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La Société canadienne de météorologie et d'océanographie

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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 CMOS Annual Congress took place between 31 May and 3 June, 2004. More than 400 persons convened in Edmonton to discuss issues of mutual interest with respect to meteorology and oceanography. More than 275 scientific papers were presented. We are showing on the cover page some happy moments from this important Congress organized each year in a different Centre of the CMOS community. Photos are courtesy of Paul-André Bolduc and of the Local Arrangements Committee. You may read additional details on **page 112**.

Page couverture: Le congrès annuel de la SCMO s'est tenu entre le 31 mai et le 3 juin 2004. Plus de 400 personnes se sont rencontrées à Edmonton pour discuter des problèmes d'intérêt commun reliés à la météorologie et l'océanographie. Plus de 275 communications scientifiques ont été présentées. Nous illustrons en page couverture des moments joyeux de cet important congrès organisé chaque année par un centre différent de la communauté de la SCMO. Les photos sont la courtoisie de Paul-André Bolduc et du comité local d'organisation. Vous pouvez lire des détails supplémentaires en **page 112**.

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Société canadienne de météorologie et d'océanographie (SCMO)

Executive / Exécutif

....from the President's Desk

CMOS friends and colleagues:

The banquet at our very enjoyable and informative Congress in Edmonton brought with it several changes to the membership of our executive. The President's reins were handed over from Allyn Clarke to me. I want to thank Allyn for his fine service. He provided a very smooth transition for the "Nova Scotia" executive, helping us learn our roles here while the CMOS office in Ottawa was assuming administrative responsibilities that previously were carried out on our behalf by the Canadian Association of Physicists' office. Along with deftly handling the many more immediate items associated with the Presidency, he also guided some continuing topics such as the refinement of the CMOS Vision Paper. I am pleased that Allyn has already identified some files that he will pursue during his upcoming year as Past President – we certainly will benefit greatly by his continuing service on the executive. Neil Campbell was presented with a medal and plaque in honour of his many years of exceptional service as Executive Director, and it was also announced that a new award is being established in his name to recognize outstanding volunteer contributions to our Society. Neil was also elected as a Councillor-at-Large during our Annual General Meeting (AGM) in Edmonton. It is great that we will continue to have the benefit of his involvement in various capacities in the coming years. Our incoming Executive Director, Ian Rutherford, is already busy expertly handling his new responsibilities. We are pleased to announce that Ian's former activities in our CMOS business office are being conducted by our new Office Manager, Lise Harvey. At his request, Ron Loucks is handing over duties as Recording Secretary. Michael Dowd was elected to this office at our AGM. Thank you, Ron and Michael, for your service in this important role. Susan Woodbury, who was named a CMOS Fellow at the Congress, was also elected as Vice-President.

Our new executive had its first meeting and considered several items about which you will be hearing more in the coming months, such as locations and arrangements for upcoming Congresses, letters of appreciation to donors, implications of the Privacy Act, and publicizing the newly established Roger Daley Postdoctoral Publication Award. There will be renewed contacts with committee chairs and centres. We also discussed possible CMOS follow-on related to the recently released open letter entitled "Beyond the Breaking Point?". (see page 106).

We are looking forward to a busy and exciting year during which we look to you for continuing involvement and support for our Society's activities, publications and upcoming Congresses. Have a good summer and let's hit the ground running in September!

Harold Ritchie
President / Président

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Inside / En Bref

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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

16 June 2004

Subject: Climate Change

Both Letters to the Editor (by Henry Hengeveld and Julian Charles Brimelow, Vol. 32, No. 2) agree assiduously with Allan MacRae's call (Vol. 32, No. 1) for open debate in climate science by themselves invoking free debate.

For instance, Hengeveld dismisses a thoroughly documented, peer-reviewed paper by S. McIntyre and R. McKitrick by asserting that neither author "has any scientific background" to write such a paper, when the paper primarily concerns tracking and correcting errors in porting and handling large data streams, their documentation and lack thereof -- procedures McIntyre and McKitrick are well-qualified to address. The only relevance to climate is the consequence of the errors in this specific case.McIntyre and McKitrick's criticisms of M. Mann and colleagues in treating large data bases used to construct temperature indices from proxies have just been joined by D. S. Chapman et al. (Geophysical Research Letters, 2004, 31, L07205, doi:10.1029/2003GL019054), who find consequential mishandling of borehole data resulting from "selective and inappropriate presentation of model results," "misleading analysis: and "just bad science".

Rejecting McIntyre and McKitrick's philosophy of transparent, full and open disclosure and documentation, cannot be held as beneficial to climate or any other branch of science, a social process standing not solely on faith in peer-review but more correctly on verification of results.

Sallie Baliunas
Cambridge, Massachusetts

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21 June 2004

Subject: Climate Change

I disagree with some of the comments made by Henry Hengeveld in a recent letter to your journal concerning my work with Ross McKitrick on Michael Mann's famous "hockey stick" graph.

Hengeveld chose to criticize my background rather than our findings. This is an irrelevancy. However, my background is not as unsuitable as Hengeveld suggests. I studied Maths and Physics at the University of Toronto. I have many years of business experience, which has involved evaluation of large data sets and which has led to the development of a sceptical attitude towards "promotions" – using this term in its business sense. What interested me in the Mann curve was its central role in IPCC promotions. This is not a criticism per se: a well-designed graphic, such as Mann's temperature curve as presented by IPCC graphic designers, is invaluable to most promotions. But as someone with knowledge of speculative promotions, I became interested in exactly how this graph was made.

Hengeveld says that McKitrick and I did not discuss methodologies with Mann. We have previously refuted this claim and its repetition by Hengeveld only shows that he did not check the facts. Prior to publication of our article, I sought clarification from Mann both on methodology and on the dataset (which appeared to be collated incorrectly). Mann refused to respond to either request and stated explicitly that he would not respond to any further inquiries. After we published our article, Mann said that his group had provided us with an incorrect dataset and blamed their incorrect dataset on a claim that we had requested an Excel version, a claim which was false (we had requested an FTP location for the data). Mann then deleted from his FTP site the very dataset to which we had been directed, and identified a new FTP location for the MBH98 data. He then stated for the first time that he had used 159 series in his calculations – a figure which occurs nowhere in his original Nature article. Since he had never publicly identified the 159 series, we requested a listing, which he refused to provide. Mann claimed that our emulations of his methods were inaccurate. We had no interest in imprecision, but our previous attempt at obtaining a better description of Mann's methodology had been rebuffed. In order to reconcile our findings, we once again asked Mann for details on his methods, this time specifically requesting source code for his calculations. Once again, Mann refused.

Subsequent to our E&E article, we have analyzed the criticisms contained in Mann's Internet response to that article. We have developed a complete response to these criticisms. We are confident of our original findings and that Mann's temperature reconstruction is invalid. Indeed, we have sharpened our findings and are now able to show exactly where Mann's calculations went awry. We submitted these findings in January to a senior journal and are awaiting a final decision.

Stephen McIntyre,
Toronto, Canada

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8 June 2004

Subject: Get-well Card

I wish to thank the many well wishers who sent me kind get-well messages from the Edmonton Congress. I am sorry having had to miss what must have been a great Congress, but hope to see you all next year in Vancouver.

Uri Schwarz,
Executive Director Emeritus

Summary of 2003 PAGSE Submission to Standing Committee on Finance

Each autumn, PAGSE (Partnership Group for Science and Engineering) makes a presentation to the House of Commons Standing Committee on Finance. In the 2003 report PAGSE re-enforced its endorsement of recent federal initiatives, including the Canada Foundation for Innovation, the Canada Research Chairs, Genome Canada, the Sustainable Development Technology Fund, the Canada Graduate Scholarships, and significant contributions to the Indirect Costs (principally infrastructure) of scientific research, as well as increased funding provided to granting agencies, including NSERC. Furthermore, this year PAGSE has recommended new initiatives in five areas: a PMO Office of Science and Innovation, the setting of priorities for research, the commercialisation of research, the international dimension of research, and research cluster development.

PMO Office of Science and Innovation: PAGSE recommended the establishment of an Office of Science and Innovation within the PMO, in line with similar institutions in the US, UK, Japan and Australia. Such an office would represent and provide a coordinated and cohesive approach to issues relevant to research and innovation at the highest political level, thereby addressing a major gap in science governance in Canada.

Setting priorities for research: Reiterating its approbation of recent federal initiatives in the realm of science and engineering, PAGSE opined that the time has come to evaluate how these new initiatives fit with existing programs (e.g. granting agencies, Centres of Excellence, NRC) in addressing research and innovation in Canada. Accordingly, PAGSE indicated that determining the priorities for science and engineering research in Canada for the next 5-7 years will be of enormous value, demonstrating a reinvigorated and coordinated approach across all sectors of research and innovation (academia, government and industry).

Commercialisation of research: PAGSE noted that technology transfer and business enterprise are now important elements of the outcomes of some university-based research. Many universities need to build the capacity for commercialisation of their research, and the business sector needs new instruments to ensure success in transferring new research ideas into the commercial realm, as well as increased access to venture capital. PAGSE recommended that the Canadian Government should allocate new resources to these different aspects of commercialisation of university-based research, such as a Commercialisation Office reporting to Industry Canada, or a similarly mandated NGO, as well as minimising barriers to industry-university partnerships. In addition, to accelerating the facilitation of commercialisation, PAGSE recommended that government ensure that graduate students and PDF's working in small and medium enterprises be paid regular salaries as opposed to lower stipends, and that these researchers be supported by NRC's Industrial Research Assistance Program. Furthermore, government should extend the scientific research tax credit programs to companies, regardless of their current profitability.

International dimension: Recognising that research is a global enterprise, and that Canada can profit from international collaboration in terms of alliances and access to facilities not available domestically, PAGSE recommended the creation of an International Innovation Fund ($30M/yr) to support research partnerships, potentially involving academia, government and industry.

Granting agencies and cluster development: PAGSE congratulated the government on the increased funding attributed to NSERC, SSHRC and CIHR in recent years. However, it noted major challenges that remain for these agencies: unexpectedly large numbers of new applicants, and the requirement for higher levels of support for trailblazers and rising stars to support their global competitiveness. PAGSE believes that the granting agencies, industry and NRC should partner to build new research and development clusters to serve as springboards for economic growth, and recommended the creation of a new industry-driven Tri-agency Cluster Development program, and an increase in support to the three granting agencies.

Eighth Conference on Polar Meteorology and Oceanography

The Eighth Conference on Polar Meteorology and Oceanography, 9-13 January 2005, San Diego, California will be part of the 85th AMS Annual Meeting.

The 85th Annual Meeting is being organized around the broad theme of "Building the Earth Information System" and the role that science can play in decision-making for society. Two integrating sub-themes that will be highlighted are "Living with a Limited Water Supply" and "Living in the Coastal Zone".

Papers for the 8th Conference on Polar Meteorology and Oceanography are now solicited on all aspects of polar meteorology and oceanography - modeling and observing cloud-radiation interactions - atmosphere/sea-ice/ocean exchanges - polar ice sheets - the stable boundary layer - high latitude chemistry in both the ocean and the atmosphere - hydrological processes - polar lows - large-scale climate and climate change and model intercomparison results - recent and upcoming field programs.

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The Great Maritimes Blizzard of February 18-19, 2004

by Chris Fogarty[1]

Résumé: Le 18 février 2004, une intense dépression s'est développée bien au sud de la Nouvelle-Écosse lorsque de l'air froid provenant de l'est de l'Amérique du Nord a rencontré les eaux relativement chaudes du Gulf Stream. La tempête s'est déplacée vers le nord-est en passant au sud de la Nouvelle-Écosse et sur l'île de Sable. De la neige abondante et des vents violents ont balayé une immense région traversant la Nouvelle-Écosse, l'Île-du-Prince-Edouard et le sud-est du Nouveau-Brunswick provoquant des conditions de blizzard et des records de chute de neige. De grandes quantités de neige généralisée variant de 60 à 90 cm (24 à 36 pouces, 2 à 3 pieds) ont été enregistrées paralysant la Nouvelle-Écosse et l'Île-du-Prince-Edouard. L'état d'urgence a été déclaré à travers les provinces afin que les agents de secours puissent faire leur travail et ramasser l'énorme quantité de neige tombée. On a mis des jours pour nettoyer plusieurs routes et artères urbaines.

