warm, calm, fog hanging over the water so low that we were above it on the upper deck. Visibility was not good and I don't recall seeing any wall cloud. By the time we were homebound the eye was moving on. The last 2-3 blocks we walked in strong westerly winds and more rain. The trip, and passage of the eye, probably took a bit over an hour.

The Met Officer on duty at the naval air base (at that time also the Halifax airport), the late Rod Holbrook, climbed up the ladder to the observing platform behind the office (built so that the met staff could get a view of the airfield) for a once-in-a-lifetime experience in the eye of a hurricane. What he saw was the navy wheeling out aircraft, ready to resume flying exercises in view of the fine weather! He retreated hurriedly to the phone and the planes were back in the hangar before the westerlies got started. He claimed that if he got paid to retirement without working another day, he would owe the taxpayers nothing because of that one phone call!

A golfing friend, when the subject of Juan came up, said that his most frightening experience had been when the eye of a hurricane passed right over a ship that was waiting out its passage before entering Halifax harbour. Sure enough, it was the fall of 1950. The ship was the aircraft carrier HMCS *Magnificent*. He had also spent time on Ocean Station Bravo in the Labrador Sea when that was a joint effort with the USN, before Canada took over Papa. Rough times there too, but not like the hurricane. Bill Ganong would have been the Met Officer on the Maggie in 1950.

I don't recall much about damage, other than some trees down and boats blown about. A vicious winter storm the winter of '49-50 made more of an impression, including a major power outage.

Trees often cause most of the damage, as seems the case with Juan. In 1950 the 100-year-old trees blown down by Juan were relative striplings, and perhaps many of the trees that would have been ancient in 1950 had already succumbed to the explosion in 1917. Fifty-three years adds a lot of mass, and wind resistance, to the upper reaches of trees (and of many meteorologists for that matter). Also, the same storm a bit later in the year, when leaves had started to fall, would have caused less damage (Ginny was in late October). Southern England was devastated by a windstorm on 16 October 1987. Such winds were not unknown for the late fall and winter, but had never occurred so early when the trees were still in full leaf. As well, saturated ground from earlier rains left the trees less well anchored. Will tree-damage forecasts be next?

Another memory involves a telephone conference about a hurricane approaching the Atlantic provinces. Participants included the Chief Prognostician at CAO, the Shift Supervisor at Halifax, me, and perhaps someone from the Gander or Moncton offices representing aviation interests - I think we were four. As I moved to CAO in October 1963 and would have participated (more properly, listened in) as a prognostician-in-training, the hurricane must have been Ginny. Phone conferences were quite a new thing for the Met Service then.

The debate was about how soon a northward-moving hurricane would recurve - early enough to just skirt Nova Scotia or late enough to hit both NS and Newfoundland. One brave soul - my guess would be Al Parry at CAO - talked about merging with a disturbance in the westerlies and steering into the Gulf of St. Lawrence before it recurved, which would hit PEI as well as Newfoundland. As I recall we compromised, with NS forecast to be hit solidly before the storm passed south of Newfoundland.

The recently-available archive of hurricane tracks shows that Ginny had an unusual history. It formed quite far west, moved slowly northward, looped a couple of times off the US coast, suddenly raced northward to landfall in southwestern NS, thence up the Bay of Fundy and on to Anticosti! Ginny is number 3 on the Green Lane list, with winds of 90 kts (probably recorded at Yarmouth). That record also shows the 1950 storm, downgraded to tropical-storm status when it made landfall, moving up through western Newfoundland to the Strait of Belle Isle.

In1963 CAO would have had coarse-grid barotropic and baroclinic 500 mb progs and hurricane advisories from the USA, maybe something from CAO NWP, but not yet any output from PE models. Satellite pictures existed by then,

but no APT - only coded nephanalyses from Washington.

How things have changed - forecasts such as we have seen this year for Isobel and Juan, giving several days warning and nailing the track pretty cold at least 48 hours in advance, were not even dreamt of 40 years ago, much less 53.

If I am at all typical you do not hear from people on the retirees list very often. If that is so, be assured that we of the silent majority appreciate your work very much.

Don Smith
Halifax Centre

November 18, 2003

Subject: Trends in extreme events for Canada, especially the Prairies

Madhav Khandekar (*CMOS Bulletin SCMO*, Vol.31, No.5, October 2003, p.125) has reviewed some literature on trends in extremes and concludes there is little longer-term trend especially on the Prairies. My reading of the literature suggests a somewhat different conclusion.

There are several reasons for focusing on more recent periods, i.e. the past 30 to 50 years. The first is that IPCC's 2001 Assessment Report indicates that natural variability, driven by changes in solar energy, volcanic emissions and internal variability in the system, was mainly responsible for global changes to mid-20th century. It is only since then that the observed trends can be plausibly accounted for only by the increases in greenhouse gas concentrations (see Fig. 18, IPCC, 2001, Technical Summary – the Scientific Basis). If this is indeed the cause, we can expect any trend to continue or accelerate.

A second, more practical, factor is that engineering colleagues tell me that, currently, many construction and other economic decisions in Canada are still based on frequency analyses of extremes published in the 1960s and 1970s. So if increases in frequency of extreme events have occurred since then, many drainage facilities and other structures may be under-designed for current conditions.

Among the references that might be cited about recent trends are:

Zhang, X., Harvey, K.D., Hogg, W.D. and Yuzyk, T.R., 2001. *Trends in Canadian Streamflow*, Water Resources Research 37,4: 987-998:

- more frequent low flows in most Prairie streams since the 1960s.
- trend toward reduction in spring peak flows (except for Red River) because of greater melting of snowpack over winter leaving less for the spring freshet. The Red has been affected by a trend towards much greater winter precipitation in the US headwaters.

Yulianti, J.S. and D. H. Burn, 1998. *Investigating links between climatic warming and low streamflow in the Prairie regions of Canada*, Canadian Water Resources Journal 23, 1: 45-60.

Stone, D.A., Weaver A.J., and Zwiers, F.W., 2000. *Trends in Canadian Precipitation Intensity*, Atmosphere-Ocean 38, 2: 321-347.

- this paper suggests that for south-eastern Canada most of the increase in total precipitation accumulation in spring and early summer is due to increases in heavy event frequency. For increases in spring rainfall in south-western Canada, both heavy and light events are contributors, but for autumn periods, heavy event frequencies are the main contributors to the increased totals. This study was based on Mekis and Hogg's corrected data over the 1950-1995 period.

Adamowski, K, Bougadis, J. and Patry, G.G., 2003, Ottawa University. *Influence of trend on short duration design storms*, submitted to J. of Hydrological Engineering, American Society of Civil Engineers.

- the only recent analysis I know of, of trends in short duration (<1 hour) heavy rainfalls in Canada, indicates that in southern Ontario from 1968-1998, return periods for a given design storm for 5 minute to 1 hour duration, has been reduced from 22-31 years down to 7-9 years (for Oshawa). On average for 15 stations trend coefficients were highest for 15 and 30 minute storms (1.31 and 1.22) than for 5 and 10 minutes or 60 minutes.

In short, there is mounting evidence that the climate model projections of Kharin and Zwiers are beginning to be documented in Canada as well as USA and elsewhere. They indicate that more heavy rain events will occur in a greenhouse gas forced climate.

Kharin, V.V., and Zwiers, F.W., 2000. *Changes in extremes in an ensemble of transient climate simulations with a coupled atmosphere-oceans GCM*, J. of Climate 13: 3760-3788.

Winter Storms:
McCabe, G.J., Clark, M.P., Sereze, M., 2001. *Trends in Northern Hemisphere Surface Cyclone Frequency and Intensity*. J. of Climate 14, 12: 2763-2768.

- this paper documents an increase in frequency and intensity of winter extra-tropical cyclones north of 60°N from 1959-1997. South of 60°N there has been a decrease in frequency but increase in intensity. This is reasonably consistent with earlier

projections by Steve Lambert (CCCma).

Lambert, S.J., 1995. *The effect of enhanced greenhouse warming on winter cyclone frequency and intensity*, J. of Climate 8: 1447-1452.

Now it could be argued, and Dr. Khandekar might do so that these 30-50 year changes are part of natural variability and perhaps associated partly with changes in the Pacific Decadal Oscillation in the late 70s or the Arctic Oscillation. However, these trends are consistent with model projections of extremes with the observed and ever-increasing greenhouse forcing of climate, so anthropogenic climate change seems to me to be the more plausible explanation by far, for most of the changes.

We need to recognize that the trends are real and should be taken into account in planning and design activities.

Jim Bruce,
Ottawa Centre.

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

Emissions Scenarios, Intergovernmental Panel on Climate Change, Cambridge University Press, Paper Cover, 0-521-80493-0, 2000, $44.95US.

Climate Change 2001, Synthesis Report, Contribution of Working Groups I, II, and III to the Third Assessment Report of the Intergovernmental Panel on Climate Change, by Robert T. Watson, Editor, April 2002, Cambridge University Press, Paperback Cover, 0-521-01507-3, $40.00US.

The State of The Nations's Ecosystems, Measuring the Lands, Waters and Living Resources of the United States, The H. Heinz III Center for Science, Economics and the Environment, Cambridge University Press, Paperback Cover, 0-521-52572-1, $25.00US.

The High-Latitude Ionosphere and its Effects on Radio Propagation, by Robert Hunsucker and John Hargreaves, Cambridge University Press, Hardback Cover, 0-521-33083-1, $140.00US.

Exploration of the Solar System by Infrared Remote Sensing, by R.A. Hanel, B.J. Conrath, D.E. Jennings, R.E. Samuelson, Cambridge University Press, Hardback Cover, 0-521-81897-4, $120.00US.

Handbook of Atmospheric Science, Principles and Applications, Edited by C.N. Hewitt and Andrea Jackson, Blackwell Publishing Ltd, Hardback Cover, 0-632-05286-4, $300.00US.

Dynamics of the Atmosphere, A course in theoretical meteorology, Wilford Zdunkowski and Andreas Bott, Cambridge University Press, Paperback Cover, March 2003, 0-521-00666-8, $60.00US.

Coasts: Form, Process and Evolution, Colin D. Woodroffe, Cambridge University Press, Paperback Cover, 0-521-01183-3, $50.00US.

Global Change and Local Places: Estimating, Understanding and Reducing Greenhouse Gases, Association of American Geographers - GCLP Research Group, Cambridge University Press, July 2003, Hardback Cover, 0-521-80950-9, $75.00US.

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

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

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Editor / Rédacteur-en-chef
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We can't change the weather. And that's a good thing because everybody would want something different.

Pacific Water in the North Atlantic Ocean[1]

by E. Peter Jones[2]

The earth's water cycle shapes our climate and sustains life on earth. Water evaporates from the oceans into the atmosphere, is transported over wide regions, falls as rain, and snow and returns to the oceans either directly or via rivers. The oceans are not, however, merely a passive provider of water vapour to the atmosphere. Ocean dynamics are controlled by seawater density, which in turn depends on the salt content and temperature of seawater. Through density, the oceans are greatly affected by how, when, and where freshwater enters and leaves the ocean through evaporation, precipitation, and run-off.

Figure 1. The Global Conveyor Belt representing global thermohaline circulation in the Arctic and Atlantic oceans (thanks to Greg Holloway). Warm water flows to polar regions, transporting heat and eventually becoming cooled and made dense enough to sink to deep waters and flow south. Upwelling in equatorial regions closes the loop.

In arctic regions, freshwater figures strongly in the formation of dense water that sinks into the deep ocean as part of thermohaline circulation or the Global Conveyor Belt (Figure 1). As ice is formed, freshwater is extracted from seawater, and the excluded salt drains from the ice as brine to form dense water. This denser water forms thick mixed layers in the surface ocean or over shallow shelves triggering dense plumes that flow down the continental slopes into deeper water. In some regions, these waters are dense enough to penetrate to the lowest depths of the ocean. Too much freshwater in the surface layers, however, might interfere with this process. The Greenland Sea is presently the source of much of the northern hemisphere's deep waters feeding the Global Conveyor Belt. Both freshwater from rivers entering the Arctic Ocean, and ice produced within it, are exported to the Greenland Sea and can affect its deep convection processes. The freshwater budgets in arctic regions are of direct relevance to the understanding and prediction of changes in thermohaline circulation and hence to global climate.

The North Atlantic is the saltiest of the world's oceans while the North Pacific is the freshest. The Arctic Ocean provides a pathway that moves freshwater from the Pacific Ocean to the North Atlantic Ocean as low salinity surface water. This source of freshwater is comparable in volume to river runoff.

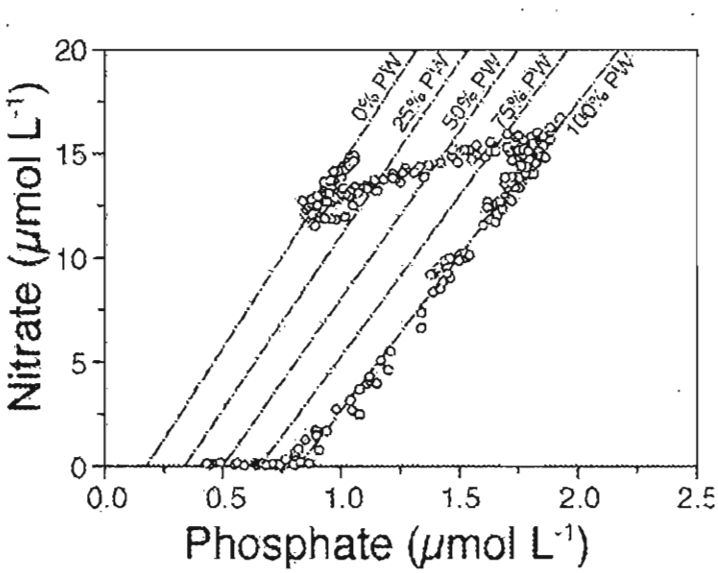

Figure 2. Nitrate-phosphate relationships showing the distinction between waters of Atlantic and Pacific origins. Pacific water has less nitrate relative to phosphate than does Atlantic water.

[1] First published in: Geddes, D.E. [ed.]. 2002. Bedford Institute of Oceanography - 2001 in review. Fisheries and Oceans Canada and Natural Resources Canada. 84 p.

[2] Ocean Sciences Division, Bedford Institute of Oceanography, Dartmouth, NS, Canada.

Pacific water enters the Arctic Ocean through the shallow (50 m deep) Bering Strait. Atlantic water flows along the northern coast of Norway, entering the Arctic Ocean through the much deeper Fram Strait. Pacific and Atlantic waters partially mix within the Arctic Ocean, but with the Pacific water being less dense (less saline) than the Atlantic water, it remains confined in the Arctic surface layers within the basins adjacent to North America. In addition to their different salinities, the two source waters have other properties that distinguish one from the other. In particular, they have different relationships between their dissolved nitrate and phosphate concentrations that have enabled us to trace the pathway of Pacific water through the Arctic Ocean into the North Atlantic Ocean (Figure 2).