Introduction

On 18 February 2004 an intense low pressure system formed well south of Nova Scotia as cold air from eastern North America clashed with the relatively warm waters of the Gulf Stream. The storm moved northeastward, passing south of Nova Scotia and over Sable Island. A vast area of heavy snow and high winds swept across Nova Scotia, Prince Edward Island and southeast New Brunswick bringing blizzard conditions and record snowfalls. Widespread amounts of 60 to 90 cm (24 to 36 inches, 2 to 3 feet) were experienced, bringing Nova Scotia and Prince Edward Island to a standstill. States of emergency were put into effect across these provinces in order for emergency officials to perform their duties and clean up the mammoth snowfall. It took days for many urban streets and highways to be cleared.

The Synoptic Situation

A storm track map is shown in Fig. 1 with a time series of minimum sea level pressure in the inset based on analyses at the Maritimes Weather Centre in Halifax, Nova Scotia. The storm formed approximately 200 km southeast of Cape Hatteras, NC at 00 UTC 18 February. It then moved to the northeast at 35-40 km/h, attaining its lowest sea level pressure of 959 mb at 18 UTC 19 February, 250 km southeast of Halifax, NS (Fig. 2).

The total (maximum) 24-hour deepening between 18 UTC 18 February and 18 UTC 19 February was 37 mb. The minimum requirement for a storm to be dubbed as a meteorological "bomb" is commonly accepted as 24 mb in 24 hours, so this system exceeded the criterion by a factor of 1.5. After achieving the lowest sea level pressure, the storm moved more slowly toward the northeast at approximately 27 km/h. It then moved across the Burin Peninsula of Newfoundland and exited Newfoundland as a 990-mb low on 21 February. The 500 mb geopotential height and vorticity analysis is shown in Fig. 3 valid at 12 UTC 19 February. The surface low was very near the location of the 500-mb low centre at this time, which offers an explanation as to why the storm was moving so slowly when compared to other storms of this intensity and based on experience.

Visible and infrared GOES satellite imagery is shown in Fig. 4 depicting the storm at different stages during the rapid deepening period. At 18 UTC 18 February the cloud pattern is typical of a cyclone in its formation stage with a broad cloud shield and cirrus deck over-running Nova Scotia and a strikingly sharp cold front extending southward into the Bahamas. Overnight on 19 February the cyclone developed a comma-shaped cloud pattern as shown in Fig. 4b and Fig. 4c. During this period very heavy snow had spread across Nova Scotia. The visible image in Fig. 4d shows the most intense stage of the mature low with cloud wrapping around to the north and west. This cloud region continued to bring heavy snowfall for an extended period of time to the Maritime Provinces.

When the snow arrived it came as a solid band of radar reflectivities as indicated in Fig. 5. On the south side of this leading band was more convective-type precipitation, which appears in the image approaching the Atlantic coastline of Nova Scotia. The storm also brought some freezing rain, ice pellets and rain over Guysborough, Richmond and Cape Breton Counties in eastern Nova Scotia. Snowfall rates were much higher than the radar imagery indicated. For example, in Fig. 5 the maximum snowfall rate is 2 to 3 cm/hr according to the scale, while in reality this would have corresponded to rates near 5 cm/hr.

[1] NovaWeather, Halifax, NS, Canada

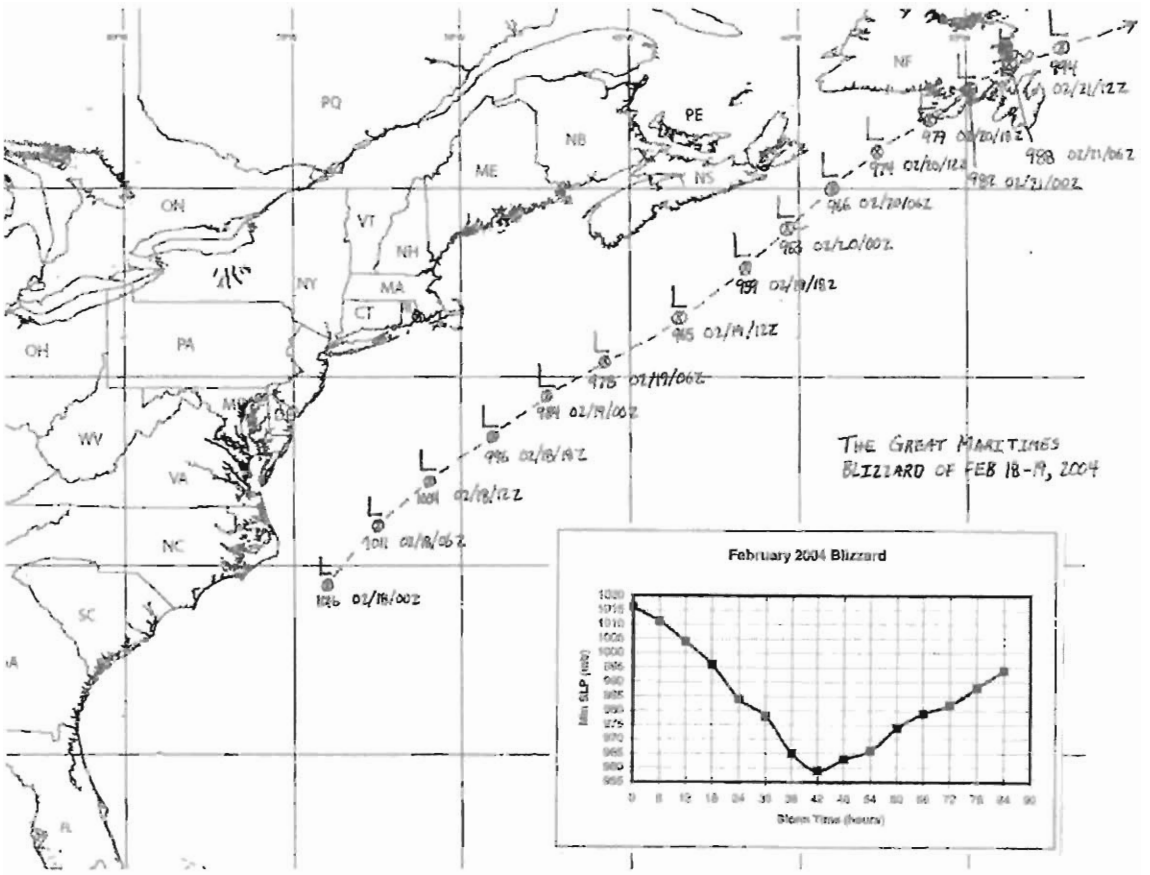

Fig. 1. *Storm track and time series of minimum sea level pressure.*

The Snowfalls

Every storm has a story. For this one, it was the mammoth snowfall and blizzard. A wide swath of 60+ cm (2+ feet) snowfalls was measured over central Nova Scotia, Prince Edward Island and extreme southeast New Brunswick as shown in Fig. 6. The analysis is subjective and represents an estimate of the general pattern. Data are taken from principal airport stations, volunteer climate observers and amateur weather observers. A few points should be noted when interpreting this analysis. For one, the amounts themselves (shown in red in cm) are estimates. Errors in measurements are due to many factors, but the most problematic is taking measurements when there is extensive blowing snow. If snow is melted using a Nipher snow gauge as is done at the airports, errors may also come about when using the simple 10:1 snow/water ratio. A couple of highly suspect amounts in the analysis (including Shearwater's 95 cm) are flagged with a question mark and the contour lines are not fit to the data. The main reason for the suspicion of these data was a persistent inconsistency between observed snowfall intensities and measured snowfall rates during the blizzard. In some instances, hourly accumulations of 7 cm were being reported while snow was falling at a moderate pace. Normally moderate snow will give 2 or 3 cm hour. I personally took observations of snowfall intensities, visibilities and snowfall rates. The snowfall rates/amounts measured were consistent with the reduced visibility due to the falling snow. The total estimate for the Clayton Park area of Halifax was 70 cm.