Two processes affect nutrient concentrations in the oceans. Photosynthesis reduces carbon, nitrate, and phosphate concentrations in the ocean and increases oxygen concentrations. Decay reverses this process, increasing carbon (carbon dioxide), nitrate, and phosphate concentrations, and decreasing oxygen concentrations. Since photosynthesis utilizes these components in fixed ratios, the relationships between nitrate and phosphate are maintained in a water mass that has not mixed with another one. By observing the nitrate and phosphate concentrations, we have been able to delineate boundaries and mixing regions between the source waters in the near surface waters of the Arctic Ocean. This has enabled us to infer the circulation of near-surface water (Figure 3).

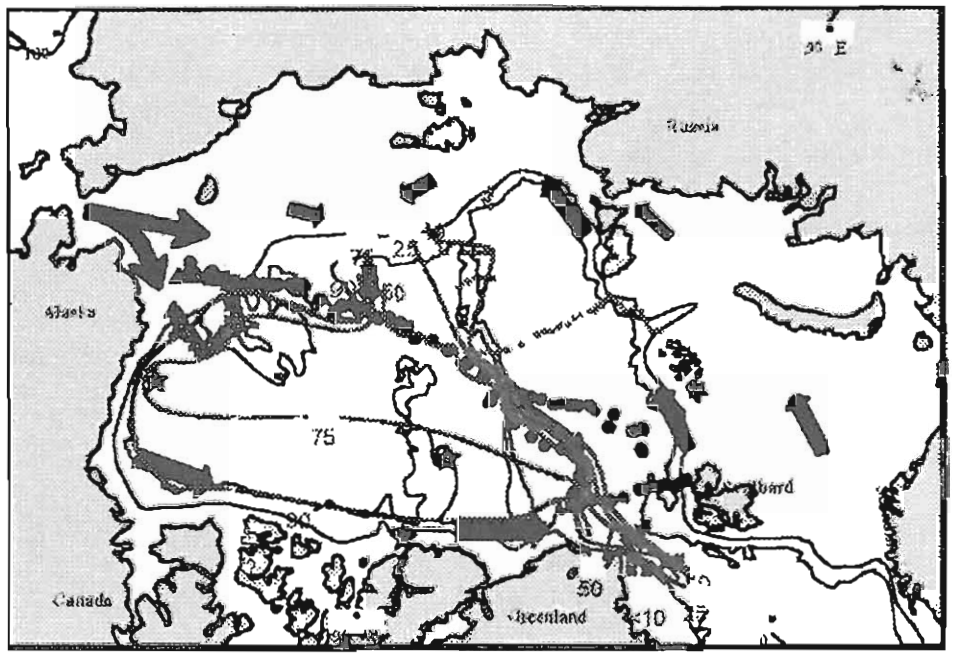

Figure 3. Contours of the percentage of Pacific source water in the surface layer (upper 30 m) of the Arctic Ocean. Arrows show the flow pattern in the surface layer suggested by the relative distribution of Pacific and Atlantic source waters.

Pacific water is not confined to the Arctic Ocean. Using nutrient concentrations as tracers, we find Pacific water well to the south in the Atlantic sector (Figure 4). Near surface water (typically the top 200 m) exits the Arctic Ocean through the Canadian Arctic Archipelago and through Fram Strait to the west of Greenland. Our analyses show that much of the water flowing through the Canadian Archipelago is of Pacific origin. In Barrow Strait and Jones Sound almost all is of Pacific origin. Atlantic water is only seen exiting through Nares Strait between Ellesmere Island and Greenland at depths greater than 100 metres.

An unexpected, but with hindsight not surprising, finding was that the seawater (that is, excluding contributions from rivers and sea ice meltwater) in Hudson Bay appears to have come from the Pacific Ocean. Since water flowing through Barrow Strait is of Pacific origin, water flowing south from Barrow Strait through Fury and Hecla straits into Hudson Bay could also be expected to be of Pacific origin.

Pacific water flowing through the Canadian Archipelago joins the Baffin and Labrador currents and can be distinguished as far south as the Grand Banks, and perhaps Flemish Cap, before it becomes too well mixed with Atlantic water to be discernible.

Pacific water also exits the Arctic Ocean through Fram Strait and along the east coast of Greenland. As it travels south, it mixes with Atlantic water, but is still identifiable in Denmark Strait between Greenland and Iceland. Near the south of Greenland, available data show no signs of Pacific water.

Changes in the freshwater flow from the Arctic Ocean may have significant consequences for the climate and life on earth. At the least, it could result in a cooling in northern regions if the thermohaline circulation in the North Atlantic Ocean is weakened. More drastically, it has been postulated that past changes in the thermohaline circulation, a shutdown of the Global Conveyor Belt, may have been the cause of ice ages. We must become able to predict, with far greater certainty, the magnitude of such effects and the probability of their occurrence within a given time scale. Identifying where source waters originate and tracing their circulation is necessary so that ocean currents can be appropriately represented in models that describe ocean circulation and its interactions with the atmosphere. Such models are vital to describing climate and predicting climate change.

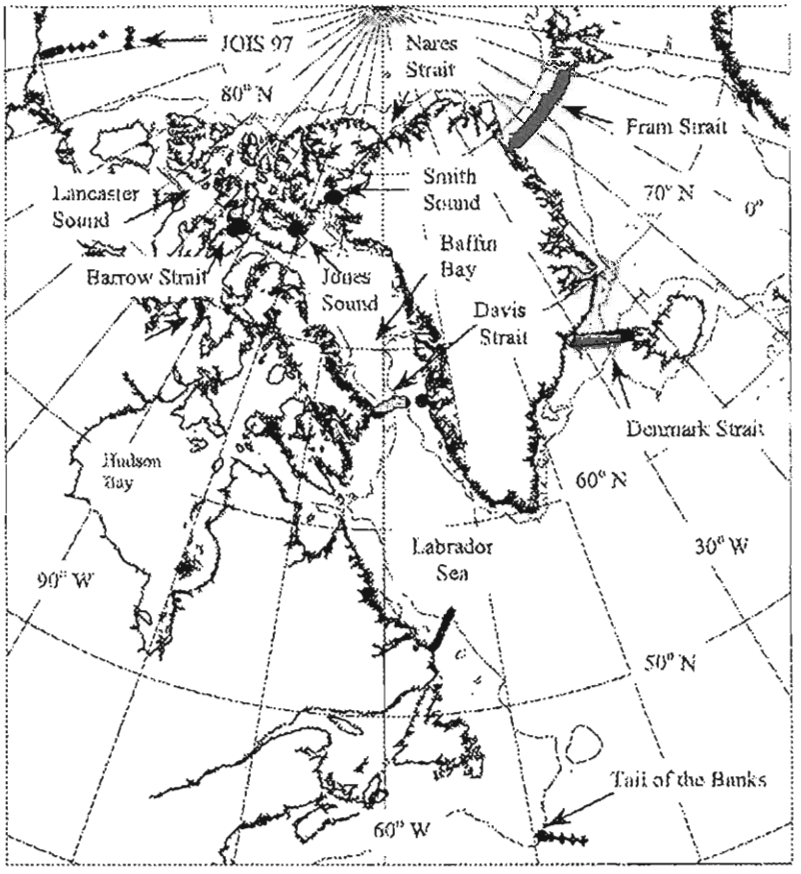

Figure 4. Map showing locations of oceanographic sections where Pacific water is found.

One-Week Summer School on Process Studies of Atmospheric Dynamics and Chemistry by Comparison of Models and Measurements

The summer school is intended to help modellers understand measurements, and measurement scientists understand models, because it is through the detailed comparison of models and measurements that maximum scientific understanding is achieved. The principal focus of the summer school will be stratospheric dynamics and chemistry, but some treatment will be provided of the troposphere and mesosphere. Topics will include: stratospheric ozone chemistry, stratospheric dynamics, mesosphere/lower thermosphere dynamics and chemistry, radiative transfer and remote sounding, measurement techniques, retrieval theory, 3D and 4D data assimilation, chemical transport. Practicals with various instruments will be included.

Confirmed Lecturers: Dylan Jones (Toronto), Jack McConnell (York), Ian McDade (York), Tom McElroy (MSC), Charles McLandress (Toronto), Stella Melo (Toronto), Richard Ménard (MSC), Saroja Polavarapu (MSC), Ted Shepherd (Toronto), William Ward (New Brunswick).

Dates: 22-28 May, 2004 (mid-day to mid-day).

Location: Banff, Canada.

Registration is $500, which includes shared accommodation and meals (single accommodation may be possible for a surcharge of $327), but space is limited. Preference will be given to graduate students at Canadian universities. Please send applications by 31st January 2004 to

Dr. David Sankey,
Department of Physics, University of Toronto,
60 St. George Street, Toronto, ON, M5S 1A7.
Email: sankey@atmosp.physics.utoronto.ca
Fax: (416) 978-8905

Further information and application forms are available on the web at http://www.atmosp.physics.utoronto.ca/MAM/summerschool.html

The summer school is organized by the *Modelling of Global Chemistry for Climate* (GCC) Project, and supported by funding from NSERC and CFCAS.

The Great Waterspout Outbreak of 2003

by Wade Szilagyi[1]

Abstract

The period from September 27 to October 3, 2003 saw the largest waterspout outbreak over the Great Lakes in recorded history. In total, an unbelievable 66+ waterspouts were sighted! On one day alone, 21+ waterspouts were seen over Lake Ontario. One confirmed waterspout even made it to land, causing some shoreline damage. The outbreak period was 7 days, making it the longest lasting event. It was also the most photographed event with 67 photographs and 3 videos taken. The event was recognized well in advance; with at least 4 days lead-time. The event's contribution to the year's total of 82 waterspouts was a record in itself. This was the largest number of waterspouts ever observed in any year. An interesting fact is that if the event did not take place, the 2003 waterspout season would have turned out to be the lowest on record. This record-breaking event can be attributed to a cold air mass, with an associated major upper trough, that moved over the Great Lakes, remaining entrenched there for an entire week. Lake temperatures were also well above normal for that time of year. This combination turned the Great Lakes into a "natural laboratory" that generated multiple vortices on a daily basis.

Résumé

Au cours de la période du 27 septembre au 3 octobre, l'année 2003 aura observé, sur les Grands Lacs, l'éclosion du plus grand nombre de trombes marines de toute son histoire. Au total, on a pu observer, de façon incroyable, plus de 66 trombes marines. En un jour seulement, on en a observé plus de 21 sur le lac Ontario. On a confirmé qu'une trombe marine aurait atteint les rives et causé quelques dommages. La période d'éclosion d'une durée de 7 jours a été un événement dont la persistance a été la plus longue. Ce phénomène qui a été le plus photographié dénombre 67 photographies et 3 vidéos. Cet événement a été reconnu comme un fait marquant 4 jours à l'avance. La contribution de cet événement aux 82 trombes marines inventoriées cette année a été un record en lui-même. C'est le plus grand nombre de trombes marines jamais observées en une année. Il est intéressant de constater que si l'événement n'avait pas eu lieu, la saison des trombes marines pour l'année 2003 aurait été la plus faible de son histoire. Cet événement qui s'inscrit comme un record est dû à une masse d'air froid associée avec un creux en altitude qui s'est déplacé sur les Grands Lacs et qui y est demeuré pendant une semaine complète. Les températures du lac ont été aussi très au-dessus de la normale pour ce temps de l'année. Cette combinaison a développé une sorte de «laboratoire naturel» sur les Grands Lacs favorisant la formation d'une multitude de tourbillons de façon quotidienne.

Introduction

September is the peak month for waterspout activity over the Great Lakes (Fig. 1). During this period fifteen waterspouts are sighted on average. However, up until the last few days of September 2003, only six sightings were reported. As with the year before, it looked like there would be little in the way of waterspouts.

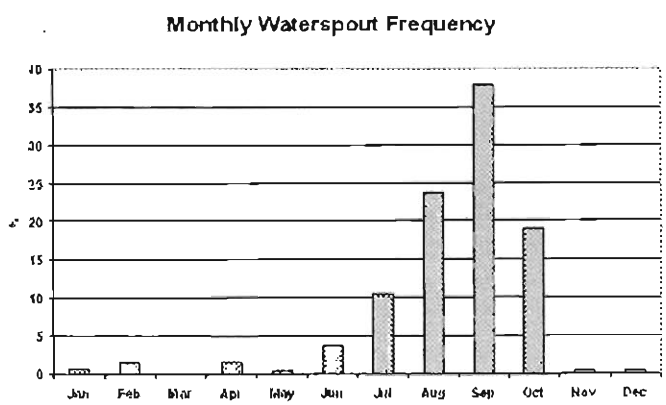

Fig. 1. Monthly waterspout frequency distribution

The water temperatures of the Great Lakes were well above average for that time of year. This was as a result of a warmer than average summer that the region experienced. Interesting enough, warm water temperatures are one of the favourable conditions for waterspout development, yet few occurred. The same pattern was also seen the previous year with water temperatures well above normal, but with waterspout sightings well below the average. The reason for this was that the main jet stream was well to the north of the Great Lakes. As a result, few cold air outbreaks occurred. This meant that conditions were generally stable over the Great Lakes. Stable conditions are not conducive to waterspout development (See section on "Atmospheric stability"). However, things were to change in the last days of September 2003.

[1] Meteorologist, Service, Clients and Partners Directorate (SCPD), Meteorological Service of Canada, Downsview, Ontario, Canada.

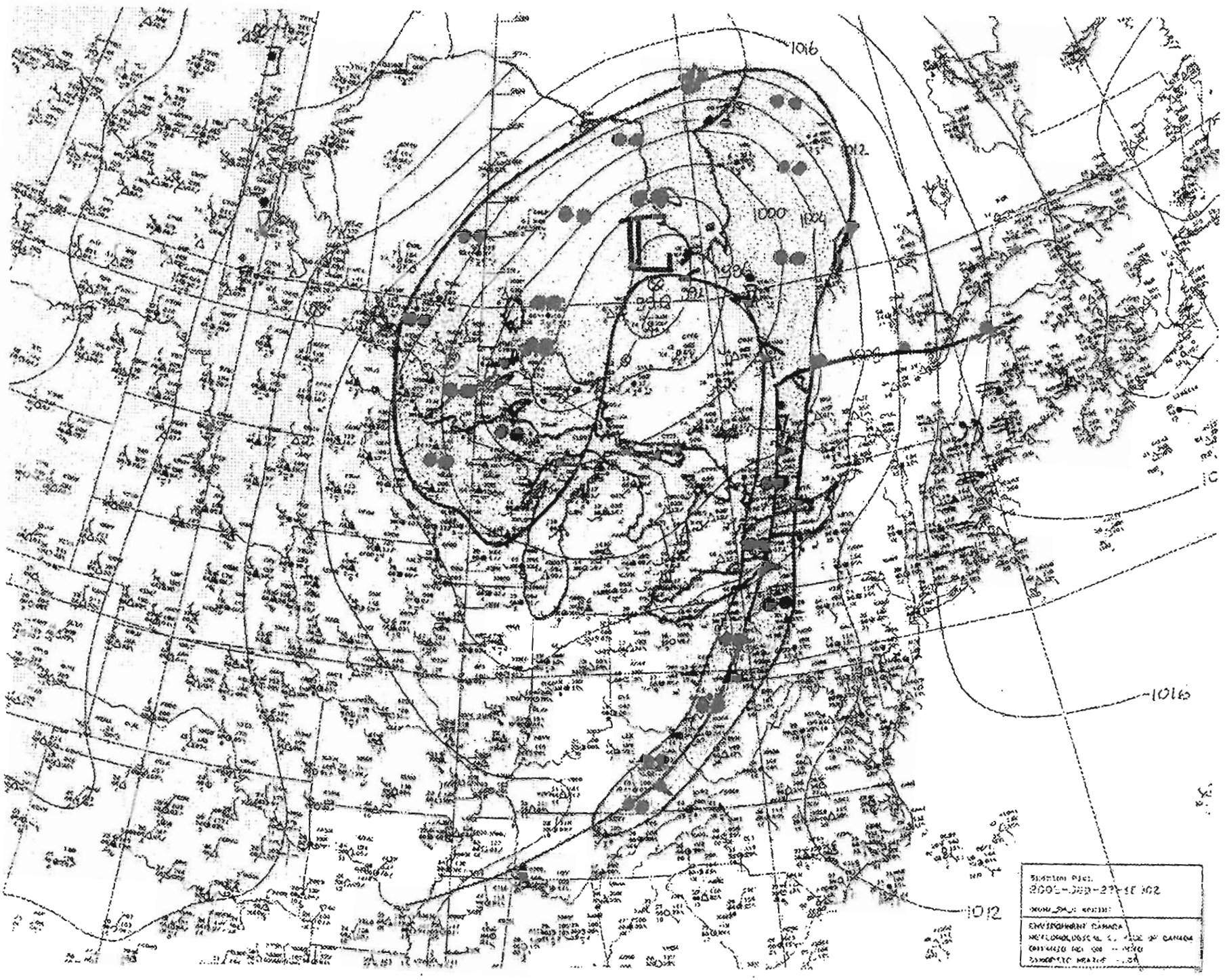

Fig. 2. Surface synoptic map. September 27, 1800 UTC.

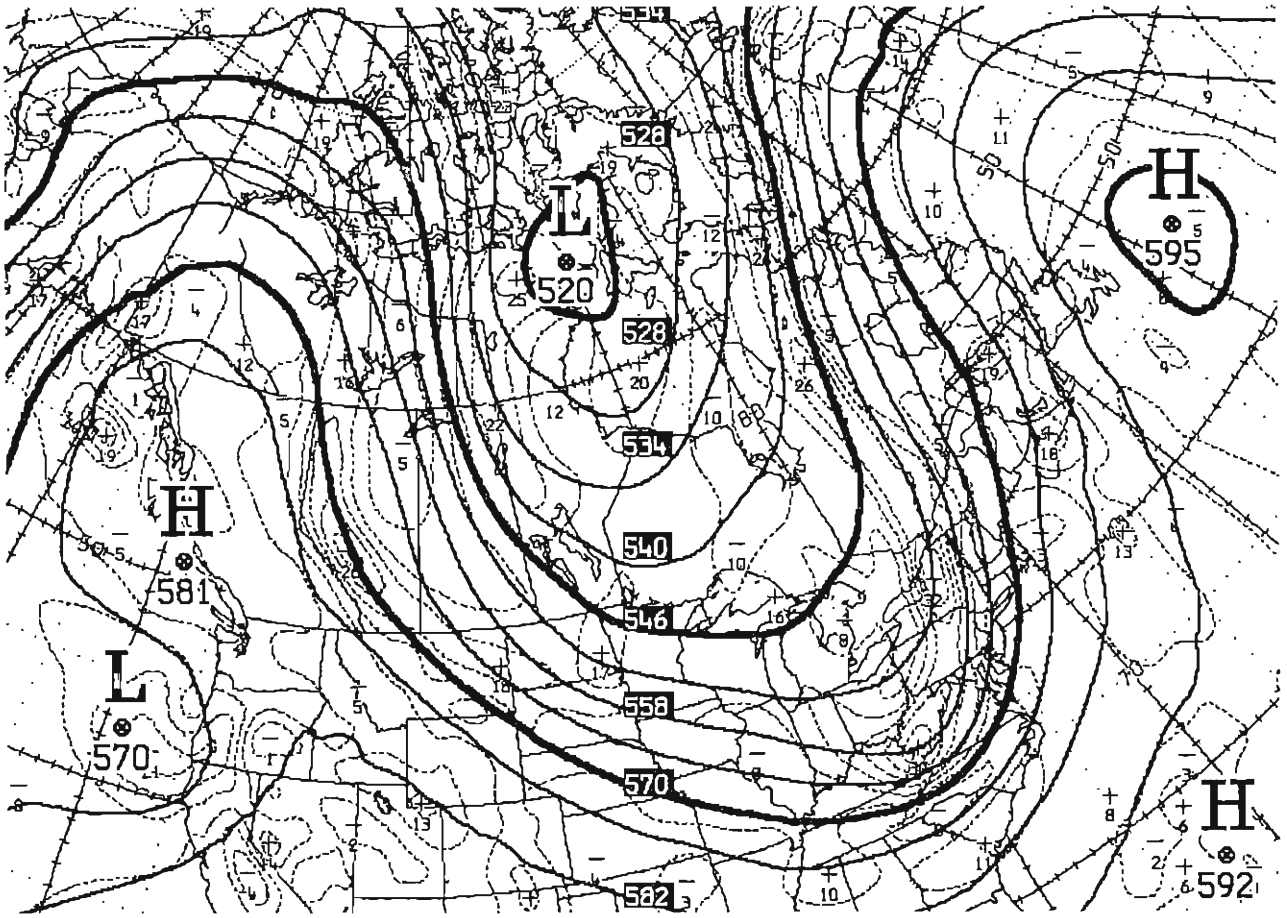

Fig. 3. Regional GEM 00hr 500 mb height/vorticity map. September 28, 0000 UTC.

Synoptic Situation

The onset of the outbreak was brought on by the flood of cold air in the wake of the passage of a cold front (Fig. 2). This cold front would be the last major surface synoptic feature that the region would see until the end of the outbreak period seven days later. Also present was an exiting cut off surface low over northeastern Ontario. Farther to the west, to the lee of the Rockies, a major northwest to southeast ridge was building in. This ridge would be responsible for developing the "Pipeline to the Arctic", which is a stream of cold air whose source is over the Arctic region. Aloft, a negatively tilted major upper trough established itself over the region (Fig. 3), remaining there for the next week.

The outbreak period would also see the set up of several convergent lines over the Great Lakes comprising of showers and embedded thunderstorms (Fig.4). It was along these convergent lines that the majority of waterspouts were sighted. On October 1, one convergent line produced more than twelve waterspouts. Of these, seven were seen in a row at the same time!

On October 2, an interesting event took place over eastern Lake Ontario. A northeast to southwest convergent line of showers and embedded thunderstorms had set up. At the same time, a northeast to southwest oriented surface trough was moving southward from Ontario over the lake. When the two features interacted, the convergent line intensified on radar (Fig. 4). It was during this period that over twenty-one waterspouts were sighted!

The last day of this historic event occurred on October 3. By this time, the axis of the upper trough had moved off to the east of the Great Lakes. Also, geopotential heights were rising and warm air advection was taking place over the region. This was in association with an approaching system from central Ontario. By October 4, conditions stabilized enough over the Great Lakes that no further waterspout sightings were reported.

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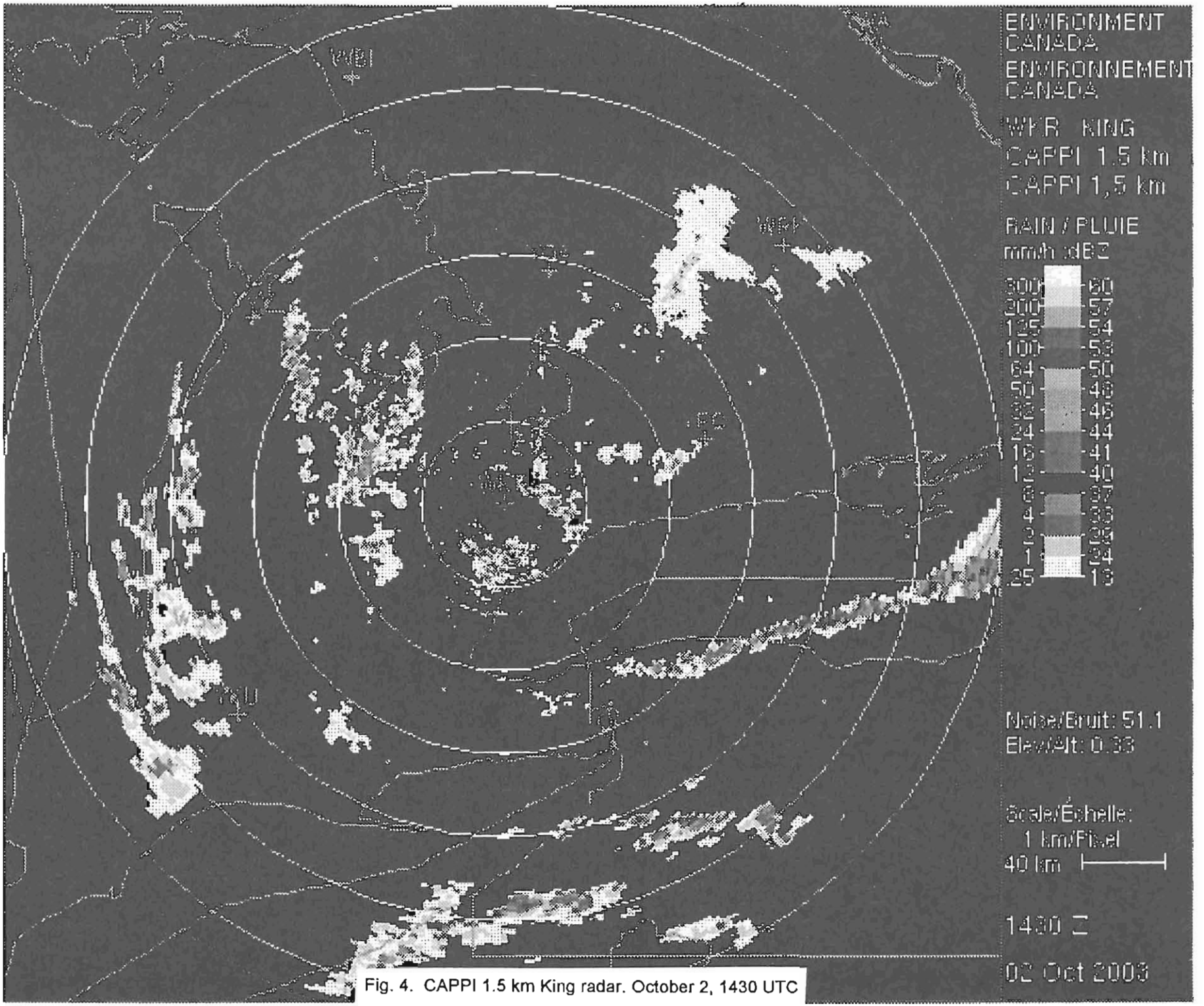

Fig. 4. CAPPI 1.5 km King radar. October 2, 1430 UTC

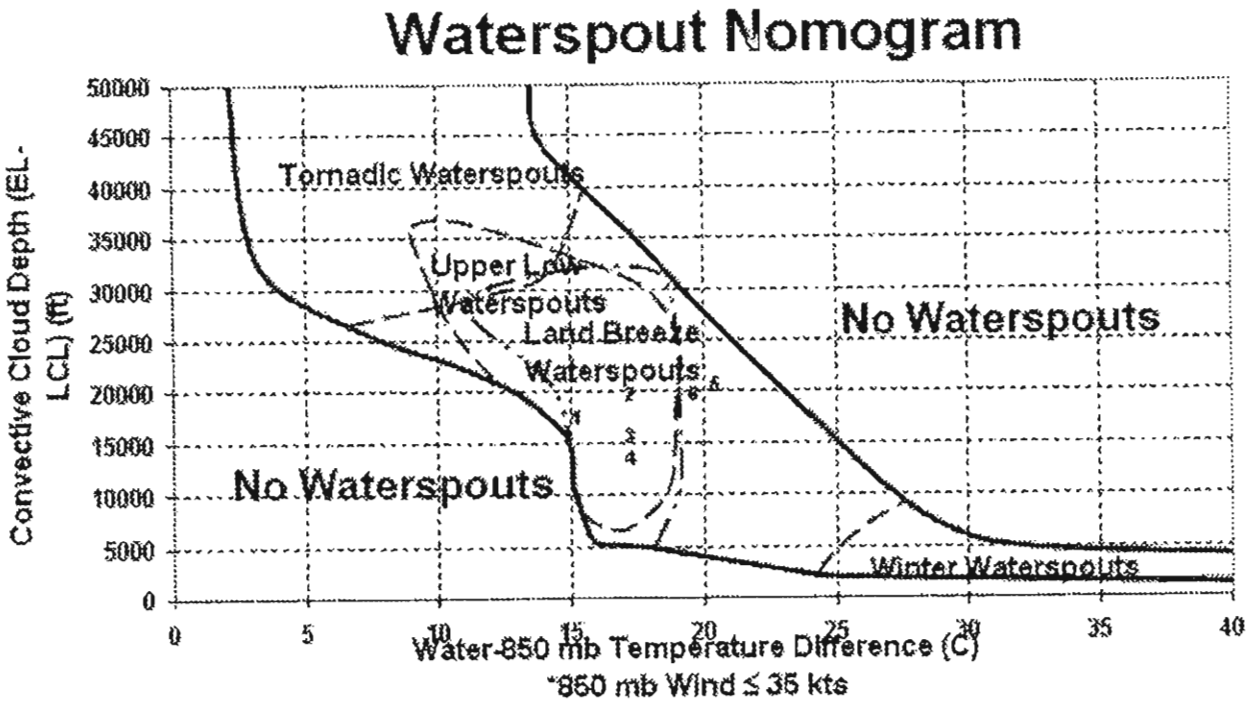

Fig. 5. The Waterspout Nomogram. A tool used in diagnosing and forecasting waterspout potential over the Great Lakes. Plotted numbers represent each day of the event, starting with Day 1.

Atmospheric stability

Ongoing research by the author into waterspout activity over the Great Lakes has resulted in the identification of two boundary layer instability parameters that are strongly correlated with waterspout formation. These parameters are the lake-850 mb temperature difference (T) and the lake generated convective cloud thickness (Z). In addition, a boundary layer wind constraint has been identified. T is a measure of the instability in the lowest 5,000 ft of the atmosphere. Z is the depth of the convective cloud that forms over the water. It is a measure of the instability in the boundary layer as well as a moisture content indicator. The wind constraint is the 850 mb wind speed. Empirical evidence has shown that there exists an upper limit to the boundary layer wind speed; measured at 850 mb, at which point the formation of waterspout vortices ceases. This limit is 35 kts.

These three parameters are the components of a technique that has been developed by the author to diagnose and forecast waterspout potential over the Great Lakes. The technique takes the form of a nomogram (waterspout nomogram) (Fig. 5). It is based on 139 waterspout events that have taken place from 1988 to the present. Conditions are favourable for waterspout development when T and Z are such that the resultant plotted point on the nomogram falls within the envelope of lines indicated. The outer edge of the envelope is called the waterspout threshold line. This is the limit for which waterspouts can form.