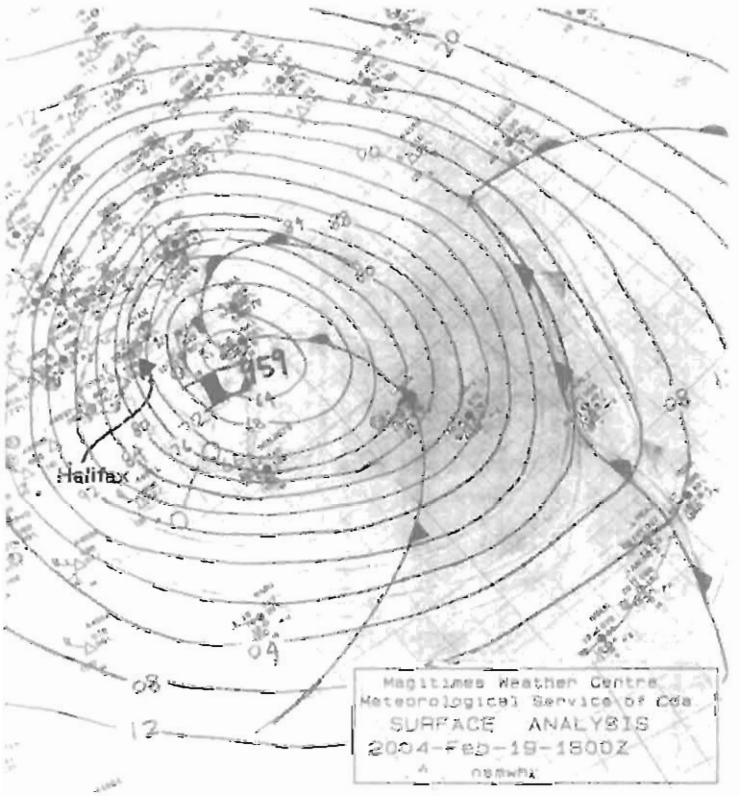

Fig. 2. *Sea level pressure analysis of the storm at maximum intensity.*

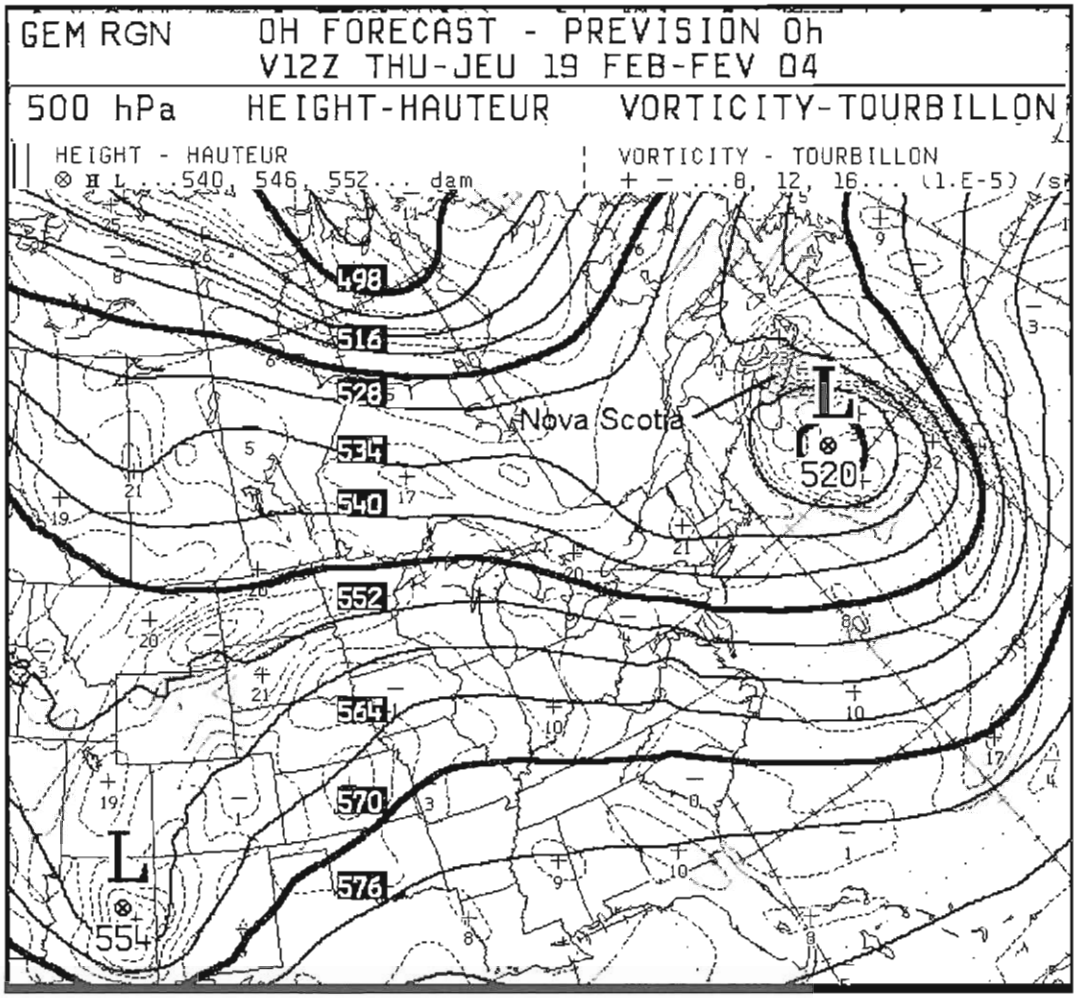

Fig. 3. *500 mb geopotential height and vorticity from the GEM regional 00 HR forecast.*

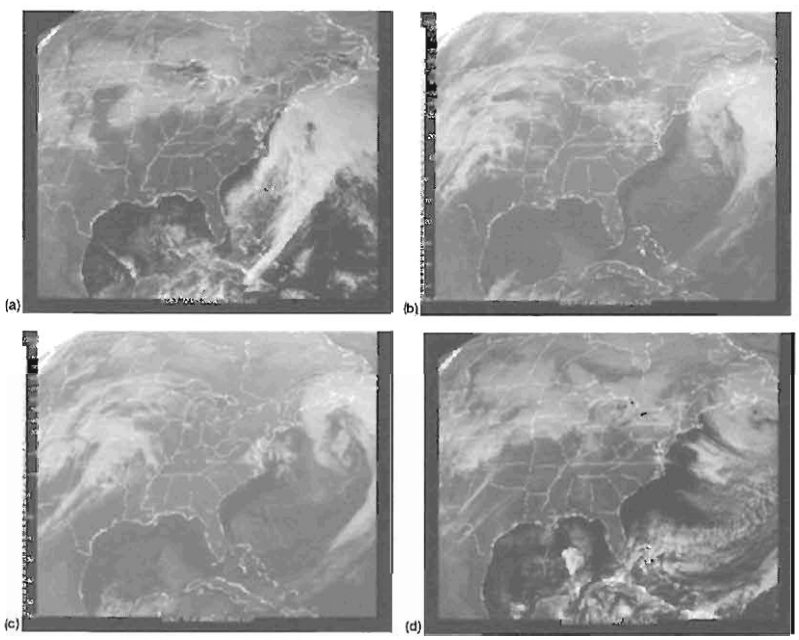

Fig. 4. *GOES satellite imagery showing the evolution of the storm.*

The 80+ cm pockets in the analysis are estimates based on the likelihood that snowfalls would be higher in those areas consistent with elevated terrain and upslope airflow. The sharp drop-off in amounts over southeastern New Brunswick marks the northwest side of the storm. The gradient in amounts over southwestern Nova Scotia denotes the area south of the most intense snow belt. The lighter amounts over eastern and southeastern Nova Scotia represents where snow changed to rain and ice pellets or where the storm's dry slot was forming.

It is interesting to note that although the track of the low was well south of mainland Nova Scotia (over Sable Island), the weather was very intense. Of course, this is no surprise knowing the structure of these storms where the heaviest precipitation occurs well to the left of the storm's track. In this case, *the axis of maximum snowfall averaged 300 km away from and parallel to the storm track.* The band of heaviest snow (60+ cm) was very wide however, averaging 150 km.

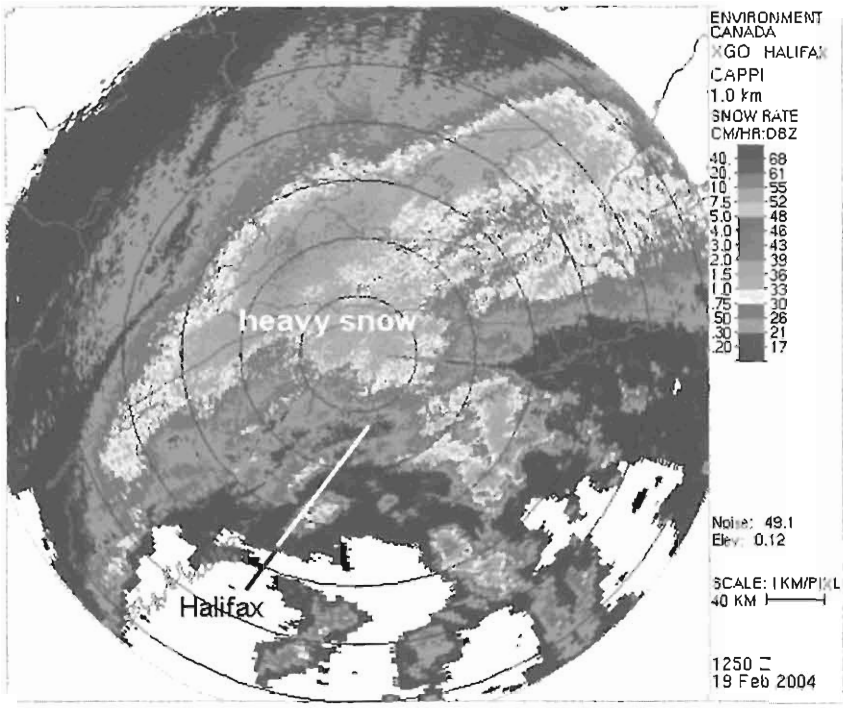

Fig. 5. *Radar image from Gore, Nova Scotia showing intense snow band over the province.*

The excessive amounts of snow were partly attributed to the slow forward motion of the storm. During the storm's rapid deepening period, it was only moving northeastward at a maximum of 40 km/h. Typically we observe intense storms in this area to move at least 60 km/h during their deepening phase.

Many snowfall records were broken with this storm including largest one-day/one-storm snowfall for Halifax. This is based on the - what I believe to be - dubious 95 cm Shearwater value. The previous record snowstorm for Halifax city was 73 cm in February 1960. If the estimate of 70 cm is representative of the area, then one may be led to believe this storm's snowfall is very similar to the 1960 storm. However, given the challenge of snow measurements in high wind situations, this will never be absolutely sure!

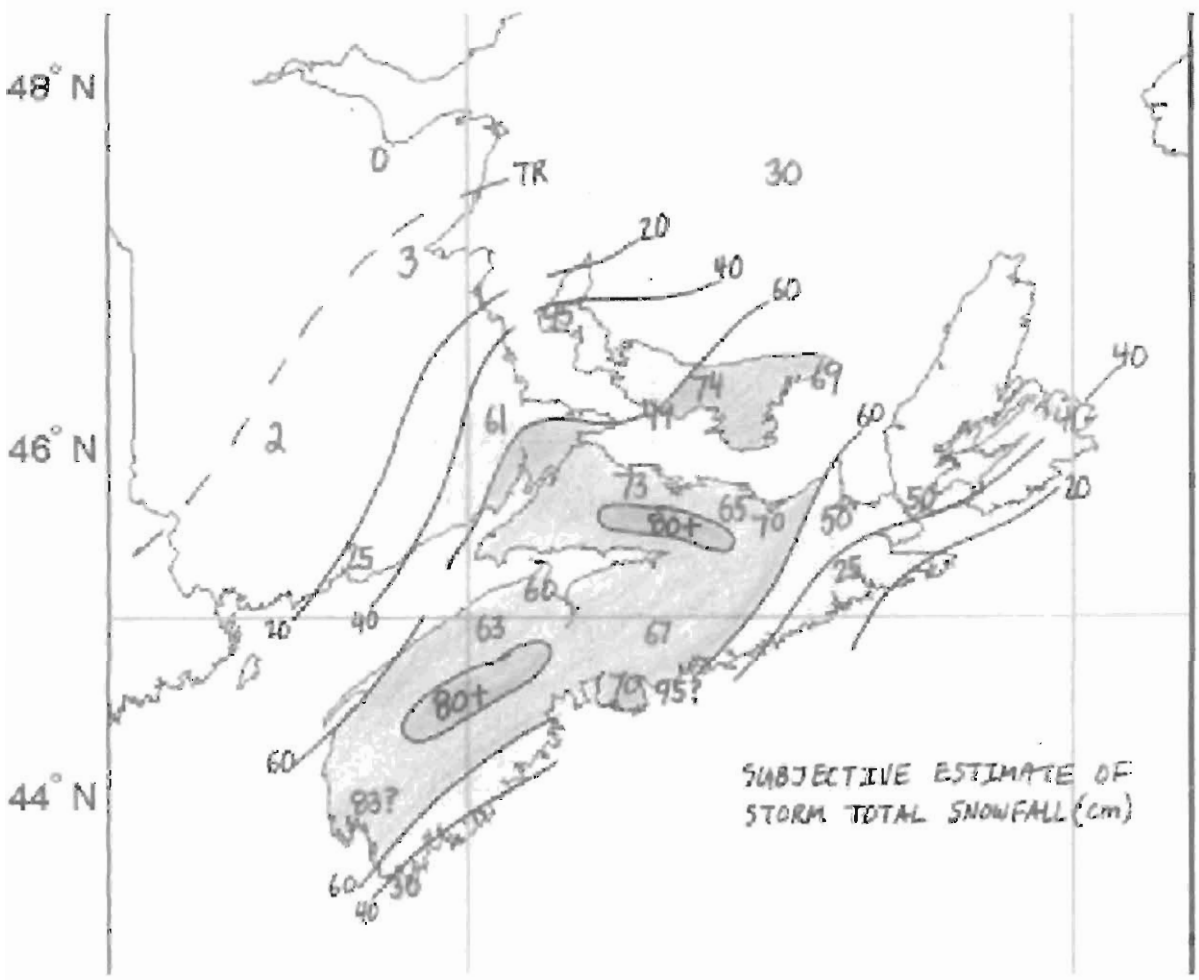

Fig. 6. *Subjective analysis of storm total snowfall estimates.*

Fig. 7. *The blizzard rages on. At daybreak on 19 February drifts were already burying cars.*

The Weather Conditions

Blizzard conditions persisted for close to 24 hours in the Halifax area. Visibilities were generally around 1/8 to 1/4 mile with frequent whiteouts producing zero visibility. Wind gusts were generally 80 to 100 km/h with near 120 km/h wind gusts in exposed areas, like McNab's Island in Halifax Harbour which registered a peak wind gust of 124 km/h (67 knots) in the north-northwesterly winds as the storm was departing Thursday evening. Winds were blowing a steady 80 km/h (43 knots) during the height of the storm. At Shearwater, winds were steady at 65 km/h (35 knots) gusting to near 90 km/h (50 knots) at the height of the blizzard Thursday evening. The fact that the sustained winds were so high is indicative of a powerful storm. The intensity of the snow during the blizzard was also very heavy, so the formation of drifts was relentless and there seemed to be no way for snowplough operators to keep up with the shear volume of snow. They had to be taken off the roads for the simple fact that they could not even see where the streets were or where they were going! A photograph of conditions during the early morning hours of 19 February is shown in Fig. 7.