The passage of the cold front on September 27 resulted in a flood of cold air over the above seasonally warm waters of the Great Lakes. This resulted in unstable conditions in the boundary layer that would last for a week. The instability increased each day, reaching a peak on the days of October 1 and 2. This was the direct result of air being tapped from a colder source region ("Pipeline to the Arctic"). Figure 6 shows the conditions over Lake Ontario on October 2. This is an example of extreme instability. A deep dry adiabatic layer was present from the surface up to 750 mb. Convection easily reached the tropopause, which was quite low at 17,000 ft. On that day, T was 19.5°C, Z was 20,000 ft and the 850 mb wind speed was 25 kts. According to the nomogram, these were extremely favourable conditions for waterspout development (point 6, Fig. 5). More than 21 waterspouts formed along a convergent line on that day (Figs. 4 and 7a)I This same line contained embedded thunderstorms with anvils (Fig. 7b), indicating that convection had indeed reached the tropopause. Graupel was also observed from this line as it moved onshore (Fig. 7c).

Acquisition of reports

The importance of networking for gathering reports cannot be overstated. Without the networking that took place during the outbreak, the total number of confirmed waterspout sightings would not have resulted in a record-breaking event. With networking, the total number of waterspouts confirmed was 66+. Without networking, the number would have been only 23+!

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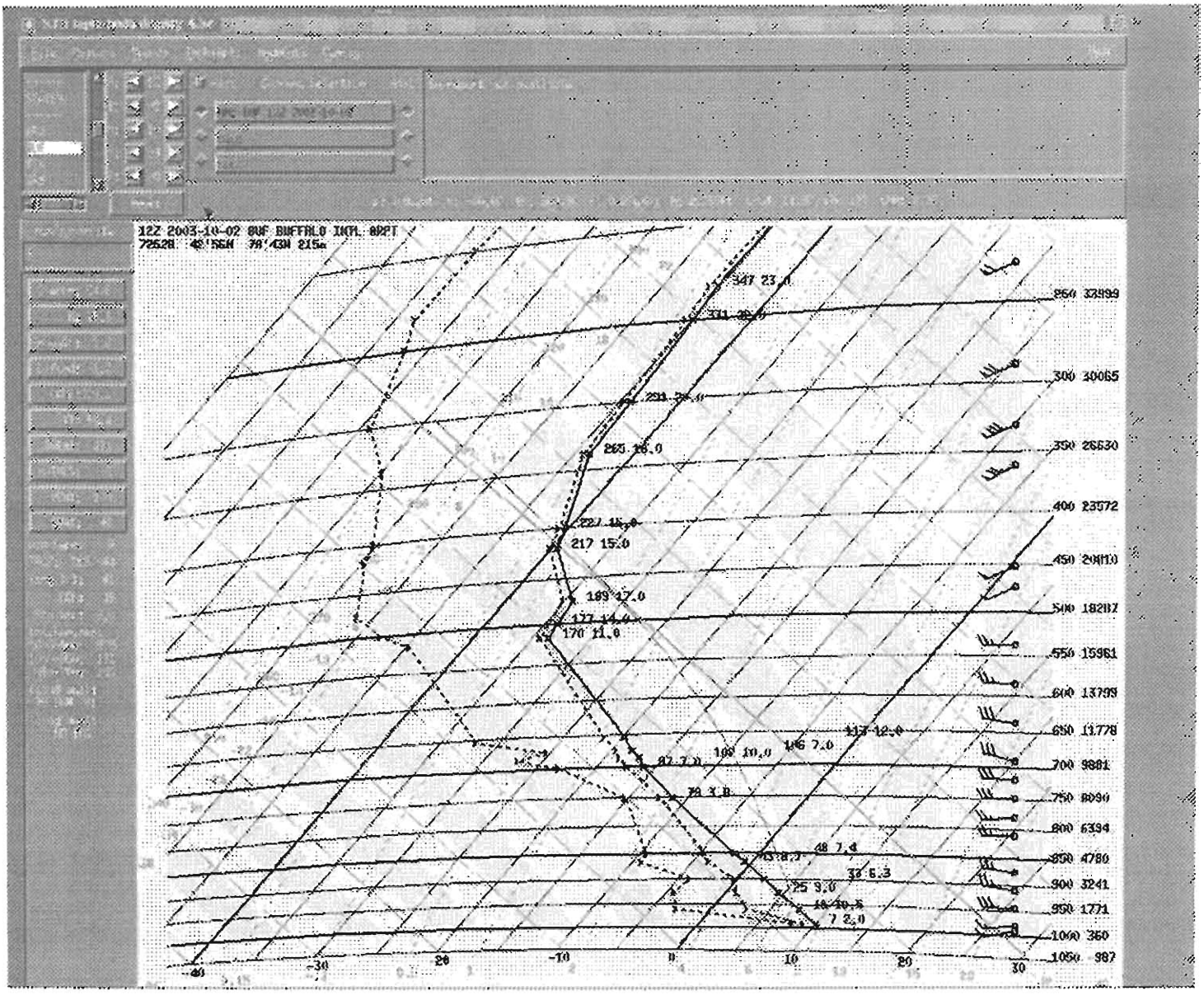

Fig. 6. Modified Buffalo tephigram. October 2, 1200 UTC

Meteorologists are usually informed of waterspouts from a variety of sources such as ships, aircraft, weather watchers, Coast Guard, and the general public. Previous to 1994, little communication took place between weather offices with regard to the sighting of waterspouts. In 1994, the author initiated a waterspout research project; this resulted in the establishment of a networking process. This process opened up the lines of communication among weather offices from around the Great Lakes. When a report of a waterspout was received at a weather office, the weather centre in Toronto was notified. All waterspout reports from every weather office from around the Great Lakes were then compiled at this central location. Immediately, there was a dramatic increase in the number of confirmed waterspout sightings (Fig. 8).

During the outbreak of 2003, this networking process was enhanced by actively pursuing reports from secondary and tertiary sources. These new sources of information included students from Oswego College in NY, a helicopter traffic reporter from Cleveland, storm chasers from Ontario and New York, Ontario Parks staff, and private individuals.

Another enhancement to the networking process was the direct coordination with a storm chaser during the entire event. This individual dedicated each day to seeking out and reporting on any waterspout sightings. The individual was contacted on a daily basis and directed to the most probable location of waterspout development within his area. It is through these efforts that seven additional waterspout reports were added to the total for the entire event.

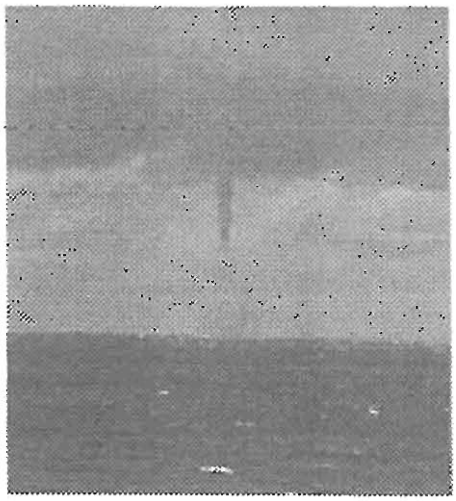

Fig. 7a. A picture of one of the 21 waterspouts that formed along a convergent line over eastern Lake Ontario on October 2. Photo courtesy of Lance Glover.

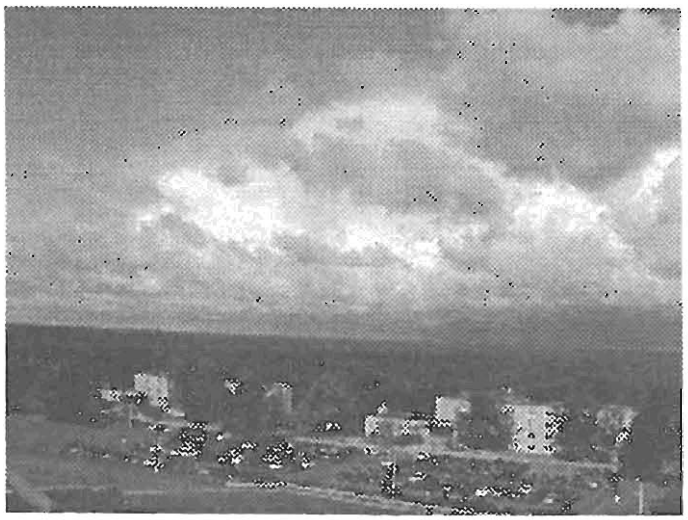

Fig. 7b. A thunderstorm anvil produced along the same convergent line. This is evidence that convection reached the tropopause. Photo courtesy of Scott Steiger.

Event Predictability

The first hint that a major waterspout event was to take place was five days in advance of the event itself. At that time, the 120 hr Global model showed that a major upper trough was to establish itself over the region. The model also indicated a set up of the "Pipeline to the Arctic" scenario. However, before this would occur, a smaller waterspout event was to take place.

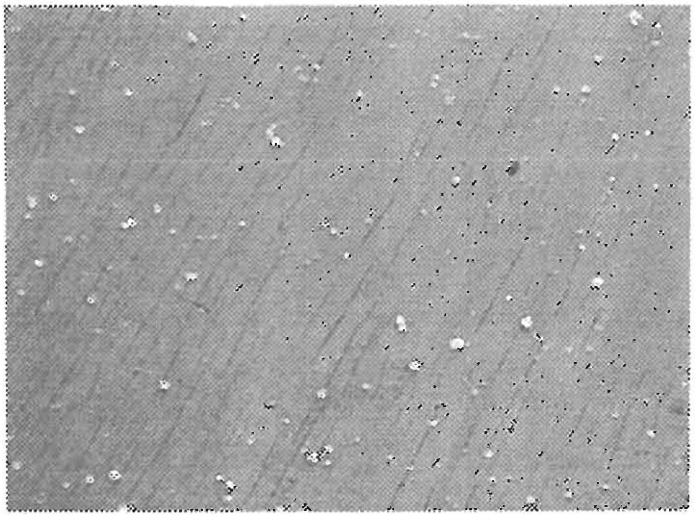

Fig. 7c. Graupel produced from one of the convective clouds along the convergent line. Photo courtesy of Scott Steiger.

On September 23, four days before the event, a change in air mass occurred with the passage of a cold front. An associated upper trough also moved over the region. The waterspout nomogram had predicted two days in advance of this event that favourable conditions would exist for the formation of waterspouts. This is what took place, with two waterspouts being sighted off Lake Erie. Still on September 23, the Global model continued to indicate that a major upper trough was to move into the region starting on September 27. The model surface map showed that thicknesses with this air mass would be even lower than the thicknesses that were associated with the latest waterspout event on September 23. Based on this evidence, it was concluded that a major waterspout outbreak would occur. This was four days in advance of the event!

On September 25, two days before the event, evidence of a major outbreak was even stronger when the waterspout nomogram indicated favourable conditions for waterspouts. Finally, on September 26, waterspouts were mentioned in meteorological discussion bulletins and included in the marine forecast for Lake Michigan the next day.

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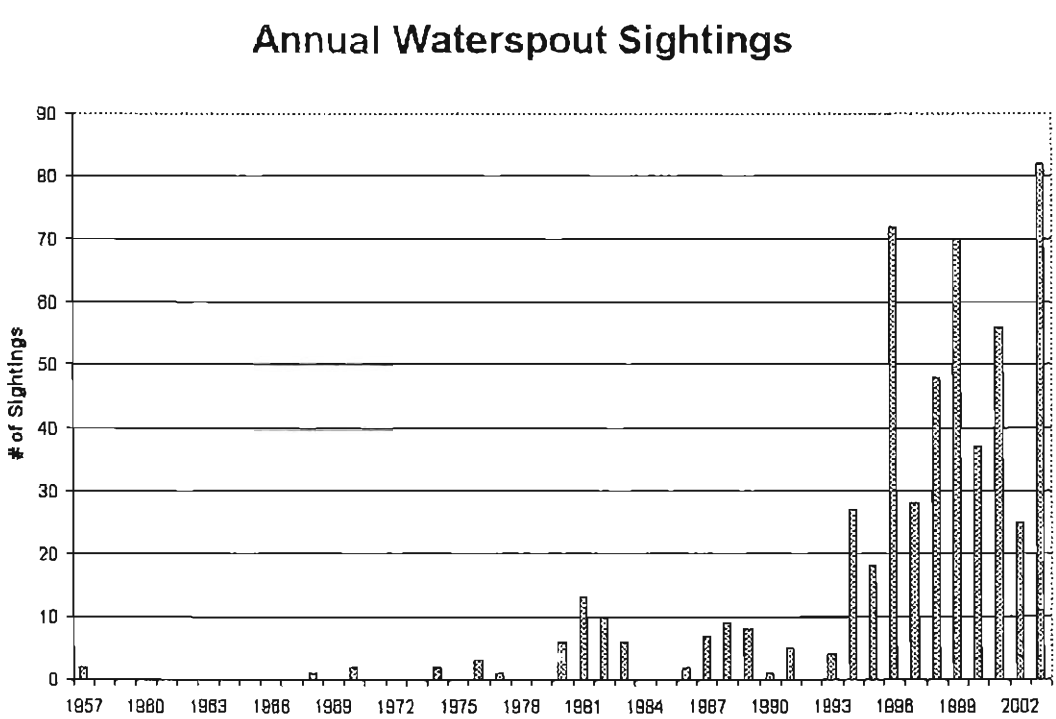

Fig. 8 Annual confirmed waterspout sightings (1957-2003).

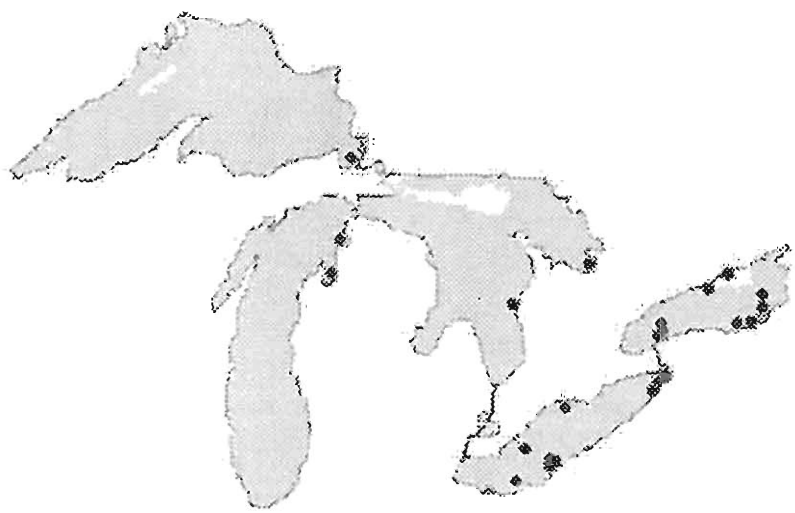

Fig. 9. Locations of waterspout sightings during the outbreak (September 27-October 3). Note that some location points had multiple sightings.

Event Summary

A summary of the record-breaking event as well as a comparison with the last major outbreak is given in Table 1.

	1996	2003
# of Waterspouts	41	66+
Max. 1-day total	26	21+
Max. sighted at one time	8	7
Lead time	0 hours	4 days!
Outbreak period	6 days	7 days
Pictures	0	67!
Video	0	3
Storm chasers involved	0	6

Table 1. A summary of the record-breaking waterspout outbreak of 2003 and a comparison with the last major outbreak that took place in 1996.

What stands out in the comparison between the two major events is that the lead-time for predicting such events has improved dramatically. Also, photographic evidence of such events has increased.

Figure 9 shows the spatial distribution of waterspout sightings over the Great Lakes during the record outbreak. It can be seen that the majority of the sightings occurred over Lakes Erie and Ontario. This was partly due to the geometric shape of each lake that allowed for convergent lines to set up. The other factor was that the events took place in a region where the population density was relatively high. Also, most sightings took place near communities. It should be noted that many convergent lines were observed on radar over Lake Huron and Georgian Bay (Fig. 4). However, only two sightings were made from these areas during the entire outbreak period. This is an area of low population density. Waterspouts had likely occurred here as well.

To understand the scale of this historic event, a comparison must be made with a typical waterspout outbreak. On average, a waterspout outbreak period lasts just over one day. Also, an average of five waterspouts are sighted during an outbreak. The Great Outbreak of 2003 lasted almost seven times longer than an average outbreak period. It also produced just over thirteen times the number of waterspouts that would normally occur.

Conclusion

The Great Waterspout Outbreak of 2003 occurred as a result of a significant change in the upper air pattern. The result was the movement of a cold air mass over the Great Lakes that were unseasonably warm. This created more than favourable conditions for waterspout formation that would last up to a week. The key to the longevity of the event was the entrenched major upper trough over the Great Lakes and the continuous supply of cool air from the Arctic region ("Pipeline to the Arctic").

Atmospheric conditions were ideal for a record-breaking waterspout event to take place. However, there was a non-meteorological component that allowed for the confirmation of so many waterspout sightings resulting in such a record. This was the process of networking which took place within and outside the meteorological community. Without this process, which developed during and after the event, the total number of confirmed waterspout sightings would have been far less. This networking process resulted in at least forty-three additional waterspout reports!

Networking was so successful that a program called "The Waterspout Watch Program" will be developed for next year's waterspout season. The program will consist of establishing a reporting mechanism that will notify various contacts from around the Great Lakes region when the potential for waterspouts will occur. These contacts will try to confirm any waterspouts during this period and report back to a central information managing authority.

Waterspout research has led to a significant improvement in our understanding and ability to forecast waterspout events since 1994. There is no doubt that this trend will continue in the future. The establishment of the Waterspout Watch Program, improvements to the waterspout nomogram, and greater synoptic pattern recognition of waterspout outbreaks will ensure an improved level of skill in forecasting such events in the future.

Acknowledgements

Special thanks to Tom Niziol (Buffalo Weather Office) and Jack Kertzie (U.S. storm chaser) for going out of their way to observe and photograph waterspouts off Lakes Erie and Ontario. I would also like to thank Rob Kuhn (Ontario Storm Prediction Centre), James Kosarik (Cleveland Weather Office), Steve Rowley (Gaylord Weather Office), David Andersen (The Plain Dealer) and Paul Vanderploeg (WTAM radio Cleveland) for supplying me with additional waterspout sighting information. Finally, special thanks to students Tracey Juda and Lance Glover as well as Prof. Scott Steiger of Oswego College for sending pictures and video.

Meteors in the Earth's Atmosphere

Edited by Edmond Murad and Iwan P Williams, 2002
314 pp., Hardcover ($80.00 US)
ISBN 0-521-80431-0

Book reviewed by Chris M. Wielki[1]

Meteoroids have fascinated both scientists and non-scientists alike for centuries. In 1200 BC Spartan writings reveal that wise men believed an observation of shooting stars meant that the king had committed a sin; hence the need to dispose of him. In recent years much of this focus has shifted and meteoric phenomenon is now studied in a more scientific manner. This is a well edited scientific book, presented in thirteen chapters sectioned into essentially four themes. These consist of 1) an introduction including a literature review on meteors by the editors, 2) a detailed study of meteoric dust measurements, 3) a large composition on observations of extraterrestrial matter in the earth's atmosphere, and 4) modeling and analysis of meteoric metals.

Chapter 1 (Introduction) is well written and very easy to read. It gives a historical review of meteors and discusses the evolution of scientific studies in this field. It contains a short description of observation methods, and some key terms are presented as a precursor to future chapters that focus on these methods. Meteoroid sources are also summarized.

Chapter 2 (The Evolution of Meteoroid Streams) focuses on the dynamics of the meteoroid formation processes and the meteoroid's evolution subsequent to the formation. The editor looks at what a study of meteors can tell us about meteor formation dynamics, physics of the process, and the nature of the parent body. The discussions on changes to the orbital plane and the evolution of the meteoroid orbit are well described, and are a captivating read. The three phases of the meteoroid stream (generation from the parent body, evolution, and meteoroid ablation in the atmosphere) are also discussed with a focus on the evolution.

Chapter 3 (Space Dust Measurements) discusses results from dust measurements in interplanetary space (circumplanetary, interplanetary, and interstellar dust). The chapter discusses how dust measurements are made and gives examples of measurements. Forces affecting dust particle dynamics are discussed as well as the importance of studying space dust to learn more about the parent body.

Chapter 4 (Extraterrestrial Dust in the Near-Earth Environment) discusses the collection of extraterrestrial dust in areas where terrestrial particles are low, as well as interplanetary dust in the stratosphere. The identification, sources and chemical composition of extraterrestrial dust are also the subject of this chapter. An interesting section, Atmospheric heating and element loss, is included which discusses experiments in various situations during atmospheric deceleration.

Chapter 5 (Detection and Analysis Procedures for Visual, Photographic and Image Intensified CCD[2] Meteor Observations) describes visual, photographic, and image-intensified techniques for observing meteors. As the detection is restricted to coverage in the visual (400-700nm), discussions and equations, such as luminous intensity are included. The first few pages of this chapter are strong. They provide definitions and equations (i.e. Zenith hourly rate, luminous intensity, etc.) vital to the understanding of the chapter's material. There is an interesting discussion on the meteors that are missed as a result of the angle between the center of the field of view and the meteor. Future trends are also summarized in this chapter. The chapter is very well done and incorporates good use of figures.

Chapter 6 (Radar Observations). Since radars are a valuable tool for finding information about meteoroids, such as the atmospheric trajectory, mass, altitude, velocity, and the orbit that sent them into the earth's atmosphere this is a vital chapter. A discussion follows on the generation of ionization (which serves as the radar target) and how the radar interacts with the meteoric plasma. An ionization dissipation section discusses mechanisms (diffusion, ionic reactions, with a short mention of winds), which dictate the life of meteoric plasma, thus affecting the lifetime of radar echoes. The radar equation biases in radar sampling are also mentioned. The chapter ends with a section on the current facilities that are in operation around the world.

Chapter 7 (Meteor Trails as Observed by Lidar) reports on observations of meteor trails by ground-based lidars. The chapter has a short review of the field including how the meteor trail is produced, lidar capabilities, and differential ablation. This is a good chapter containing valuable figures to aid the text, and a very well described section on observation technique (includes Mie and Rayleigh scattering, and how winds can advect the meteor trail into the lidar detection region). The reports on observations in the chapter focus on the Leonids, and

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[2] Charge Coupled Device

discuss the ablation of meteoroids relative to the free metal atom concentration layers at about 90 km.

Chapter 8 (In Situ Measurements of Meteoric Ions) discusses the metal ion layers' relation to meteoroid ablation in the atmosphere. A large portion of this chapter discusses sounding rockets. The metal ion layers are discussed using sounding measurements, and various trends in the metal layers are discussed (such as day and night, and latitude variations). Reasons for the variations including atmospheric dynamics, and changes in the incident distribution of the meteoroids are provided. The chapter has excellent figures to accompany the text, which prove very useful for the discussions on sounding results from recent years. Satellite measurements conclude the chapter.

Chapter 9 (Collected Extraterrestrial Materials: Interplanetary Dust Particles. Micrometeorites, Meteorites, and Meteoric Dust) begins with some definitions (Meteoroids, Interplanetary dust particles, etc.). The definitions section is quite good; however, having definitions for objects that have already been discussed in the book seems unnecessary (probably because when a collection of essays [written on the same subject] is compiled as a book, there will naturally be redundancy, and this is likely unavoidable). The chapter discusses constraints on extraterrestrial material sources, and has individual sections discussing the collection, classification, and chemistry of meteorites, micrometeorites, interplanetary dust particles, meteoric dust, and mesospheric metals.

Chapter 10 (Meteoroid Impacts on Spacecraft) opens with a very interesting paragraph describing impacts that have occurred in the past including an example from the last maximum of the Perseids where MIR was hit about 2000 times over 24 hours. The chapter focuses on meteoroid impacts, and discusses physical effects related to plasma generation. The author continues with a discussion (including equations) on impact probabilities, plasma generation and oscillations, and the generation of electric and magnetic fields due to the presence of plasma.

Chapter 11 (Models of Meteoric Metals in the Atmosphere) begins with a historical survey, and an interesting section on the ablation of meteoroids. The section regarding meteoroid ablation holds a thorough explanation of the ablation process (including melting by components) and calculations (including the velocity of the ablating meteoroid). The author continues to discuss steady-state models providing examples such as variations in Na and Fe layers by season. There is also a short section on time-dependent models. The methodology for integrating the models into geophysical parameters, such as gravity waves, is then summarized.

Chapter 12 (Laboratory Studies of Meteoric Metal Chemistry) describes laboratory techniques that are employed for studying reactions of metal atoms and metal containing molecules with atmospheric species. A theoretical methods section follows, which discusses the use of quantum theory calculations to extrapolate laboratory data to fit conditions found in the upper atmosphere. The chapter ends with a compilation of recommended rate coefficients.

Chapter 13 (Summary and Future Outlook). The editors provide an excellent summary of the chapters and a brief half-page outlook. This chapter is followed by a two-page glossary of terms used in the book.

My overall impression of the book is quite good and would recommend it to both graduate and undergraduate students. The papers are for the most part well written and many are suitable for non-specialists, as the authors do well explaining fundamental concepts. Given the nature of having multiple authors, there is some overlap. This does allow new points of view and does not hamper the book.

Books being reviewed
Livres en circulation pour critique

Radiative Transfer in the Atmosphere and Ocean, Reviewer: Chris McLinden, Toronto, ON.

Land Use, Land-Use Change and Forestry, Reviewer: Richard Fleming, Sault-Ste Marie, ON.

Ecological Climatology, Concepts and Applications, Reviewer: Brad deYoung, St. John's, NL.

Inverse Problems in Atmospheric Constituent Transport, Reviewer: Dr. Irene Rubinstein, Toronto, ON.

Inverse Modeling of the Ocean and Atmosphere, Reviewer: Dr. Irene Rubinstein, Toronto, ON.

Environmental Change, Climate and Health: Issues and Research Methods, Reviewer: Sharon Jeffers, Montréal, QC.

Atmospheric Pollution: History, Science and Regulation, Reviewer: Claude Lelièvre, Montréal, QC.

Ecohydrology: Darwinian Expression of Vegetation Form and Function, Reviewer: Nigel Roulet, Montréal, QC.

Scattering, Absorption and Emission of Light by Small Particles, Reviewer: Syd Peel, Downsview, ON.

Polar Lows: Mesoscale Weather Systems in the Polar Regions, Reviewer: André April, Québec, QC.

Innovative Energy Strategies for CO_2 Stabilization, Reviewer: Tracy Garner, Toronto, ON.

Oil and Hydrocarbon Spills III: Modelling, Analysis and Control, Reviewer: Al Ages, Sidney, BC.

Climate: Into the 21st Century, Reviewer: Pat Spearey, Ottawa, ON.

Canadian National Committee for SCOR
Comité national canadien pour SCOR
Scientific Committee on Oceanic Research

Highlights of the 36th Executive Committee SCOR Meeting

Russian Academy of Sciences
Moscow, Russia
15-18 September 2003

(The full report will as usual be produced by the SCOR secretariat and distributed to national SCOR committees when ready. http://www.jhu.edu/~scor/)

Canada was represented at the meeting by Dr. Bjorn Sundby, Chair of the Canadian National SCOR Committee. Also present from Canada, representing the International Council of Science (ICSU), was Dr. Gordon A. McBean, The University of Western Ontario.

1. LARGE-SCALE SCIENTIFIC PROGRAMS

1. Joint Global Ocean Flux Study (JGOFS)
This very successful program has come to an end and will be closed. The final report was presented at the meeting by Dr. Toshiro Saino, member of the scientific steering committee. It should be noted that Canadian scientists have played an important role in JGOFS. An extensive written report, presented to the meeting, can be made available to interested parties.

2. Global Ocean Ecosystem Dynamics (GLOBEC)
Although the Canadian GLOBEC program ended in 1999 (Chaired by Dr. Brad de Young), GLOBEC is going strong, and two Canadians (Drs. Rosemary Ommer and Ian Perry) are members of the GLOBEC Scientific Steering Committee. Dr. Manuel Berange presented an oral report and an extensive written document of the many GLOBEC activities to the meeting. These can be made available to interested parties.

3. Integrated Marine Biogeochemistry and Ecosystem Research (IMBER)
Beginning with the workshop on *Future of Global Ocean Biogeochemistry* that was held in 2000 in Plymouth, this new program, which will pursue many new lines of investigation revealed during JGOFS, has taken shape and a draft of the Science Plan and Implementation Strategy should be available on the Web for comments by the scientific community by October 2003. The Science Plan has three main themes: Interactions between marine biogeochemical cycles and ecosystems; Sensitivity of ecosystems, biogeochemical cycles, and their interaction to global change; and Feedbacks from biogeochemical cycles and the ecosystem to the Earth System components. The program was initially called "OCEANS", but this was changed to "IMBER" at the request of SCOR and IGBP, the two sponsors. Dr. Julie Hall (New Zealand) heads the IMBER team of which Dr. William Miller (Canada) is a member.

4. Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB)
GEOHAB became a SCOR Program in 1998. It is co-sponsored by IOC and IGBP. Canadian researchers have been active in developing the international GEOHAB since its inception, and Dr. Allan Cembella (Canada) is a member of the scientific steering committee. An open science meeting on harmful algal blooms in upwelling systems will be held in Lisbon, Portugal, 17-20 November, 2003.

A Canadian GEOHAB program is under development. This effort is led by Dr. Suzanne Roy.

5. Surface Ocean - Lower Atmosphere Study (SOLAS)
SCOR and IGBP have jointly supported the development of a new international research program on ocean/atmospheric biogeochemical coupling. The primary goal of SOLAS is to address key interactions between the marine biogeochemical system and atmospheric chemistry and climate. The program is highly interdisciplinary, involving chemists, physicists, and biologists from both marine and atmospheric sciences.

It is worth noting that the Canadian program was the first national SOLAS program to be created. It is led by Drs. Maurice Levasseur and William Miller.

6. Land Ocean Interactions in the Coastal Zone (LOICZ)
This program, which is sponsored by IGBP, is being restructured as it enters its second phase. Considering its oceanographic expertise, SCOR has agreed to co-sponsor the new Theme 3: Fate and transformation of materials in coastal and shelf waters. There is no Canadian LOICZ program, but Canadians have strong expertise and interest in the coastal ocean, and the involvement of SCOR in LOICZ might open up new opportunities for Canadian coastal zone researchers.