The Impacts

Some called this storm the "White Juan", and it certainly brought back some memories of the last major disaster to hit the same area in September 2003 – Hurricane Juan. Similarities include the problem of power outages (although not nearly as widespread in the blizzard), difficulty traveling after the storm and the fact that both events brought the region to a standstill as businesses, schools and shopping malls shut down for an extended period of time. A province-wide state of emergency was declared and the city of Halifax had to issue traffic curfews to keep motorists and pedestrians off the streets so they could be cleared.

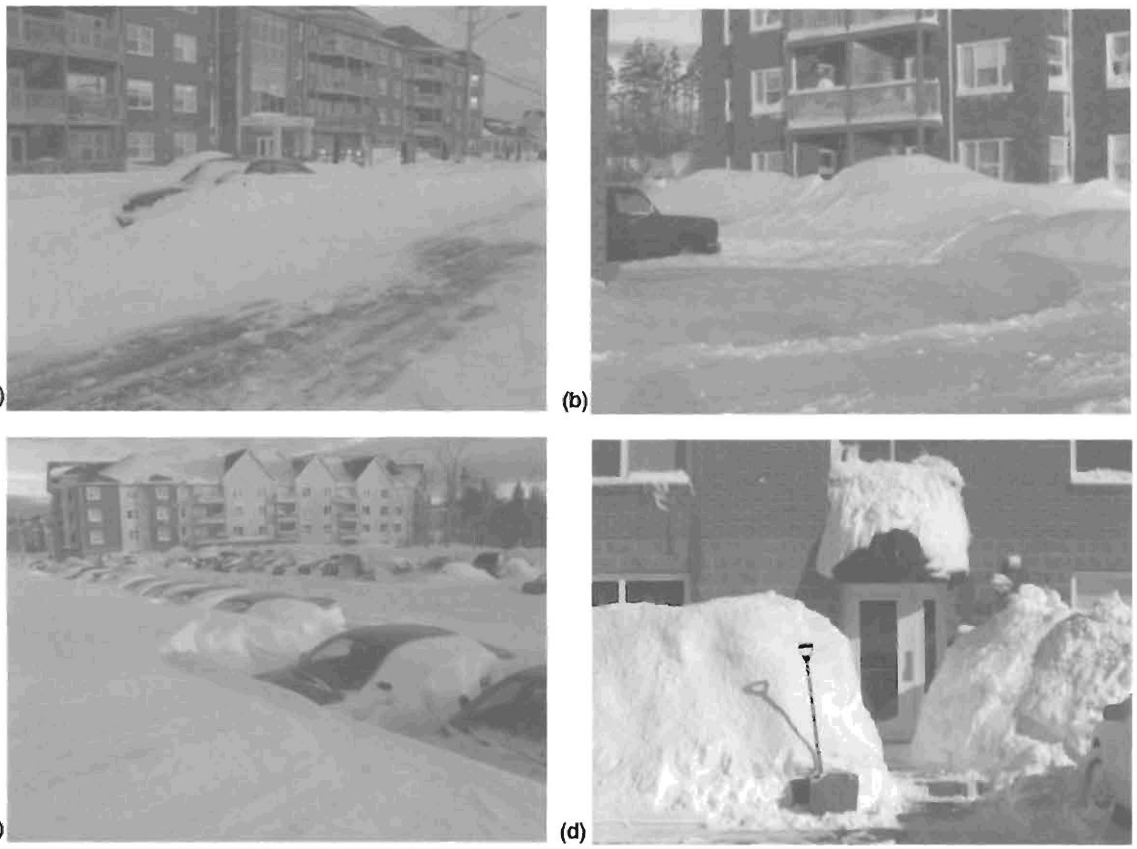

Fig. 8. *Images from after the storm in Clayton Park, 20 February 2004.*

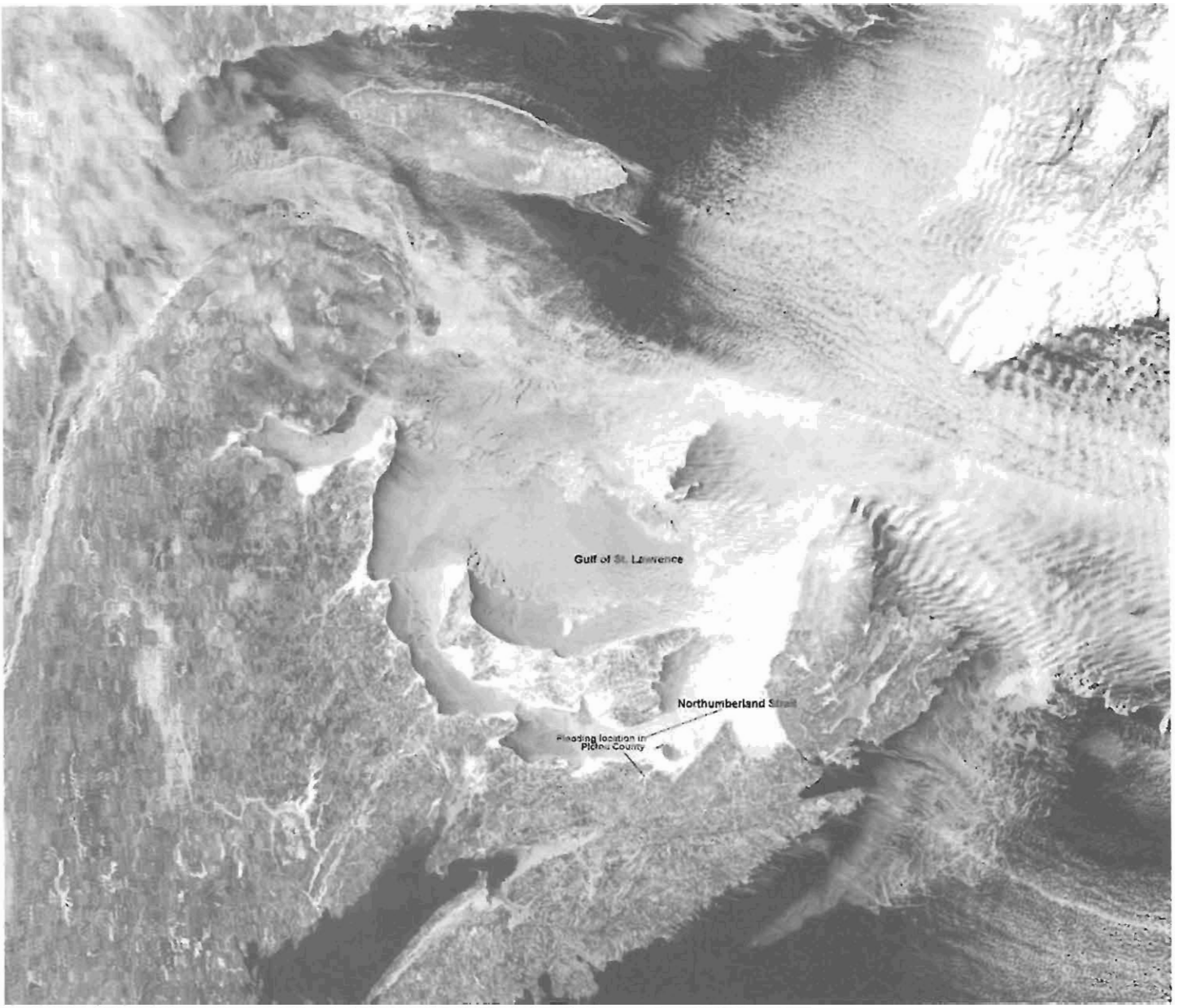

Fig. 9. *Ice cover in the Gulf of St. Lawrence and Northumberland Strait prior to the blizzard. Image from MODIS satellite at 1505 UTC 17 February 2004*

The biggest problem was the massive amounts of snow, which clogged city streets and other roadways. The snow came too fast and there was too much drifting for snowplough operators to keep up with it. There was too much snow to simply push off to the side of the road; it had to be bulldozed in many areas. Roads were impassable during the storm and remained that way for several days in the case of side streets. Many streets were reduced to one lane. Highway exit ramps were hazardous because of reduced visibility due to large snow banks and because the banks occasionally jutted out into traffic lanes. The clogged roadways made it difficult for power crews to access those areas that experienced power outages. A few aftermath photographs are shown in Fig. 8.

Storm Surge

The strong northerly winds blowing across the Gulf of St. Lawrence and Northumberland Strait produced a significant storm surge that caused some flooding. There were reports of flooding in Prince Edward Island, southeast New Brunswick and northern Nova Scotia. The surge waters came near high tide on the night of 19 February. Based on observations in the Pictou County area of Nova Scotia, the surge may have been of the order of 1.5 m (5 feet) because there was flooding in areas that do not normally flood in a more "typical winter storm surge" of 1 m in this area. A high resolution MODIS satellite image (Fig. 9) the day before the storm arrived, showed dense ice along the Northumberland Shore of Nova Scotia but this did not appear to damp-out the surge effects as some believe. The numerical storm surge prediction model (which does not include sea ice effects) used at the weather office,

predicted a surge of near 1.5 m. There are many things we do not understand about the impact of sea ice on storm surge. Nonetheless, the office issued storm surge warnings and the provincial Emergency Measures Organizations were alerted to the potential for surge-related flooding.

Summary

From a forecasting perspective, all the atmospheric ingredients were in place to indicate a major blizzard. The public was warned appropriately that a heavy snowfall with high winds was to be expected with snowfall amounts of the order of 50 cm. Numerical guidance did suggest upwards of 80 cm of snow, but it is often the case that numerical guidance overestimates snowfalls in this region. In addition, it is very unlikely that a meteorologist will write a perfect forecast for a 50- or 100-year event. There have been three such events in Nova Scotia during the span of one year: the heavy spring flooding of March 31, 2003 that washed out several major bridges in the province, Hurricane Juan of September 29, 2003 cut a swath of destruction through the centre of the province, and the Great Maritimes Blizzard of February 19, 2004. These events were all forecast well in the sense that weather warnings were issued in advance and close collaboration with emergency measures departments was maintained. What *was* surprising were the *impacts* of these weather disasters, and this highlights the fact that we as meteorologists should work more on understanding and conveying the impacts of severe weather on society and infrastructure.

Collaborative Report Encourages Government Science

Report advocates strong government research infrastructure for atmospheric science
June 17, 2004

by Nicolle Wahl[2]

Scientists from across Canada have released a report advocating strong government research infrastructure for atmospheric science.

The scientists warn that cost-cutting measures at the Meteorological Service of Canada (MSC), which began in the mid-1990s, will erode its ability to sustain leading-edge research. The report, released today, suggests that loss of this infrastructure will adversely affect Canada's ability to understand and deal with environmental threats such as climate change, air pollution and severe weather.

Scientists from the MSC, McGill University, York University and the Universities of Victoria, Western Ontario and Toronto collaborated on the report, titled *Beyond the Breaking Point?*. While they applaud recent increases in university research funding, they stress that universities cannot replace the resources, commitment and administrative and technical support that a large government organization can offer.

"Canadians have come to expect that government oversees important functions such as extreme weather forecasting and air pollution," says U of T geography professor Miriam Diamond, a report co-author. "However, Canadians need to understand how successive years of cutbacks by the federal government have imperilled our capacity to have this information readily available."

Furthermore, says Diamond, cutbacks are crippling Canada's ability to be a full participant in international negotiations on climate change and air quality.

The scientists point to the 2002 closure of the Eureka observatory in the High Arctic, which monitors atmospheric ozone depletion, as an example of the cutbacks. Temporary funding from a university consortium brought Eureka back into service in 2004 but its future remains in doubt.

Tom McElroy is a senior scientist at MSC and a report co-author. "The partnerships between university and MSC researchers have been very productive in the past. But this productivity has required an active participation by the government partner - a role which is becoming increasingly difficult to maintain in many areas," he says. "The government contribution is vital to the understanding of complex environmental issues. Only government can supply national monitoring networks, long-term programs, and other support that universities can't."

Diamond adds that it's critical for the Canadian population to understand that federal funds spent on science are not wasted. "We've been led to believe that the civil service is a waste of money. In fact, government science is extremely cost-effective and efficient," she says. "As Canadians, we see great return on investment for money that goes into government science."

For more information, please contact:

- Tom McElroy, Meterological Service of Canada, ph: (416) 739-4630; e-mail: tom.mcelroy@ec.gc.ca; or
- Miriam Diamond, Department of Geography, ph: (416) 978-1586; e-mail: miriam.diamond@utoronto.ca

You can find this story on the web at: http://www.news.utoronto.ca/bin6/040617-131.asp

Note from the Editor: Article reproduced here with authorization of the author.

[2] University of Toronto, Toronto, ON

Warren David Forrester
1925 - 2004

Warren David Forrester, an astronomic surveyor, physical oceanographer and tidal officer, died on February 22, 2004 in Oshawa, Ontario.

Warren was born in Hamilton, Ontario on March 4, 1925 and received a BA in Mathematics and Physics from the University of Toronto in 1947. After graduation he began working with the Geodetic Survey of Canada as an Astronomic Surveyor. In 1956 he joined the Canadian Hydrographic Service as a Special Projects Officer and became interested in measuring tidal currents in the Bay of Fundy using photogrammetry. This led him to take educational leave to study physical oceanography at the University of British Columbia where he obtained an MSc in 1961. He continued studies in physical oceanography at John Hopkins University under the direction of Professor Raymond Montgomery. Partway through these studies Warren came to the Bedford Institute of Oceanography in Dartmouth, Nova Scotia where he carried out the observational work for his PhD thesis.

The aim of his study was to examine currents in coastal waters where the geostrophic approximation deteriorates because friction and acceleration are not negligible. To compare the geostrophic current with the true current he needed to measure both. The true current he measured by placing 18 current metres across the St. Lawrence Estuary. For the geostrophic current he had to obtain water samples simultaneously across the section because the current is mostly tidal and changes speed and direction rapidly. He placed 8 moorings across the estuary with up to 12 water bottles distributed through the water column. All the bottles were closed at the same time using an arrangement of timers and messengers. After they were tripped, the ship recovered and reset all the moorings for another set of observations. In this manner he obtained a complete set of observations on each of 11 consecutive days. At the time the experiment was considered innovative and ingenious and much discussed at BIO. Warren's careful analyses resulted in a successful PhD; no mean feat as Professor Montgomery was rumoured to be uncommonly tough.

Following this study in the St. Lawrence Estuary, Warren continued to work in the Gulf of St. Lawrence examining internal waves, tidal transports, ice volumes and distributions of temperature and salinity. He was also involved in the aftermath of the grounding of the tanker ARROW on February 4, 1970. His role in this was to study the distribution of oil particles suspended in the water. Warren served as a valued member on a number of Ph.D. and M.Sc. committees at Dalhousie. His reputation as a thorough helpful and perceptive reviewer was well known.

In 1975 Warren left the Bedford Institute for the Canadian Hydrographic Service (CHS) where he became Head of the Tides and Water Levels Group. In 1981, he retired from the government service and became a freelance oceanographic consultant. Under contract with CHS, he rewrote the Canadian Tidal manual which was published in both official languages, English and French. As a consultant, he was involved in a number of overseas projects for the Canadian International Development Agency and the United Nations. In Mali he assessed the feasibility of hydrographic charting of the Niger River for navigation. In Goa he presented lectures on tidal theory, observation and prediction, and in Malaysia he provided tidal and geodetic expertise. He also continued to be a regular attendee of CMOS Annual Congresses including the Ottawa meeting in 2003.

Warren is remembered by his colleagues at the Bedford Institute as a careful and thoughtful scientist. Beyond science, he was known for owning the only Citroën in town, for living in interesting houses outside the city that seemed more like cottages, for having a firm hand on the pennies with less concern for larger sums when the price of gold fell out of bed, and for many enjoyable conversations and parties where he would display his skill as an inveterate punster.

John Lazier
Bedford Institute of Oceanography
Darmouth, NS

I had the honour to work with Dr. Forrester from 1975 to 1981, until he retired from CHS. Working with Warren Forrester was quite an enjoyable experience. For Warren, there were no stupid questions. He would take all the time needed to explain the scientific facts and laws. As he was thorough in his explanations, I have learned a great deal from Warren about oceanography and hydrography in general, but also about tides and measurement of tides in particular.

Paul-André Bolduc

CMOS Members Honoured

1) **Dr. Hal Ritchie**, then vice-president of CMOS and now the incoming President, received the *2003 Patterson Distinguished Service Medal* for outstanding service to meteorology in Canada. This prestigious award was presented to Dr. Ritchie at the annual Congress of the Canadian Meteorological and Oceanographic Society (CMOS) in Edmonton.

Dr. Ritchie is well known in the field of numerical modeling through his pioneering work in spectral modeling and the use of semi-Lagrangian time-stepping formulation. He is recognized in Canada and internationally for his extensive work on the application of semi-Lagrangian techniques in atmospheric models. His work in spectral modeling led to the development of the Canadian Spectral Model which was the first model of its kind to have a semi-Lagrangian scheme implemented operationally. The formulation and procedures initially developed by Dr. Ritchie are now used operationally at most numerical weather prediction centres.

More recently, Dr. Ritchie has led the Atlantic Environmental Prediction Research Initiative (AEPRI) which has been responsible for a number of innovative developments such as the operational storm surge prediction hurricane reconnaissance programs. When the Minister of the Environment announced the new National Lab initiative for the Meteorological Service of Canada, he used the AERPI model as an example of a successful lab-type infrastructure.

Dr. Ritchie is a principal investigator of the Marine Environmental Prediction System. He plays a key role at the Centre for Marine Environmental Prediction at Dalhousie University and leads the coupled modeling and environmental prediction group at Recherche en prévision numérique in Dorval. He has brought scientists from a variety of disciplines together to work on developing an operational coupled multi-disciplinary model that will improve Canadian Environmental forecasting.

Dr Ritchie is well respected and well liked amongst his colleagues and those he supervises. To quote one of his employees: "One works with Hal, not for him".

The Patterson Distinguished Service Medal, presented since 1954, is considered the pre-eminent award recognizing outstanding work in meteorology by residents of Canada. This prestigious award is named in honour of Dr. John Patterson, a distinguished meteorologist who was Director and Controller of the Meteorological Service of Canada from 1929 to 1946, a crucial period in the development of Canada's weather service.

1) **Dr. Hal Ritchie**, alors vice-président de la SCMO et maintenant le nouveau président, a reçu la *médaille Patterson de 2003 pour services distingués* du fait de sa contribution exceptionnelle à la météorologie au Canada. Ce prix prestigieux a été remis à M. Ritchie au Congrès

Dr. Hal Ritchie (right) receiving the Patterson Medal Certificate from Jim Abraham (left) during the Award Luncheon at the Edmonton Congress. Photo courtesy of the LAC.

annuel de la Société canadienne de météorologie et d'océanographie (SCMO), à Edmonton.

M. Ritchie est bien connu dans le domaine de la modélisation numérique pour son travail de précurseur en modélisation spectrale et l'utilisation d'une formulation semi-lagrangienne d'établissement d'un pas de temps. Il est reconnu au Canada et à l'échelon international pour ses vastes travaux portant sur l'application des techniques semi-lagrangiennes dans les modèles atmosphériques. Son travail relatif à la modélisation spectrale a conduit à la conception du modèle spectral canadien, le premier modèle du genre à posséder une formulation semi-lagrangienne appliquée en exploitation. La formulation et les méthodes conçues à l'origine par M. Ritchie servent maintenant en exploitation à la plupart des centres de prévision météorologique numérique.

Plus récemment, M. Ritchie a dirigé l'Initiative de recherche en prévision environnementale de l'Atlantique (IRPEA), qui a abouti à plusieurs innovations comme les programmes de reconnaissance des ouragans pour la prévision des ondes de tempête. Quand le ministre de l'Environnement a annoncé la nouvelle initiative du Laboratoire national pour le Service météorologique du Canada, il a cité le modèle IRPEA comme exemple d'une infrastructure réussie de type laboratoire.

M. Ritchie est un des principaux chercheurs du Système de prévision de l'environnement maritime. Il joue un rôle clé au *Centre for Marine Environmental Prediction* à l'université Dalhousie et dirige le groupe de prévision environnementale et de modélisation couplée à Recherche en prévision numérique à Dorval. Il a réuni des scientifiques de diverses disciplines pour la mise au point d'un modèle multidisciplinaire couplé d'exploitation qui améliorera la prévision de l'environnement canadien.

M. Ritchie est bien respecté et apprécié parmi ses collègues et les personnes qu'il supervise. Pour citer un de ses employés : «On travaille avec Hal, non pas pour lui».

La médaille Patterson pour services distingués, présentée depuis 1954, est considérée comme le prix prééminent qui reconnaît le travail exceptionnel accompli en météorologie par des résidents du Canada. Ce prix prestigieux est décerné en l'honneur de M. John Patterson, météorologue distingué qui a été directeur et contrôleur du Service météorologique du Canada de 1929 à 1946, période cruciale à l'essor du service météorologique du Canada.

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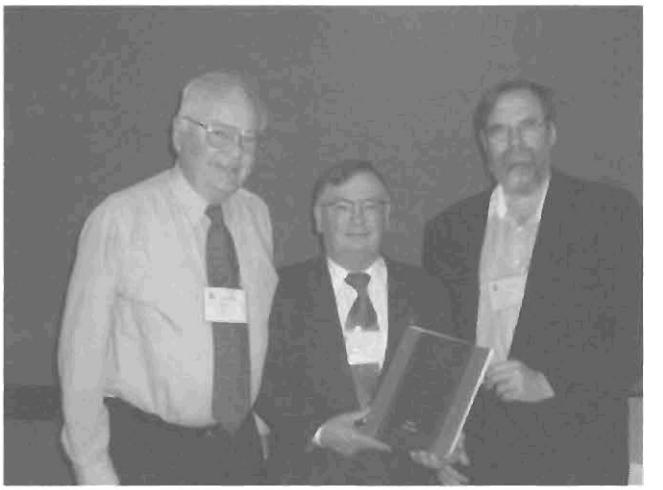
2) **Dr. Savithri Narayanan**, Director, Marine Environmental Data Service (MEDS), DFO, has received a Head of the Public Service Award for her work in the category of *Valuing and Supporting People*. Internationally recognized in her field of expertise, she has successfully created a working environment where her employees flourish due to a focus on learning, scientific achievement and teamwork. Her professional excellence and respect for her staff truly make her a role model in the public service across Canada.

Dr. Savithri Narayanan (right) receiving her award from presenter Rob Wright (left) from Privy Council Office during a ceremony held in December 2003 at the Lac Leamy Hilton Hotel, Gatineau, QC.

2) **Dr. Savithri Narayanan**, Directrice, Service des données sur le milieu marin, MPO, a reçu le prix du Chef de la fonction publique pour son travail dans la catégorie *Valoriser et soutenir les gens*. Reconnue à l'échelle internationale dans son domaine d'expertise, elle a réussi à créer un milieu de travail où ses employés s'épanouissent parce qu'elle met l'accent sur l'apprentissage, les réalisations scientifiques et le travail d'équipe. Son excellence professionnelle et le respect qu'elle porte à ses employés font d'elle un modèle dans la fonction publique pour tout le Canada.