2. NEW WORKING GROUPS

The meeting discussed four proposals for new working groups. Two of these, "Analyzing links between present oceanic processes and paleo-records" and "Reconstruction of past ocean circulation", are related to the International Marine Global Change Study (IMAGES) program, which had expressed interest and willingness to co-sponsor these working groups. A third proposal, "Geotraces", is of interest to the Intergovernmental Oceanographic Commission

(IOC) which also expressed willingness for co-sponsorship. The meeting recommended to go ahead with these three proposals on the condition that financial co-sponsorships were confirmed. A fourth proposal, "Physical and biological structure of mesoscale rings in the world's ocean" was not recommended for funding. Details of the three successful proposals are given below:

1. SCOR/IMAGES working group to investigate the reconstruction of past ocean circulation
This working group will assess existing paleoceanographic methods for reconstructing the history of ocean circulation over the past 120,000 years: Are existing methods sufficient for a robust reconstruction of past ocean circulation? Are existing chronological tools sufficient to reconstruct distinct ocean circulation states? The WG will also assess available paleoceanographic data for reconstructing the history of ocean circulation over the past 120,000 years: Can robust conclusions on past ocean circulation be drawn from the existing data? For what time periods and locations? The group will make recommendations for future development. The group will be chaired by Dr. Jean Lynch-Stieglitz (USA). Dr. Andrew Weaver (Canada) is proposed as Associate member.

2. Analyzing the links between present oceanic processes and paleo-records
The rationale for this proposal is that the usefulness of a paleoceanographic proxy depends on how well one understands the processes that control the formation of the proxy and its preservation in the fossil archives. The objective of the proposal is to combine the new insights that have been gained by studies of modern biogeochemical processes and ecosystem dynamics with paleoceanographic studies of past oceanic processes. The working group will be co-chaired by Drs. Karin Lochte (Germany) and Marie-Alexandrine Sicre (France). No Canadian members were proposed.

3. Geotraces
The goal of this working group is to generate a greatly-improved understanding of the marine biogeochemical cycles of selected trace elements as well as of stable and radioactive isotopes. In many cases these species serve as tracers of oceanic processes or they function as essential elements in biological processes. A coupled effort linking field studies, laboratory experiments and modeling to elucidate the processes influencing transport and cycling as well as biological impact of these tracers is envisioned. That information would be exported to and exploited by other research programs. Proposed chair: Dr. Robert Anderson, USA. So far, there is no Canadian participation. However, there is considerable Canadian expertise in this field, and the proposed work is of interest to Canada.

Please note that there were **NO** working group proposals from Canada this year. I urge those who read this report and have ideas for new working group topics to contact the Canadian National SCOR Committee for advice on how to prepare a successful proposal. Working groups form the backbone of SCOR, and there is a successful record of Canadian proposals.

3. REPORTS FROM EXISTING WORKING GROUPS AND PROGRAMS

WG 108 Double diffusion
The work of this group is completed and has been published in a special issue of Progress in Oceanography (Vol. 56, no. 3-4, 2003). The issue is edited by Drs. Ann Gargett and Barry Ruddick (both from Canada).

WG 112 Magnitude of submarine groundwater discharge and its influence on coastal oceanographic processes
This group is completing its work with a special issue of Biogeochemistry, scheduled to be published before the end of 2003. Dr. Leslie Smith (Canada) is a member of the group and author of one of the papers in the special issue.

WG 114 Transport and reaction in permeable marine sediments
This group, which is chaired by Drs. Bernard Boudreau (Canada) and Markus Huettel (Germany), organized a Gordon Research Conference in 2003 in order to attract attention to the importance of permeable sediments. The conference, joint with WG 112, was a success. It is noteworthy that 70% were attending their first GRC and 56% were non-Americans, both unusually high statistics for a Gordon Conference. A second conference has been scheduled for 2006. This is only the second time that a SCOR working group has left a legacy in the form of a Gordon Research Conference. The first to do so was WG 86, Ecology of Sea Ice, Dr. Louis Legendre (Canada) member.

WG 115 Standards for the survey and analysis of plankton
Dr. Erika Head (Canada) was added as Associate Member in 2003.

WG 119 Quantitative ecosystems indicators for fisheries management
This WG is chaired by Drs. Philippe Curry (South Africa) and Villy Christensen (Canada). Canadian members are D. Pauly, T. Pitcher, J. Rice, and K. Zwanenburg. An international symposium on "Quantitative Ecosystem Indicators for Fisheries Management" will be held at the UNESCO headquarter in Paris, 31 March to 3 April 2004. The symposium will provide an overview of the vast range of indicators of the exploitation and state of ecosystems that are being developed for fisheries management from an ecosystem perspective.

WG 121 Ocean Mixing
Drs. Chris Garrett and Barry Ruddick (Canada) are members of this WG which met for the first time this summer. The group is planning a conference on ocean mixing for August/September 2004, possibly in Victoria, B.C.

4. OCEAN CARBON

The SCOR – IOC Advisory Panel on CO_2, whose role is to provide an international forum to promote high-quality observations needed to understand the ocean component of the global carbon cycle, has developed a watching brief on ocean carbon sequestration that is available on the Web

http://ioc.unesco.org/iocweb/co2panel
and
http://www.ioccp.org).

SCOR and IOC in collaboration with the Panel are planning an international science symposium called "The Oceans in a High-CO_2 World" to be held in 2004 (tentatively in Lisbon, Portugal). The goal of the symposium is to synthesize the current understanding and outstanding scientific questions regarding the biogeochemical consequences of the natural invasion of atmospheric CO_2 into the surface ocean and of the chemical and biological consequences of proposed ocean carbon sequestration methods.

5. SCOR and ICSU

Review of SCOR by ICSU
As part of a process that will determine the mission and role of ICSU in the area of the environment, a review was conducted of those of its organizations, including SCOR, that focus on environmental issues. The task of the review panel was, among others, to examine current activities within the ICSU family, and identify gaps, overlaps and synergies among existing activities. Dr. Gordon McBean, member of the ICSU review panel, reported on the outcome of the review. In the case of SCOR, the review was very favourable.

International Polar Year 2007/2008
The year 2007 will mark the 125th anniversary of the First International Polar Year, the 75th anniversary of the Second Polar Year and the 50th anniversary of the International Geophysical Year (1957/58). The ICSU Executive Board decided in February 2003 to establish a planning group for a 4th International Polar Year, chaired by Professor Chris Rapley, British Antarctic Survey. Dr. Gerhard Duhaime (U. Laval) is Canadian member. The group, which met for the first time in July, has identified three themes that may serve as the foundation for IPY 2007/08:

- Exploration of new frontiers;
- Understanding Change at the Poles;
- Decoding Polar Processes.

Scientific Committee on Antarctic Research (SCAR)
SCOR and SCAR have agreed to cooperate on issues related to research in the southern Ocean region. Accordingly, SCOR scientists are invited to participate in the SCAR open science conference on "Antarctica and the Southern Ocean in the Global System" in Bremen, Germany, 26-28 July 2004. Abstract deadline is 15 January 2004 (http://www.scar28.org).

6. FINANCE AND ORGANIZATION

Membership fee. It was decided to raise the membership fees for SCOR members by 1%, in accordance with ICSU guidelines.

Budget. The ad-hoc finance committee, which I was asked to chair, found the status of SCOR finances to be healthy. The committee felt that SCOR should be able to sponsor 2 new WG each year on an ongoing basis.

Election of new officers. The terms of Professors Robert Duce, USA (President) and Roberto Purini, Italy (Vice-President) expire in 2004. Calls for nomination of candidates for these two positions will be sent to national committees in accordance with the rules for election of SCOR officers.

Report prepared by
Bjorn Sundby
Chair, CNC/SCOR

An Updated Local Activity Structure for CMOS

It has been said that the real heart of CMOS is in that part of the Society where things happen, in the Committees and in the Centres.

In the Committees, members from across Canada work together on current issues, while in the Centres members from the same geographical area promote local activity and interest in the Society. For some of our larger Centres, traffic and distances are increasingly barriers to collective effort. Bylaw changes to allow Centres to have subordinate chapters could help the work of our active members and encourage increased participation.

Centres and Chapters
Centres and chapters are defined in CMOS Bylaws 4 and 5 respectively. The number of members is specified (minimum of 20 members; required executive officers are detailed; and provision of a Centre subvention is specified. Chapters may have as few as five members; no subvention is specified in the bylaw; the only specified executive officer is a "representative". In recent years there has been a move to remove the distinction between Centres and Chapters. Formerly only Centre chairs were automatically members of the CMOS council, but a few years ago Chapter chairs were added.

Members can choose to be members of a Centre, via the annual membership form, or alternatively are assigned to one based on the mailing address. Subventions are based on total Centre membership, which encourages allocation of members to Centres to strengthen the modest financial support for Centre activities. While the by-laws do not actually specify any geographic requirements, the Congress By-law (By-Law 8), requires that Centres run the

annual Congress, and that the Congress rotate around country. This creates a need for geographically-focused Centres with a membership adequate to this role. There is one cross-Canada program to support Centre activities: the Tour Speaker Program. Each year an eminent practitioner (usually a CMOS member) "volunteers" to cross the country with a general interest presentation on a meteorological or oceanographic topic (alternate years). In principle, the Touring Speaker visits every Centre or Chapter, though the program varies from year to year.

Other common Centre programs include Science Fair participation, local workshops, and invited school presentations.

Existing Centres vary in size and geography. For example, the Toronto Centre is assigned members who live anywhere in Southern Ontario. The level of Centre/Chapter activity also varies: in recent years the Montréal Centre has been relatively inactive, as judged by the annual reporting process. Geography is a challenge for some Centres. Distance makes face-to-face executive meetings difficult, let alone general meetings of the membership. Some Centres' "geographic space" includes several "natural" activity centres, e.g. "in" Montréal Centre, there is McGill, UQAM, and two MSC offices (CMC and Québec Region). This can contribute to a strain on Centre executives, to "represent" these potential "activity centres". Further, this creates additional distance between the Centre executive and its members.

Subordinate Chapters

The suggestion is to allow Centres to organize their membership into chapters, which would be termed subordinate chapters. The requirements concerning the number of members would be essentially the same as for the existing independent chapters. Such subordinate chapters would be funded from the Centre subvention; could report to the Society either directly or through the Centre; would meet jointly for Centre meetings, for example for the Tour Speaker visit; and would commonly (though not necessarily) reflect a geographic focus. Council would formally approve or dissolve such subordinate chapters, as it does for existing chapters. One might envision subordinate chapters at the various 'activity centres' of some existing Centres – e.g. (for Toronto Centre): CCIW, the University of Toronto, York University, MSC Downsview, and the Weather Network. It would also be possible to have a specifically student centre, or an MSC forecast operations centre (as opposed to a Research Centre). Such a chapter could organize or provide an organizing vehicle for activities such as local workshops under the CMOS banner, with lower coordination overhead.

Where from here?

There would have to be changes to the By-Laws to allow this sort of change, but the most important question is whether such a change would be of near-term practical use. This proposal was discussed at the last Congress: the views of Centres, Chapters, and individual members are needed. I'd welcome any comments, either through the pages of the Bulletin or directly to the undersigned, which I will collect and present to the CMOS Executive for consideration.

Fred Conway
fjconway@rogers.com

Help Wanted from CMOS Centre Chairs

The *CMOS Bulletin SCMO* needs your help in order to remain relevant and interesting. It should have an Editorial Committee made-up of one Rapporteur/associate editor from each CMOS Centre.

The Editor, Paul-André Bolduc, would be extremely pleased to receive as a Christmas gift a nomination from each of you. Please forward your nomination as soon as possible to: paulandre.bolduc@sympatico.ca

Thank you in advance for your kind collaboration.

Richard Asselin
Director of Publications

Aide demandée de la part des Présidents des centres de la SCMO

Le *CMOS Bulletin SCMO* a besoin d'aide afin de préserver sa pertinence et son attrait. Il devrait avoir un comité de rédaction composé de Rapporteurs/rédacteurs associés de chaque Centre.

Le Rédacteur, Paul-André Bolduc, serait très heureux de recevoir en cadeau de Noël une nomination de chacun de vous. Prière d'envoyer au plus tôt votre candidat à: paulandre.bolduc@sympatico.ca

Merci à l'avance pour votre excellente collaboration.

Richard Asselin
Directeur des publications

Nominations

The Ottawa Centre has nominated **Michael Hawkes** as an Associate on the *CMOS Bulletin SCMO* Editorial Committee. **Bruce Ramsay** will act as a backup when Mike is out of reach. Congratulations to Mike and Bruce and welcome aboard!

P.A. Bolduc,
CMOS Bulletin SCMO Editor.

Call for Nominations for CMOS Prizes and Awards

Background:

The Prizes and Awards Committee is anxious to receive nominations for CMOS awards and offers the following background information for potential nominators. The Committee is made up of meteorological and oceanographic researchers and managers from academia, government and non-government agencies.

1) The Committee requires a nominating letter which should include an up-to-date CV and a summary of the candidate's work that is to be considered for an award. Note that the President's Prize pertains to a specified scientific paper, book or other major publication.

2) Letters of support are essential and should indicate the extent of influence of the candidate's work.

3) The Committee prefers that nominations and supporting documentation be submitted in electronic format; however, hard-copy material will be accepted if electronic material is not available.

All Society members are encouraged to consider nominating individuals of the meteorological or oceanographic community who have made significant contributions to their fields. The award categories are:

a) The President's Prize
May be awarded to a member or members of the Society for a recent, published contribution or body of work of special merit in the fields of meteorology or oceanography.

b) The J.P. Tully Medal in Oceanography
May be awarded to an individual for outstanding scientific contributions and leadership which have had a significant impact on Canadian oceanography.

c) The Dr. Andrew Thomson Prize in Applied Meteorology
May be awarded to a member or members of the Society for an outstanding contribution to the application of meteorology in Canada.

d) The Prize in Applied Oceanography
May be awarded to a member or members of the Society for an outstanding contribution to the application of oceanography in Canada.

Appel de mises en candidature pour les Prix et Honneurs de la SCMO

Préambule:

Le Comité des prix et honneurs de la SCMO attend avec impatience les mises en candidature pour les prix de la SCMO et désire donner l'information pertinente suivante aux nominateurs. Le Comité est constitué de chercheurs et gestionnaires en météorologie et océanographie du monde universitaire, du gouvernement et des agences non-gouvernementales.

1) Le Comité demande une lettre de nomination dans laquelle on devrait trouver un curriculum vitae mis-à-jour et un sommaire du travail du candidat qui devrait être considéré pour l'attribution d'un prix. Prière de prendre note que le Prix du Président s'adresse spécifiquement à une communication scientifique, un livre ou une publication d'importance.

2) Des lettres supportant la candidature sont essentielles et devraient indiquer l'étendue de l'influence du travail du candidat.

3) Le Comité préfère recevoir les nominations et les documents les supportant sous forme électronique; par contre, des copies papier seront acceptées en l'absence de document électronique.