3) **Mr. Paul-André Bolduc**, *CMOS Bulletin SCMO* Editor, has been granted a Citation for his leadership in revitalizing the *CMOS Bulletin SCMO* and making it a well-established and well-regarded publication that is used as the principal means of communication among Society members. Along with the Citation certificate, Mr. Bolduc received a bound book of the cover pages of the Bulletin from February 1996 to December 2003, a total of 48 pages. In his acceptance note, Mr. Bolduc thanked Dr. Neil Campbell for his all-time support and collaboration, Ms. Dorothy Neale for reviewing the texts and making them readable, his wife, Louise, and his son, Jean-François; without their help the Bulletin will never be published on time; and mostly all the **authors** who during the last eight years have published numerous articles, reports and notes and have selected the Bulletin as the means to communicate with all members of the Society. This honour reflects the vitality of the *CMOS Bulletin SCMO* and of the Society as a whole.



From left to right, Dr. Neil Campbell, Executive Director, Paul-André Bolduc, Editor and Dr. Allyn Clarke, President. Photo taken by R. (Dick) Stoddart.

3) **M. Paul-André Bolduc**, Rédacteur, *CMOS Bulletin SCMO*, a reçu une Citation pour son leadership à revitaliser le *CMOS Bulletin SCMO* et à en faire une publication vigoureuse et estimée qui sert de moyen principal de commnication entre les membres de la Société. En plus de la Citation, M. Bolduc a reçu un livre relié présentant toutes les pages couvertures du Bulletin de février 1996 jusqu'à décembre 2003, soit un total de 48 pages. Dans son discours d'acceptation, M. Bolduc a remercié Dr. Neil Campbell pour son support continu, Ms Dorothy Neale pour avoir revisé tous les textes et les rendre compréhensibles, sa femme Louise et son garçon Jean-François; sans leur aide précieuse le Bulletin ne serait jamais publié en temps; et surtout tous les **auteurs** qui, durant ces huit années, ont publié de nombreux articles, des rapports et des notes et qui ont choisi le Bulletin comme moyen de communication

avec tous les membres de la Société. Cet honneur reflète la vitalité du *CMOS Bulletin SCMO* et de toutes les composantes de la Société.

Youth Featured at 38th CMOS Congress (Edmonton)

Left-right: Ms. Paige Wakefield, Sir Alexander Mackenzie School, and Ms. Alex van Zyl, Sir George Simpson School, both of St. Albert, Alberta, winners in the Edmonton Regional Science Fair, 17-18 April 2004.

In the midst of our busy professional lives, we often overlook our mission statement (as stated right at the top of our web page and on the first page of every *CMOS Bulletin SCMO* issue), that "*CMOS exists for the advancement of meteorology and oceanography in Canada*". In keeping with this mission, during the 38th Congress we featured poster exhibits from two young ladies who were CMOS winners in the 2004 Edmonton Regional Science Fair. The presentations by Ms. Paige Wakefield and Ms. Alex van Zyl somewhat 'stole the show' at our official Poster Session, and both youth handled themselves quite professionally and were a credit to their schools. Paige, of Sir Alexander Mackenzie School in St. Albert, highlighted "*Weather Forecasting*" in her poster (forecasters might take a cue from this), while Alex, from Sir George Simpson School in St. Albert, displayed her poster on "*Adventure into Snow*", aptly named since Alex is a recent immigrant to Canada from Zimbabwe! We were delighted with their participation and their presentations, and encourage future congresses to continue this type of exhibit. The photo adequately captures the enthusiasm which they brought to the Congress.

Geoff Strong
Chairman, Scientific Program Committee
38th CMOS Annual Congress (Edmonton)

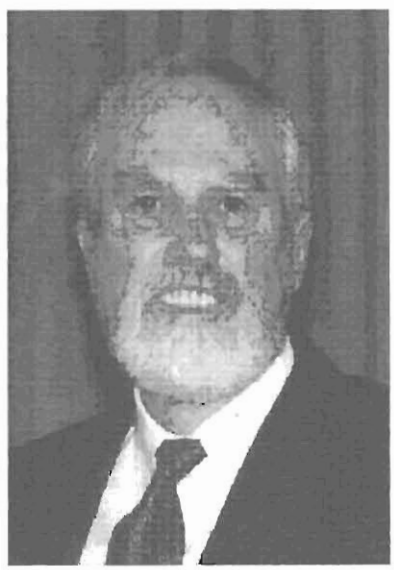
Roger Daley Postdoctoral Publication Award

Initiated by Mrs. Lucia Daley in remembrance of her husband, the Roger Daley Postdoctoral Publication Award, valued at $2000, is to be made annually to a candidate who, at the time of nomination, is working in Canada in a non-permanent position as a postdoctoral fellow or research associate, and is within five years of having received a doctoral degree. The award is based on the excellence of a publication, in the field of meteorology or oceanography, that has appeared, or is in press, at the time of nomination. The awards program will be funded by Mrs. Daley for ten years, and will continue for as long as the contributions solicited through CMOS will permit. The first award will be made in 2005. Your donation to the fund will ensure that this award will continue for a long time.

Please send your contribution to:

CMOS
The Roger Daley Postdoctoral Publication Award
P.O. Box 3211, Station D
Ottawa, ON K1P 6H7

A receipt for charitable donation will be provided.



Roger Willis Daley (1943-2001)

La Bourse pour publication postdoctorale Roger Daley

Instaurée par Mme Lucia Daley en mémoire de son époux, la Bourse pour publication postdoctorale Roger Daley, d'une valeur de 2 000 $, est accordée chaque année à un candidat qui, au moment de la nomination, occupe un poste non-permanent de boursier postdoctoral ou d'associé de recherche au Canada, ayant reçu son doctorat il y a moins de cinq ans. L'attribution est basée sur l'excellence d'une communication scientifique en météorologie ou en océanographie qui a été publiée ou qui est sous presse au moment de la nomination. Le programme de bourses sera financé par Mme Daley pendant 10 ans, et se poursuivra aussi longtemps que les contributions recueillies par la SCMO le permettront. La première bourse sera adjugée en 2005. Votre contribution au fonds fera en sorte que le programme durera longtemps.

Veuillez envoyer votre contribution à:

SCMO
Bourse pour publication postdoctorale Roger Daley
C.P. 3211, Succursale D
Ottawa, ON K1P 6H7

Un reçu pour don de charité vous sera émis.

PAPER ORDER for ATMOSPHERE-OCEAN 42-2

AO-503
Sensitivity of the CRCM Atmospheric and the Gulf of St. Lawrence Ocean-Ice Models to their Interactions by Manon Faucher, Daniel Caya, François Saucier and René Laprise.

OC-248
Double Kelvin Waves over the Newfoundland Shelf-break by Daniel G. Wright and Zhigang Xu.

AO-514
A Parameterization of Solar Energy Disposition in the Climate System by Zhaomin Wang, Rong-Ming Hu, Lawrence A. Mysak, Jean-Pierre Blanchet and Jian Feng.

AO-600
Associations between Low Frequency Variability Modes and Winter Temperature Extremes in Canada by Amir Shabbar and Barrie Bonsal.

OC-247
Investigation of Sea Radiance Fluctuation by G Han Kara

Prochain numéro du *CMOS Bulletin SCMO*

Le prochain numéro du *CMOS Bulletin SCMO* paraîtra en **octobre 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.

Next Issue *CMOS Bulletin SCMO*

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

Photos legend / Légende des photos

Photo 1: Dr. Richard Asselin (Director of Publications), Dorothy Neale (CMOS Executive Secretary) and Lise Harvey (Office Manager) at CMOS booth. / Dr. Richard Asselin (Directeur des publications), Dorothy Neale (Secrétaire exécutive de la SCMO) et Lise Harvey (Chef de bureau) au kiosque de la SCMO.

Photo 2: Where oceanography meets meteorology; Drs. David Greenberg and Peter Taylor discussing where to go next during an health break. / Où l'océanographie rencontre la météorologie; Drs. David Greenberg et Peter Taylor se demandant où se diriger après la pause-santé.

Photo 3: Invited speaker Dr. Howard Freeland lecturing the audience on System ARGO during Congress. / Conférencier invité Dr. Howard Freeland donnant une présentation sur le Système ARGO pendant le congrès.

Photo 4: Ms. Susan Woodbury receiving her Fellow's certificate from President Allyn Clarke. / Mme. Susan Woodbury recevant du président Allyn Clarke son certificat comme Fellow.

Photo 5: President of the Scientific Program Committee, Dr. Geoff Strong, addressing the audience during the CMOS Annual Banquet. / Président du comité du programme scientifique, Dr. Geoff Strong, s'adressant à l'audience durant le banquet annuel de la SCMO.

Photo 6: Incoming Executive Director, Ian Rutherford and Ms. Eleanor Campbell sitting at the head table during the CMOS Annual Banquet. / Nouveau directeur exécutif, Ian Rutherford et Mme Eleanor Campbell assis à la table d'honneur durant le banquet annuel de la SCMO.

Photo 7: Dr. Rick Thomson receiving the Tully Medal in Oceanography from President Allyn Clarke. / Dr. Rick Thomson recevant la médaille Tully en océanographie du président Allyn Clarke.

Photo 8: Dr. George J. Boer receiving his Fellow's certificate from President Allyn Clarke. / Dr. George J. Boer recevant du président Allyn Clarke son certificat Fellow.

Photo 9: Dr. Charles Lin receiving his Fellow's certificate from President Allyn Clarke. / Dr. Charles Lin recevant du président Allyn Clarke son certificat comme Fellow.

Photo 10: Michael Schaffer receiving the Rube Hornstein Medal in Operational Meteorology. / Michael Schaffer recevant la médaille Rube Hornstein en météorologie opérationnelle.

Photo 11: Dr. Allyn Clarke, Ms. Phyllis Strong and Dr. Geoff Strong sitting at the head table during the CMOS Annual Banquet. / Dr. Allyn Clarke, Mme Phyllis Strong et Dr. Geoff Strong assis à la table d'honneur pendant le banquet annuel de la SCMO.

Photo 12: Mr. Laurie Neil (Vancouver) and Mr. Brian Paruk (Edmonton) during the CMOS Annual Banquet / M. Laurie Neil et M. Brian Paruk pendant le banquet annuel de la SCMO.

• Les photos 1 à 6 sont la courtoisie de Paul-André Bolduc.
• Photos 7 to 12 are courtesy of the Edmonton Congress Local Arrangements Committee.

Photo 1

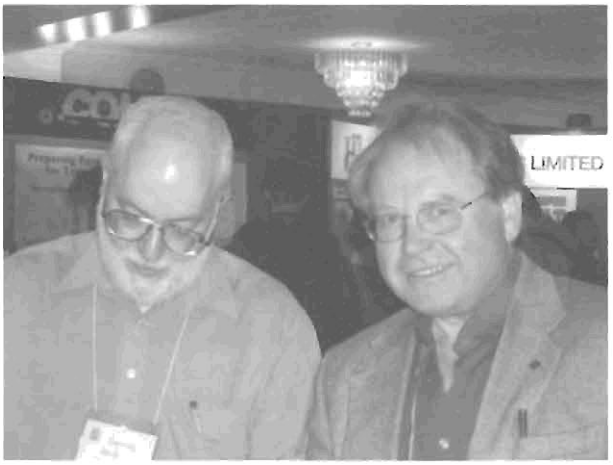


Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

Photo 9

Photo 10

Photo 11

Photo 12

2003 CMOS Prizes and Awards

✦ The Tully Medal in Oceanography is awarded to **Richard E. Thomson**, Institute of Ocean Sciences, Department of Fisheries and Oceans, Sidney, BC, for his many distinguished contributions to physical oceanography and his highly appreciated books entitled "Oceanography of the British Columbia Coast" and "Data Analysis Methods in Physical Oceanography".

✦ The Rube Hornstein Medal in Operational Meteorology is awarded to **Michael Schaffer**, Prairie Aviation and Arctic Weather Centre, Edmonton, AB for his pioneering work in marine wind forecasting and his data visualization methods for winds, which have been adopted by forecasters across Canada.

✦ The Tertia M.C. Hughes Memorial Prize is awarded to **Jian Lu**, Department of Physics and Oceanography, Dalhousie University for his insightful contributions to our understanding of the dynamics of 20th century climate change and, in particular, his publications and PhD thesis on the recent eastward shift of the North Atlantic Oscillation. Jian Lu is now pursuing further studies at the Geophysical Fluid Dynamics Laboratory, Princeton University.

Two CMOS Citations are being awarded this year; the first is awarded to:

✦ **Paul-André Bolduc**, Editor of the *CMOS Bulletin SCMO* for his leadership in revitalizing the *CMOS Bulletin SCMO* and making it a well-established and well-regarded publication that is used as the principal means of communication for CMOS members; and the second citation is awarded to:

✦ **Claire Martin**, CTV Calgary, AB, radio and television presenter who, for years has shown outstanding skills in bringing day-to-day weather and its impacts to people in a clear, simple and entertaining manner.

Title of Fellow of the Society is awarded to:

✦ **Charles A. Lin**, Department of Atmospheric and Oceanic Sciences, McGill University, in recognition of his long–standing service to the meteorological community in teaching, research, editing and serving on and with many scientific organizations in Canada and abroad.

✦ **George J. Boer**, Canadian Centre for Climate Modelling and Analysis, Meteorological Service of Canada, in recognition of his long-standing research in hydrometeorlogy, climatology and contributions to Canadian and international science and service.

✦ **Susan K. Woodbury**, Consultant, in recognition of her dedication, commitment and contribution to the development of the private meteorological and oceanographic sector in Canada, and her dedicated services to CMOS over many years.

✦ **James P. Bruce**, Consultant, in recognition of his long-standing research in hydrometeorolgy, climatology, and contributions to Canadian and international meteorological science and service.

CMOS Undergraduate scholarships are awarded to:

✦ **Pamela Fairbridge**, Dalhousie University;
✦ **Jill Maepea**, York University .

The CMOS Weather Network Scholarship is awarded to:

✦ **Angela Colebrook**, York University (in absentia).

✦ The President's Prize is awarded to **Dr. Thomas Andrew Black**, University of British Columbia, Faculty of Agricultural Science, Department of Soil Science, for his important contributions to forest biometeorology and microclimatology, as lead author, in his paper, entitled "Ecophysiological controls on the carbon balances of three southern boreal forests" published in Agricultural and Forest Meteorology, 117: 53-71, 2003.

✦ The Andrew Thomson Prize in Applied Meteorology is awarded to **Ron Hopkinson**, Meteorological Service of Canada, **Regina, SK**, for his outstanding improvements to climatological applications of meteorological and hydrological data in addressing Canadian environmental concerns, and for sharing his knowledge and expertise with others for the benefit of scientific research in Canada.

✦ The CMOS Prize in Applied Oceanography is awarded to **Richard A. Pawlowicz**, Department of Earth and Ocean Sciences, University of British Columbia, for his outstanding contributions to the application of oceanography in Canada and abroad through the development, and free distribution, of state-of-the-art software packages for tidal analysis, spatial mapping, and air-sea flux calculations.

✦ The CMOS/Weather Research House Scholarship is awarded to **Tiffany Shaw**, Department of Earth and Ocean Sciences, UBC, who is planning to continue her studies at University of Toronto with Ted Shepherd under whom she will be investigating problems in theoretical atmospheric dynamics. This scholarship of CMOS is valued at $10,000 if held for two years.

✦ The Campbell Scientific Corp. best student poster prize is awarded to **Daniel Figueras-Nieto**, **Eric Girard** and **Lucia Crăciun** for their poster "The Parameterization of Ice Crystals Heterogeneous Nucleation in Climate Models: Comparison with Observations taken during SHEBA.

✦ The CMOS Achievement Award is presented to **Neil J. Campbell** for his many years of voluntary service to CMOS as Executive Director.

A Workshop on Climate Variability

by Jacques Derome[1], George J. Boer[2], Richard J. Greatbatch[3] and Andrew J. Weaver[4]

Abstract

We present a summary of a recent workshop held by the Canadian Climate Variability Research Network. Presentations by Network members and guests covered the three research themes of the Network, namely, (a) seasonal to interannual variability and prediction, (b) decadal to century time scale variability and (c) century time scale variability and change, including the detection and attribution of anthropogenic effects.

Résumé

Nous présentons un condensé de l'atelier que le Réseau de recherche canadien en variabilité climatique a tenu les 23 et 24 février à Victoria. Les présentations couvrirent les trois thèmes de recherche du Réseau, c'est-à-dire, (a) la variabilité à l'échelle saisonnière ou interannuelle ainsi que sa prédictibilité, (b) la variabilité à l'échelle décennale, et (c) la variabilité et le changement à l'échelle séculaire.

1. Introduction

The Canadian Climate Variability (CLIVAR) Research Network brings together 23 Principal Investigators (PIs), with postdoctoral research fellows, research associates and graduate students from 10 Canadian universities and five Federal Government Laboratories. Its goals are: (a) to clarify the physical mechanisms responsible for natural climate variability on time scales ranging from a season to a century, (b) to determine the extent to which this variability is predictable, (c) to develop tools to predict that variability when feasible, and (d) to develop and apply tools to distinguish natural from anthropogenic contributions in observed and predicted global warming. It is currently funded by the Natural Sciences and Engineering Research Council and the Canadian Foundation for Climate and Atmospheric Sciences. Further details on its composition and work can be found on its Web site at: http://www.clivar.ca/network.

On last February 23 and 24, in Victoria, BC, the Network held its fourth workshop, the content of which is summarized below. The workshop was launched by an invited presentation by Dr. Stephen Lord, Director of the U.S. Environmental Modeling Center (National Centers for Environmental Predictions) on exciting recent developments in the use of a coupled atmosphere-ocean model for seasonal forecasting. In addition to presentations by the Network members, the workshop benefited from contributions by guest speakers from outside the Network.

As will become evident in the following sections, the talks were organized along the three themes of the Network, progressing from the shorter to the longer time scales of climate variability. Naturally, this summary article cannot do justice to all presentations, but it should give the reader a broad view of the activities in the Network. It should be understood that the Network does not encompass all the climate variability research activities in Canada, so this workshop summary should be read in that light.

2. Seasonal prediction and predictability

The Theme 1 topic of prediction and predictability led off the Workshop. An invited presentation by Stephen Lord of NOAA/NCEP (a list of acronyms appears at the end of this article) reviewed their current seasonal forecast system, described the recently developed coupled forecast system, provided preliminary skill assessments, and looked to the future.

There are interesting differences in the approach of NOAA/NCEP and CMC (Canadian Meteorological Centre) to the seasonal forecasting problem. NOAA has produced seasonal forecasts for many years by a combination of statistical methods, model output, and subjective experience. The current seasonal forecast system is a 2-tier system whereby an ensemble of SST (sea surface temperature) predictions are made in a restricted equatorial tropical Pacific domain using a coupled system and these SSTs are used as boundary conditions for ensembles of AGCM simulations. The results are combined with other information to produce forecasts for several seasons.

This contrasts with the current CMC seasonal forecast production which has been underway for a much shorter time and which is partially based on results from the CLIVAR Network. The first season CMC forecast is a 2-tier

[1] McGill University

[2] Canadian Centre for Climate Modelling and Analysis

[3] Dalhousie University

[4] University of Victoria

forecast using persisted SST anomalies to provide the boundary conditions for atmospheric models. Beyond the first season the forecast, while objective, is based on statistical methods.

The new NCEP coupled forecasting system (CFS) represents what is rapidly becoming the state-of-the-art for seasonal forecasting, namely a 1-tier global coupled model forecast system. The NCEP model, when run in coupled climate mode, appears to have very reasonable ENSO-like variability. This ENSO behaviour is a very great advantage since it is certainly not a given in coupled climate models.

The skill of the new CFS is being assessed in hindcast mode and results are compared with the current operational forecast and statistical forecast tools such as CCA (Canonical Correlation Analysis) forecasts. Perhaps surprisingly, the CFS and CCA forecasts appear to have skill in different US areas which may offer the hope of combining these approaches. Implementation of the new coupled forecast system is planned for late summer of 2004 and it is interesting to ponder the potential for collaborative multi-model North American seasonal forecasts which would avoid the current boundary at the 49th parallel by combining results from NCEP and CMC.

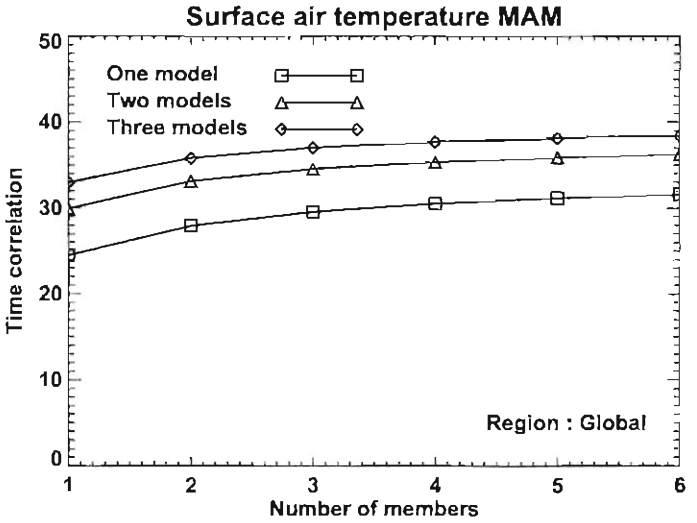


Fig. 1. Correlation between predicted and observed surface air temperatures averaged over March, April and May for the period 1969 – 1994, as a function of the number of ensemble members used for each model. The temporal correlations were averaged over the continental regions of the globe. The correlations are seen to increase both as the number of members increases and as the number of models (for a given total number of members) increases.

The Historical Forecast Project (HFP) of the CLIVAR Network assesses new versions of the RPN forecast (GEM) and CCCma climate (AGCM3) models in hindcast mode. Juan-Sebastian Fontecillia of RPN reported on the results of the HFP using the GEM model over the period 1969-94. Results were compared to the AGCM2 and SEF HFP results for the same period. Patterns of skill for temperature exceeded those for precipitation, as expected, and broadly resemble earlier skill levels. Nevertheless, clear evidence of improved skill is obtained (Figure 1) by combining the GEM results with the AGCM2 and SEF results in a multi-model ensemble. This offers hope that the anticipated 4-model ensemble will provide a further increment of skill.

A connected study by Normand Gagnon and Richard Verret of CMC looks toward potential improvement in seasonal precipitation forecasts over Canada which currently display little skill. The basis of the approach is that mid-tropospheric dynamical and thermodynamical parameters are predicted more skillfully than precipitation. Since there are physical/dynamical connections between precipitation and these quantities it is possible that model deficiencies in handling precipitation could be partially overcome by linking precipitation forecasts to them statistically. While initial results are disappointing, a number of possibilities for an improved approach remain and will be investigated.

Karine Dumas, an MSc student with Jacques Derome at McGill University, described her investigation of the 500mb height responses of the 4 models in the HFP to specified SSTs. Here the interest is the response to equatorial Pacific and North Atlantic SSTs. The models responded significantly only to the first mode of Pacific SST variation with AGCM3 exhibiting the best response compared to observations. The associated PNA pattern develops from December through January and amplifies through February in both model and observations. The response in the spring season is under investigation.