Tous les membres de la société sont encouragés à présenter des nominations de personnes considérées comme ayant contribué de façon significative dans leur sphère d'activités tant en océanographie qu'en météorologie. Les catégories de prix sont:

a) Prix du président
Peut être décerné à un ou plusieurs membres de la SCMO pour une publication récente, un livre ou une contribution importante dans les domaines de la météorologie et de l'océanographie.

b) Médaille J.P. Tully en océanographie
Peut être décernée à une personne dont les contributions scientifiques exceptionnelles et le leadership ont eu un impact significatif en océanographie au Canada.

c) Prix Dr. Andrew Thomson en météorologie appliquée
Peut être décerné à un ou plusieurs membres de la Société pour une contribution remarquable en météorologie appliquée au Canada.

d) Prix en océanographie appliquée
Peut être décerné à un ou plusieurs membres de la Société pour une contribution remarquable en océanographie appliquée au Canada.

e) The Rube Hornstein Medal in Operational Meteorology
May be awarded to an individual for providing outstanding operational meteorological service in its broadest sense, but excluding the publication of research papers as a factor, unless that research has already been incorporated into the day-to-day performance of operational duties. The work for which the prize is granted may be cumulative over a period of years or may be a single notable achievement.

f) The Tertia M. C.Hughes Memorial Graduate Student Prize;
May be awarded for a contribution of special merit in meteorology or oceanography by a graduate student registered at a Canadian university or by a Canadian graduate student registered at a foreign university.

g) Environmental Citations
May be awarded to individuals or groups who have made some outstanding contribution in helping to alleviate pollution problems, in promoting environmental improvement, stewardship or awareness, or in developing environmental ethics.

h) Citation for Outstanding Radio and Television Weather Presentation
Only Canadian weather products or programs will be considered. Nominations can be made for high standards of performance over a period of time or the media outlet's response to a particular event. Normally, submissions include audio tapes of three consecutive radio broadcasts or VHS recordings of three consecutive telecasts along with the date and time of the programs, and the names and addresses of the presenter and station. However, letters of support can also be provided by either Centres or individual Society members. Nominations will be judged on the quality of information, the educational value, the appeal to the audience, and the level of technical and professional presentation.

Additional Information
1. Some prize categories require that a nominee must be a member of CMOS.
2. Receipt of submissions by the Secretary will not be acknowledged unless requested. Acknowledgement when requested will be by telephone.

3. The current title, full address and phone number of the nominee must accompany the submission.

4. Nominees (who have not received awards) in previous years may be renominated. All criteria provided above apply to renominations. The Committee has recently adopted a policy of considering nominations (kept on file) submitted in the two preceding years. Nominators are encouraged to re-affirm and/or update these nominations.

e) Médaille Rube Hornstein en météorologie opérationnelle
Peut être décernée à une personne ayant procuré un service exceptionnel dans son sens le plus large. Par contre, la publication des articles de recherche sera exclue, à moins que cette recherche soit déjà incorporée comme aide quotidienne dans le travail opérationnel. Le travail pour lequel le prix est accordé peut être cumulatif sur une période de plusieurs années ou peut être une seule contribution remarquable.

f) Prix commémoratif étudiant de deuxième cycle Tertia M.C. Hughes;
Peut être décerné à un étudiant gradué ayant apporté une contribution notable en météorologie ou en océanographie et qui est inscrit dans une université canadienne, ou à un étudiant canadien inscrit dans une université étrangère.

g) Citations environnementales
Peuvent être décernées à des individus ou groupes ayant apporté une contribution importante aux problèmes de la pollution, en promouvant une meilleure qualité environnementale ou en développant un code d'éthique environnemental.

h) Citation pour l'excellence en présentation des prévisions météorologiques à la radio ou à la télévision
Seules les productions canadiennes sont éligibles. La nomination peut être basée sur un standard élevé et soutenu de communications ou sur la reconnaissance des médias sur un événement particulier. Une bande audio de trois émissions radiophoniques consécutives ou un enregistrement VHS de trois émissions télévisées consécutives est requis. La date et l'heure des émissions, le nom du présentateur et la station doivent être indiqués. Toutefois, si désiré, une telle justification peut accompagner la bande afin d'aider le comité de sélection. Les extraits soumis seront jugés pour leur valeur informative et/ou éducative, leur attrait pour le public, et pour le niveau de présentation technique et professionnel.

Information supplémentaire
1. Certaines catégories de prix sont réservées aux membres de la SCMO.
2. Aucun accusé de réception pour les candidatures ne sera envoyé par le Secrétaire à moins d'une demande formelle. S'il est requis, l'accusé de réception se fera par téléphone.
3. Le titre actuel de chaque candidat, ainsi que son adresse complète et numéro de téléphone, doivent être envoyés avec la mise en candidature.
4. Les candidats des années précédentes, qui n'ont pas reçu de prix, peuvent être reconsidérés. Les critères énoncés ci-dessus s'appliquent également à ces nominations. Le comité considérera désormais les nominations antérieures et conservées durant les deux dernières années. Nous encourageons les personnes qui ont fait ces nominations à les réitérer ou à les préciser.

This year the deadline is **February 13, 2004** for nominations to be received by the Executive Director.

Mr. Neil Campbell (Executive Director)
Canadian Meteorological
and Oceanographic Society
P.O. Box 3211, Station D
Ottawa, ON K1P 6H7
Tel: (613) 990-0300; Fax: (613) 993-4658
email: cmos@meds-sdmm.dfo-mpo.gc.ca

Cette année toutes les soumissions doivent être reçues par le directeur exécutif avant le **13 février 2004**.

M. Neil Campbell (directeur exécutif)
Société canadienne de météorologie
et d'océanographie
C.P. 3211, Station D
Ottawa, ON K1P 6H7
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courriel: cmos@meds-sdmm.dfo-mpo.gc.ca

Notes: l'utilisation du genre masculin dans le texte français n'a pour but que d'alléger le texte.

News from the Canadian CLIVAR Research Network

The 18th Stanstead Seminar was held June 16-20, 2003 at Bishop's University, Lennoxville, Québec, on the theme: Climate Variability and Predictability from Seasons to Decades. Each day started with a one-hour seminar by an invited speaker (C. Deser, J. Hurrell, T. Jung, A. Miller and T. Stockdale), followed by contributed presentations on observational and modelling aspects of climate variability. The scientific program, Power Point files for several of the presentations and other information on the Seminar can be found at: http://www.clivar.ca/stanstead

The Proceedings of the Seminar containing extended abstracts of the presentations are being prepared and will be available shortly at the above Web address. A CD-ROM version can also be requested from the Network Manager, Ms. Lisa LeBlanc, at lisa.leblanc@mcgill.ca.

Initiated in 1955, the Stanstead Seminars are normally organized by members of the Department of Atmospheric and Oceanic Sciences at McGill University. The 2003 vintage was taken in charge by the Canadian CLIVAR Research Network, which brings together 21 researchers from 10 Canadian universities and four Federal Government laboratories, plus their graduate students, postdoctoral fellows and research staff. The organizing committee for the 18th Stanstead Seminar was composed of George J. Boer, Jacques Derome, John Fyfe and Richard J. Greatbatch. Funding for the Seminar was made available by the Natural Sciences and Engineering Research Council, the Canadian Foundation for Climate and Atmospheric Sciences, the Canadian Institute for Climate Studies and the Dean of Science, McGill University.

Jacques Derome
Canadian CLIVAR Research Network PI

The *CMOS Bulletin SCMO* Editorial Board wishes every member the Compliments of the Season!	**Le comité éditorial du *CMOS Bulletin SCMO* présente à tous les membres les souhaits de la saison!**
Welcome 2004!	**Bienvenue 2004!**

Invitation à présenter des communications
38e Congrès annuel de la SCMO
Edmonton, Alberta, Canada
du 31 mai au 3 juin 2004

La dimension humaine de la météo et du climat

Le Centre de l'Alberta de la Société canadienne de météorologie et d'océanographie (SCMO) sera l'hôte du 38e Congrès annuel de la SCMO qui se tiendra à l'Hôtel *Fantasyland* d'Edmonton, Alberta, Canada du 31 mai au 3 juin 2004. Les sciences sont plus que jamais axées sur les impacts du changement anthropique à la météo et au climat - par conséquent le thème central du Congrès 2004 portera sur **"La dimension humaine de la météo et du climat".**

Nous désirons tout particulièrement recevoir des articles reliés au thème du Congrès. Cependant, nous vous invitons à soumettre des articles dans les domaines-clefs tels que : *le changement climatique ; la météorologie aéronautique ; les processus des latitudes septentrionales ; le temps violent et les conditions météorologiques dangereuses ; les océans dans les régions septentrionales (Arctique, Atlantique et Pacifique) et leurs liaisons ; les questions reliées à la sécheresse et à l'eau ; et la télédétection et les nouvelles technologies.* Plusieurs ateliers sont planifiés conjointement avec le 38e Congrès et éventuellement on souhaite en ajouter sur les programmes MAGS (Étude GEWEX sur le bassin du Mackenzie) et CWRP (Programme canadien de recherche en météorologie). Il y aura aussi des séances traditionnelles de la SCMO reliées à d'autres domaines de la météorologie et de l'océanographie, et on s'attend encore une fois de tenir au Congrès la Journée des enseignants.

Nous vous demandons de planifier votre présence au Congrès de la SCMO, étant donné que celui-ci demeure de façon primordiale notre rencontre annuelle à la fois pour les chercheurs, les météorologistes opérationnels et les océanographes, auxquels se joignent des hydrologistes.

La date limite pour soumettre les résumés est **vendredi le 27 février 2004**. Ils doivent être de 400 mots ou moins, incluant le titre, l'auteur ou les auteurs, l'affiliation, la ville et l'adresse électronique de l'auteur principal (sans diagramme). On doit acheminer les résumés par voie électronique en anglais ou en français au site WEB du Congrès: http://www.scmo.ca. Les auteurs doivent indiquer leur préférence pour un thème et pour le format de la présentation, soit orale ou par affiche. La soumission de résumés par des étudiants diplômés est notamment encouragée.

On peut contacter le Président du Comité du programme scientifique pour toute demande de renseignements concernant les séances scientifiques. Pour des informations additionnelles sur le Congrès, visitez le site WEB: http://www.scmo.ca ou contactez le Président du Comité local d'organisation: Brian.Paruk@ec.gc.ca. Pour des renseignements sur l'exposition commerciale, prière de s'adresser à: Oscar.Koren@ec.gc.ca.

Geoff Strong,
Président, Comité du Programme Scientifique (CPS), Congrès SCMO 2004
241 Hollands Drive, 52450 RR 222
Ardrossan, Alberta,
T8E 2G3, Canada
Tél. : (780) 922-0665 ; Fax. : (780) 922-0678
Courriel : geoff.strong@shaw.ca

Next Issue *CMOS Bulletin SCMO*

Next issue of the *CMOS Bulletin SCMO* will be published in February 2004. 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.

Prochain numéro du *CMOS Bulletin SCMO*

Le prochain numéro du *CMOS Bulletin SCMO* paraîtra en février 2004. 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.

CALL for PAPERS

CMOS 38th Annual Congress
Edmonton, Alberta, Canada
31 May – 03 June 2004

Human dimension of Weather and Climate

The Alberta Centre of the Canadian Meteorological and Oceanographic Society (CMOS) will host the 38th annual CMOS Congress at the *Fantasyland Hotel* in Edmonton, Alberta, Canada from 31 May – 03 June 2004. Our sciences are more focused than ever on the impacts of anthropogenic changes to our weather and climate – hence the overall theme of the 2004 Congress is **"Human Dimensions of Weather and Climate"**.

We particularly encourage papers directed towards the Congress theme, while we are also soliciting submissions in key focus areas, including *Climate Change, Aviation Meteorology, High Latitude Processes, Severe and Hazardous Weather, The Northern Oceans (Arctic, Atlantic and Pacific) and their Linkages, Drought and Water issues, and Remote Sensing and New Technologies.* Several workshops are planned in conjunction with the 38th Congress, possibly including MAGS and CWRP. There will also be traditional CMOS sessions in other aspects of meteorology and oceanography, and we are once again encouraging a special Teachers' Day at Congress.

The CMOS Congress is our primary annual meeting for both research and operational meteorologists and oceanographers, and is also well attended by hydrologists, so please plan to be represented this coming year at Congress.

The deadline for submission of abstracts is **Friday, 27 February, 2004**. Abstracts should be no more than 400 words, including title, author(s), affiliation, city, and e-mail address of the lead author, with no figures. Abstracts should be submitted electronically in English or French on the Congress web site at http://www.cmos.ca. Authors should indicate their preference of session themes, and whether oral or poster presentation is preferred. Submissions from graduate students are especially encouraged.

Contact the Chair of the Scientific Program Committee for enquiries regarding scientific sessions. For other information on the Congress, go to http://www.cmos.ca or contact Local Arrangements Committee (LAC) chair, Brian.Paruk@ec.gc.ca. For information on commercial exhibit opportunities, contact Oscar.Koren@ec.gc.ca.

Geoff Strong
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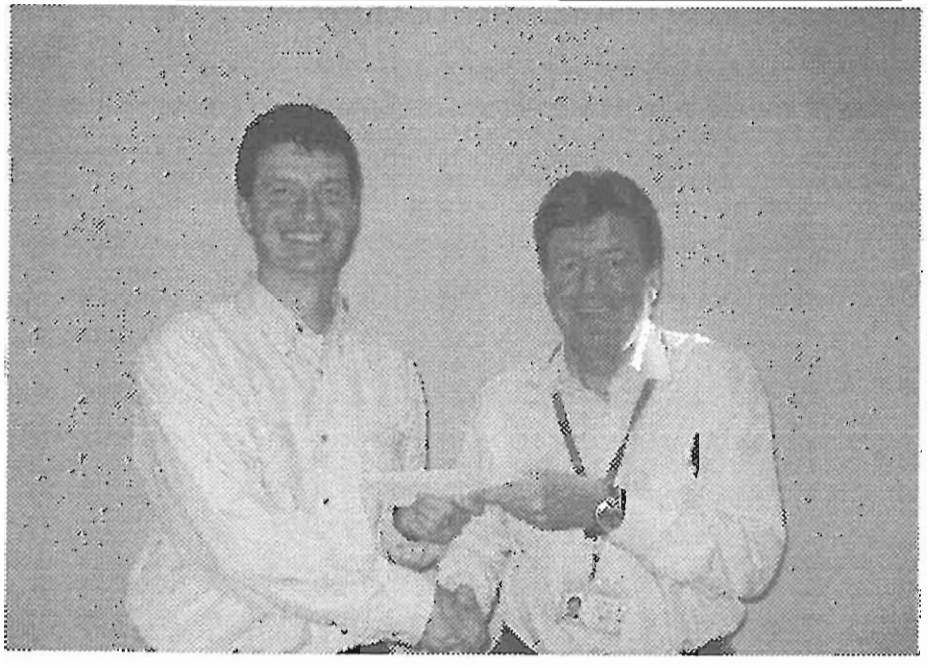

This photograph shows **Bruce Ramsay** (right), Chair of the Local Arrangements Committee for the 2003 CMOS Congress, presenting a cheque to **Serge Nadon**, Chair of the Ottawa Centre. The amount, $6,624.29, represents the Centre's share of the Congress surplus. Serge announced at the meeting that part of the resources will be used to fund a new initiative to make CMOS better known in the local community. Photograph is courtesy of **John Reid**, Ottawa Centre.

The CMOS Position of Executive Director

Applications are invited to fill the part-time position of Executive Director of CMOS which will become vacant on June 30, 2004. The position is collocated with the national office of the Society in Ottawa, Ontario. Remuneration is negotiable. Applications should be submitted by **January 30, 2004.**

Under the by-laws, the Executive Director shall:

1. conduct such business and correspondence of the Society as may be directed by Council or by the President;
2. be responsible for the proper functioning of the CMOS headquarters office;
3. serve as an ex-officio non-voting member of Council and all Committees established by Council;
4. prepare and keep current the files and documents of the Society as established by recorded Council action;
5. have custody of the Corporate Seal of the Society and, when required, shall certify documents issued by the Society.

Requirements:

1. Masters level degree in meteorology or oceanography or equivalent experience;
2. Three or more years' experience in managing meteorological/oceanographic programs at a regional or national level;
3. Experience and excellence in written and oral communication in English over a broad range of technical, policy, managerial and administrative issues. Communication capabilities in French are desirable;
4. Enhanced security classification.

Duties:

1. Responsible for the administration of the business affairs of the Society, by:

   - ensuring the proper organization and operation of the CMOS Business Office with regard to the administration of the financial business and the maintenance of the correspondence, meeting and membership records of the Society;
   - serving as the signing and reporting authority on behalf of the Society for contracts, grants and agreements;
   - authorizing and approving payments of all invoices less than $2000 and seeking approval by the Executive of payments in excess of $2,000;
   - arranging for the annual audit; and
   - preparing and submitting the appropriate reports to Canada Customs and Revenue Agency to maintain the Society's Charitable Organization Status.

2. Assists the Council and the Executive Board in the Management of the Society, by:

   - serving as ex-officio on the Executive Board, the Council and all Committees of the Society;
   - updating and maintaining documents to guide the normal operations of the Society such as "CMOS Annual Cycle of Events" and "Guidelines for CMOS Annual Congresses".

Applications should be submitted to the:

Office of the Executive Director
Canadian Meteorological and Oceanographic Society
PO Box / CP 3211
Station D
Ottawa ON K1P 6H7

Poste de Directeur exécutif à la SCMO

On désire recevoir des demandes d'emploi pour le poste, à temps partiel, de Directeur exécutif à la SCMO qui sera vacant le 30 juin 2004. Le bureau du poste de Directeur exécutif est adjacent avec le bureau national de la Société à Ottawa, Ontario. La rémunération est négociable. Les applications doivent être soumises avant le **30 janvier 2004.**

Selon les règlements, le Directeur exécutif devra :

1. s'occuper du courrier et des affaires de la Société qui lui sont désignés par le Conseil d'administration ou le Président;
2. être responsable du bon fonctionnement du bureau de l'administration centrale de la SCMO;
3. agir comme membre, à titre d'office, sans droit de vote, sur le Conseil d'administration et sur tous les comités établis par le Conseil d'administration;
4. créer et maintenir à jour des dossiers et documents de la Société conformément aux résolutions du Conseil d'administration;
5. garder le cachet réglementaire de la Société et certifier selon le besoin les documents émis par la Société.

Exigences :

1. Diplôme au niveau de la maîtrise en météorologie ou océanographie ou expérience équivalente.
2. Trois ou quatre années d'expérience à gérer des programmes en météorologie/océanographie au plan régional ou national.
3. Expérience et excellente communication écrite et orale de la langue anglaise dans un large éventail de questions techniques et celles en rapport avec l'administration, la gestion et la politique. Des aptitudes à communiquer en français sont souhaitables.
4. Classification de sécurité élevée.

Tâches :

1. Responsable de l'administration des affaires courantes de la Société, en :

   - s'assurant comme il convient du fonctionnement et de l'organisation du Bureau d'affaires de la SCMO en rapport avec l'administration des activités financières et le maintien des registres des membres, des réunions et de la correspondance de la Société;
   - agissant comme fondé de pouvoir pour signer et rendre compte au nom de la Société les activités reliées aux contrats, aux subventions et aux ententes;
   - autorisant et approuvant le paiement des factures de moins de 2 000 $ et pour les dépenses excédant les 2 000 $, en demandant l'approbation du Comité exécutif;
   - prenant les dispositions pour la vérification annuelle; et
   - préparant et présentant les rapports pertinents à l'Agence des douanes et du revenu du Canada afin de conserver le statut de Société comme organisation charitable.

2. Prête son assistance au Conseil et au Comité exécutif dans la gestion de la Société, en :

   - agissant comme membre, à titre d'office, sur le Comité exécutif, le Conseil et les comités de la Société;
   - mettant à jour et en s'assurant du maintien des documents qui servent de guide pour le fonctionnement normal de la Société en rapport avec le «Calendrier des activités annuelles de la SCMO» et des «Lignes directrices pour les Congrès annuels de la SCMO».

Faire parvenir la demande d'emploi au :

Bureau du Directeur exécutif
Société canadienne de météorologie et d'océanographie
PO Box / CP 3211
Station D
Ottawa ON K1P 6H7

IN MEMORIAM

Arthur John Childs

1909-2003

Arthur John (Art) Childs, longtime head of Meteorological Service of Canada telecommunications, died on May 6, 2003 at Richmond Hill, Ontario, in his 95th year.

In 1925, at the age of 16, Art Childs began working for the Canadian Pacific Railway. He became a telegrapher in a few years and was employed by the Meteorological Service in 1931. That year the Service was beginning to develop a teletype system to replace the existing telegraph system for receiving synoptic weather messages at the Toronto public forecast office and Art became one of the teletypists. A few years later, in 1937, when District Aviation Forecast Offices were established to serve the new Trans-Canada Airlines, Art was sent to Lethbridge to organize dedicated meteorological circuits to handle weather observations and forecasts in the western section of the airway which extended from Vancouver to Winnipeg.

The new teletype system, which connected all the airport observing stations on the airways to the forecast offices, was markedly expanded when wartime air training schools were located at scores of RCAF stations. Art presided over this expansion and took his turn at monitoring the circuits; his admonitions and comments to errant stations were signed simply "ac." At the end of the war Art was transferred to Toronto Head Office to become the head of what was to become the Canadian Meteorological Communications System.

One of his major achievements was the development of Weatherfax, a national facsimile network used to transmit weather charts from a central analysis office to the various weather offices across the country. For his outstanding contribution to Canadian meteorology Art was awarded the Patterson Medal in 1961. Late in his career Art was instrumental in setting up a national computer driven communications system which, when he retired in 1971, extended over 37,000 miles and served 380 offices. The companion nation-wide facsimile system covered 19,000 miles and served 100 offices.

Art Childs is survived by Mae, his wife of 60 years, three daughters, sons-in law, eight grandchildren and six great-grandchildren.

Morley Thomas
CMOS Archivist
Toronto, Ontario

SHORT NEWS / NOUVELLES BRÈVES

CALL FOR PAPERS - COASTAL ZONE CANADA 2004

16 January 2004 is the deadline for submitting abstracts to "CZC 2004", scheduled for 27-30 June 2004 in St. John's, Newfoundland and Labrador. CZC 2004 will focus on the increasingly complex challenges associated with understanding, maintaining, managing, and governing coastal ecosystems. The overall theme of the Conference is "All Within One Ocean: Co-operation in Sustainable Coastal and Ocean Management". Sub-themes include: Challenges, Strategies, Tools, and Managing Shared Waters. For information, access http://www.czca-azcc.org/index2.htm

RECENT WARMING OF ARCTIC MAY AFFECT WORLDWIDE CLIMATE

Recently observed change in Arctic temperatures and sea ice cover may be a harbinger of global climate changes to come, according to a recent NASA study. The Arctic warming study, appearing in the November 1 issue of the American Meteorological Society's Journal of Climate, shows that compared to the 1980s, most of the Arctic warmed significantly over the last decade, with the biggest temperature increases occurring over North America. For information, including images and animations, access http://www.gsfc.nasa.gov/topstory/2003/1023esuice.html

NEPTUNE UPDATE

NEPTUNE, a joint Canada-US venture led by the University of Victoria and the University of Washington, will be the world's largest cable-linked seafloor observatory. Information gained through the Project will lead to earlier warning of earthquakes and tsunamis, more accurate estimates of commercial fish stocks and improved models for climate prediction. $62.4 million in funding was recently announced for the Canadian portion of the Project. For information, access http://www.neptunecanada.ca

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IOOS DRAFT PLAN FOR DATA MANAGEMENT AND COMMUNICATIONS

The US Integrated Ocean Observing System (IOOS) Draft Plan for Data Management and Communications (DMAC) is available for public comment. DMAC will be a data and communications infrastructure that consists of standards, protocols, facilities and software. It will support: metadata; data discovery; data transport; on-line browsing; and data archiving. The deadline for comments has been extended until 18 November 2003. The Plan is available at http://www.dmac.ocean.us/dacsc/imp_plan.jsp.

Note from the Editor: Although the deadline for submitting comments is overdue, it will be very informative for CMOS Bulletin SCMO readers to read more on the outcome of such a plan.

DIAL-A-BUOY FOR OCEAN WEATHER FORECASTS

PORTLAND, MAINE - Smart buoys could soon tell callers everything they want to know about wind speed, water temperature and the chemical content of seawater.

The publicly-funded Gulf of Main Ocean Observing System, or GoMOOS, offers a dial-a-buoy service to inform people of various properties. The buoys return hourly data on: temperature at various depths, salinity, oxygen content as a measure of environment health, turbidity, amount of chlorophyll as an indicator of plant life, and current at various depths. GoMOOS has deployed 10 buoys in the Gulf of Maine between Nova Scotia and Cape Cod, Massachusetts. The instruments augment the U.S. National Weather Service.

Phillip Bogden, the CEO of GoMOOS in Portland, hopes to have a buoy in every U.S. port. The project is funded by the Office of the Naval Research in the U.S. and the National Oceanic and Atmospheric Administration (NOAA). Bogden suspects that the greatest users will be those who regularly go out to sea, such as mariners, kayakers and surfers. For now, the information is free but callers may have to pay their telephone company's toll charge to hear the computerized voice.
Source: 2003 Canadian Broadcasting Corporation.

CITY OF MONCTON PLEADS GUILTY IN LANDFILL CASE

The City of Moncton in New Brunswick has pleaded guilty to federal environmental charges related to a decommissioned landfill. This is the first time that a municipality has been prosecuted by Environment Canada for landfill problems. Moncton has been ordered to arrange and pay for all work needed to ensure that the landfill meets the requirements of the federal Fisheries Act. The investigation was initiated because of evidence provided by Petitcodiac Riverkeeper, a local environmental group. For more details, please access http://atlantic-web1.ns.ec.gc.ca/newsreleases/default.asp?lang=En&n=8A1B08C8

MERGING SATELLITE IMAGERY AND MAPPING DATA

The Government of Canada has announced a $5.6 million investment to support research and development by PCI Geomatics. PCI Geomatics will develop advanced technology software applications that merge large volumes of satellite imagery and mapping data to create digital maps in near real time. This will allow the use of geomatics as a decision-making tool when dealing with critical issues such as sustainable resource development, environmental protection and health and safety. For information, access http://tpc.ic.gc.ca/en/SSG/tp00367e.html

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INDICATORS FOR INTEGRATED COASTAL AREA MANAGEMENT

"A Reference Guide on the Use of Indicators for Integrated Coastal Management" has been published by UNESCO's IOC/ICAM. The aim of the Guide is to present a literature review on the use of indicators around the world, from various programmes and projects, at global, regional, national and local scale. The Guide is available at http://ioc.unesco.org/icam/files/Dossier.pdf

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THE ENVIRONMENT AND SUSTAINABLE DEVELOPMENT IN CANADA

The latest Report of the Commissioner of the Environment and Sustainable Development has been tabled in the House of Commons. The Commissioner reports on: Managing the Safety and Accessibility of Pesticides; Road Transportation in Urban Areas: Accountability for Reducing Greenhouse Gases; Sustainable Development Strategies: Case Studies; and Environmental Petitions. The report is available at http://www.oag-bvg.gc.ca/domino/cesd_cedd.nsf/html/menu3_e.html

2003 STATE OF THE GREAT LAKES REPORT

The 2003 State of the Great Lakes report is the fifth in the series of biennial reports. It concluded that the state of the Great Lakes, based on assessments of ecosystem health indicators, and Lake by Lake assessments, was mixed. Major stresses include poor land use planning and invasive species. Nutrient enrichment and anoxia in Lake Erie continue to be a problem. The report is available at http://www.binational.net

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GEORGIA BASIN ECOSYSTEM INITIATIVE: A 5-YEAR PERSPECTIVE

The Georgia Basin Ecosystem Initiative (GBEI) was launched in 1998 to protect, restore and conserve this unique ecosystem. The GBEI partners - federal, provincial and state agencies, local government agencies, community groups, Coast Salish First Nations, industry associations, conservation groups and other non-profit organizations - have worked collaboratively and used an ecosystem approach to address the Georgia Basin's environmental needs. A report details the progress made over the past five years and is available at http://www.pyr.ec.gc.ca/GeorgiaBasin/reports/5_year_perspective/summary_e.htm

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MARINE GIS CONFERENCE

31 October 2003 was the deadline for submitting abstracts to a "Marine GIS Conference" scheduled for 18 March 2004 in London, UK. The theme of the event is GIS in the Marine and Coastal Environment: experiences and solutions. For information, access http://www.metoc.co.uk or email David Green at d.r.green@abdn.ac.uk. The Conference will also be held in conjunction with Oceanology London 2004.

2004 AMRS CONFERENCE

19 December 2003 is the deadline for submitting abstracts to the 2004 AMRS Conference, "Operational Oceanography and Remote Sensing", scheduled for 16-19 March 2004 in London, UK. The session themes are: Maritime Security; Ice Services; Disaster Prevention and Management; Emerging Sensors and Platforms; and Future Requirements. For information, access http://www.waterobserver.org/event-2004-03/. Sessions will be held in conjunction with Oceanology London 2004.

SCIENCE - POLICY - ENVIRONMENT CONFERENCE

29-30 January 2004: "Water for a Sustainable and Secure Future", the 4th National Conference on Science, Policy and the Environment, Washington, DC. For more information, please access http://www.ncseonline.org/NCSEconference/2004conference/

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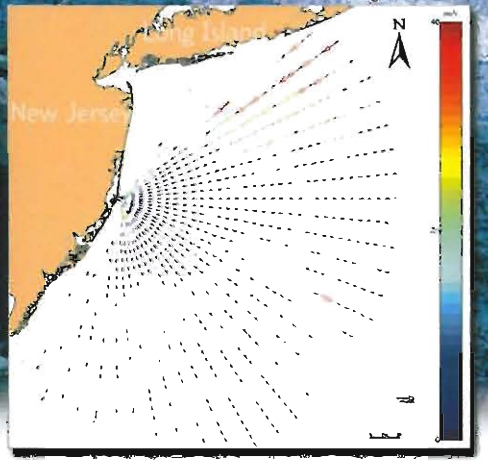

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