Xiaojing Jia, a PhD student at McGill University working with Jacques Derome, described an investigation into the predictive skill of the Arctic Oscillation (AO) in non-extreme phase of the southern oscillation (NEPSO) years. The study was performed with the simple general circulation model (SGCM) of Hall. Idealized thermal forcing patterns, based on precipitation regression with the AO, are imposed as forcing for the SGCM. They consist of a region of negative thermal forcing in the equatorial Pacific flanked by regions of positive forcing at more poleward latitudes in both hemispheres, with the entire forcing pattern confined within the tropical band. The results indicate that, in the SGCM context, the equatorial cooling pattern alone produces a negative PNA-like response, while the full pattern (or the dipole obtained by omitting the southern positive forcing) produces an AO-like response.

In a related investigation Hai Lin, McGill University, reported on investigations into the link between AO/NAO variability and SST forcing. An association is sought using regression and SVD analysis. Evidence is adduced to suggest that the trend in the AO/NAO may be linked to the Indian Ocean while interannual and lower frequency variability could be linked to the tropical Pacific. A numerical experiment with the GEM model used the

pattern of SST anomalies associated with SVD2 imposed either over the entire globe or in the tropical Pacific. The results suggest that the variability of the AO/NAO has a connection with tropical Pacific SST and that this may help to contribute to HFP forecast skill.

Thian Yew Gan of the University of Alberta reported on investigations into a range of sophisticated statistical approaches to analyzing and connecting SST and rainfall variability in the region of Eastern and Southern Africa. Rainfall is critical in these regions and predictive skill was obtained by the use of non-linear statistical prediction methods.

3. Climate variability

Understanding and modelling climate variability is a major interest in the CLIVAR Network and a range of investigations were reported based on observations and model simulations.

Canadians are particularly sensitive to winter temperature variations and extremes and Amir Shabbar, MSC, investigated trends in the frequency of cold and warm periods. The chance of experiencing cold or warm periods is connected to ENSO and AO variability and to the trends in these indices. There are weaker connections to the QBO and the state of the polar vortex. These kinds of connections may be useful in predicting the chance of extreme winter events.

Ramón de Elía, UQAM, reported on investigations of the internal variability generated in the Canadian Regional Climate Model (CRCM). Investigations suggest that the internally generated component is of sufficient size to be of interest for climate and also suggests that a probabilistic or distribution-oriented approach should be used. In other words, sampling variations are important at all scales when estimating climate statistics, including the small scales generated in RCMs.

4. The Decadal Variability

Ping-ping Rong, Dalhousie University, talked about the break-up of the Arctic winter stratospheric vortex which she interpreted as a competition between wave forcing from the troposphere and radiative damping. She noted the link between the decline in ozone and late spring break-up of the vortex during the 1990s.

John Fyfe, CCCma, discussed a problem with using EOFs to interpret variability in a mid-latitude jet. He argued that variability of the jet is better characterised by a particular jet profile with variable strength, position and width.

Adam Monahan, University of Victoria, pointed out an intriguing relationship between the mean and skewness of global surface winds which he linked to the nonlinear drag law.

Lionel Pandolfo, UBC, then used nonlinear versions of Principal Component Analysis to argue that during the last half century, the principal mode of variability has exhibited cyclic behaviour. The theme of nonlinear principal component analysis was further developed in the following talk by Beiwei Lu, an MSc student at UBC with Lionel Pandolfo.

Youyu Lu, BIO, then described on-going modelling of the North Atlantic Ocean that is being carried out jointly at the Bedford Institute of Oceanography and Dalhousie University.

Finally on Monday afternoon, Richard Greatbatch, Dalhousie University, discussed the trend in the circulation of the troposphere during the past 50 years and noted the importance of forcing from the tropical Indo-Pacific region for explaining the trend.

Tuesday morning began with two talks on modelling the subpolar gyre of the North Atlantic by Paul Myers of the University of Alberta and Duo Yang, an MSc student working with Paul Myers. Paul argued the case for using the Gent and McWilliams scheme (*J. Phys. Oceanogr.*, **20**, 150-155, 1990) with a variable coefficient, following Visbeck et al. (*J. Phys. Oceanogr.*, **27**, 381-402, 1997).

Jun Zhao, Dalhousie University, discussed an application of the semi-prognostic method for modelling the spreading of CFCs and associated deep water pathways in the North Atlantic Ocean.

Thomas Duhaut, a PhD student at McGill University working with David Straub, then presented some intriguing work pointing out that the velocity at the surface of the ocean should be taken into account when parameterising the surface wind stress since otherwise significant error can result in the power input by the wind to the ocean.

Howard Freeland, IOS, discussed an unusual event in the North Pacific in 2002 when Ocean Station Papa in the Gulf of Alaska appeared to have been within the California Current system.

5. The Century time scale

After the morning break on the second day, the talks were focused on Theme III of the Canadian CLIVAR project. Many innovative and highly collaborative new findings were presented from a diversity of groups across the country.

Greg Smith (McGill University), a PhD student working with François Saucier (IML) and David Straub, presented work on an annual model of estuarine circulation in the Gulf of St. Lawrence. He noted the existence of unusual cold water that arrived at the mouth of the St. Lawrence as a pulse in the spring of 2003. A model-based time series of vertical temperature structure in the St. Lawrence estuary was compared with field observations. The observations showed an even colder and earlier arriving (March versus May) pulse of cold water. The model was then run in a seven-year continuous hindcast mode showing the cold

pulse arrival was an annual phenomenon that was particularly enhanced in 1999. He argued that the variable surface wind forcing and sea ice cover were crucial in helping to explain the occurrence of this pulse.

Minwei Qian of UQAM began by motivating his talk with observations of August sea ice in Hudson Bay from 1956–2001. Prior to1975, most of the years were not ice free in August, in contrast to most of the years after 1975. This then motivated him to try and understand the sensitivity of Québec climate to the presence of sea ice in Hudson Bay using the CRCM (developed at UQAM), coupled to the MRO ocean model (developed at IML).

Jan Sedlácek, a PhD student at McGill University working with Lawrence Mysak, discussed simulations of sea ice and ocean variability in the Arctic during 1955-2002 using the UVic ESCM. The model showed less of a trend in the reduction of sea ice over the period studied. A thinning of 20-30 cm occurred over the entire Arctic region. The flux of sea ice through Fram Strait had peaks and temporal structure which agreed well with observations although the magnitude was larger in the model. This flux correlated well with the strength of the NAO post-1978, consistent with earlier work.

George Boer, CCCma, is working to understand the determinants of climate sensitivity and how it evolves with forcing and climate state. One way of doing this is by studying strongly forced climate change and this also has implications for questions of "runaway greenhouse" effects. He began by reviewing climate feedback theory and the concept of climate sensitivity. He then described experiments wherein the solar constant was increased by 2.5, 10, 15, 25, 35, and 45% of its control value. He demonstrated that the NCAR and CGCM2 models differed quite significantly in their transient response with the NCAR CSM being susceptible to a runaway greenhouse effect. He noted that the NCAR runaway feedback is a "runaway solar cloud warming" which points out the importance of understanding (and correctly parameterizing) cloud processes in the climate system.

Bin Yu, University of Victoria, focused his presentation on atmospheric angular momentum changes with global warming. He started out by comparing the relative angular momentum changes of the CMIP 2 models for a doubling of atmospheric CO_2. Fifteen of them showed an increase in angular momentum with doubling of CO_2. The biggest changes were in the relative momentum in the tropical and subtropical areas as well as around 60°S. In addition, most of the change occurred above the 200hPA level, except in the region of the midlatitude westerlies in the Southern Hemisphere, where changes extended to the surface. He argued for the importance of changes in stationary/transient eddies and their interaction with the meridional circulation as being important for explaining the angular momentum changes.

Virginie Lorant, CCCma, noted that there has been an increase in annual mean precipitation over land in midlatitudes over the last 50 years, and that there has been a large increase in the frequency of heavy precipitation events. She noted that models tend to rain too frequently with lower than observed intensity, and she highlighted this with an example from the Canadian regional climate model. Her summer simulations showed that prognostic closure favours less frequent but more intense convective events which increase the mean convective precipitation. It also favours an increase in the number of convectively dry days and a shift of the upper tail of the frequency distribution of the convective precipitation toward more intense heavy events. This result was independent of model dynamics and resolution.

Damon Matthews, a PhD student at UVic working with Andrew Weaver, discussed recent results from the UVic Earth System Climate model including a terrestrial and oceanic carbon cycle and dynamic vegetation. He presented results where he forced the model with 6 illustrative SRES scenarios. He noted that over the 21st century, there is no switch in the land going from a sink to a source of CO_2, although the land uptake diminishes with time. He noted that in his simulations, the negative feedback of CO_2 fertilization on vegetation growth exceeds the effect of the positive feedback of climate warming on soil respiration.

Nathan Gillett, UVic, began by reviewing continental scale detection research and forest fire records in Canada back to 1959. He noted that his overarching scientific question is: Is there any evidence of external climate forcings in forest fire data? He demonstrated that there is a significant upward trend in North American forest fires. He noted a positive correlation between summer temperature and forest fires, but cautioned that one could not unambiguously claim an attributable signal to greenhouse gases. He then went on to show that there is a significant anti-correlation between the volcanic aerosol index and the occurrence in Canadian forest fires. In particular, those years which had large areas burnt all corresponded to a low volcanic aerosol index.

Terry Lee, a UVic PhD student working with Francis Zwiers, provided an update on his research into a Bayesian approach to climate change detection and attribution. He noted that this approach required the estimation of the uncertainty in the scaling parameter β before conducting optimal regression. He argued that using the Bayesian method, with a very strong attribution constraint, there was a very strong detectable warming signal but little evidence to support attribution. Assuming no bias in the estimate of β, he predicted that there would be very strong evidence to support the attribution claim by 2020.

Xuebin Zhang, CRB, MSC described collaborative work with Francis Zwiers (CCCma) and Gabby Hegerl (Duke). He began by providing motivation for his research in terms of the monitoring and detection of changes in extreme

values. He then described the simple approach used to develop climate extreme indices and noted potential problems associated with artificial jumps in these indices at the beginning and end of the base period. He argued that such typical indices would be unsuitable for the monitoring and detection of climate change. To avoid such problems he suggested a solution in which consistency is deemed to be more important than accuracy. In this new bootstrap resampling method, individual years were left off the 30 year base period.

The final talk of the afternoon was by Slava Kharin, CCCma. His research was focused on estimating extremes in transient climate change simulations. He began by defining an extreme event associated with a stationary process, the T-year return value and the Generalised Extreme Value (GEV) Distribution. Changes in the GEV parameters in future climate simulations using CGCM2 were then discussed. He noted that over this century, the 50-year return precipitation event eventually became a 20-year return event, with changes occurring almost everywhere, even in places (such as Africa) where the mean precipitation goes down.

6. Concluding remarks

The next main workshop of the Canadian CLIVAR Research Network is scheduled to take place on February 21-22, 2005, in Montréal. Preference for presentations will be given to the Network members, but guest participation will be possible within the limits of the available space and time. For further information please see the Network website in due course, or contact the Network Manager, Lisa LeBlanc, at lisa.leblanc@mcgill.ca.

Acknowledgements: Our sincere thanks to Lisa LeBlanc who skillfully looked after the many details behind the physical arrangements of the workshop, and who assisted with the editing of this article.

ACRONYMS TABLE

AGCM	Atmospheric General Circulation Model
AO	Arctic Oscillation
BIO	Bedford Institute of Oceanography
CCA	Canonical Correlation Analysis
CCCma	Canadian Centre for Climate Modelling and Analysis
CMIP	Coupled Model Intercomparison Project
CRB	Climate Research Branch
CRCM	Canadian Regional Climate Model
CSM	Climate System Model
ENSO	El Niño Southern Oscillation
EOF	Empirical Orthogonal Function
ESCM	Earth System Climate Model
GCM	General Circulation Model
GEM	Global Environmental Model
IML	Institut Maurice Lamontagne
MRO	Modèle Régional d'Océan
MSC	Meteorological Service of Canada
NAO	North Atlantic Oscillation
NCAR	National Center for Atmospheric Research
NCEP	National Centers for Environmental Prediction
NEPSO	Non-Extreme Phase of the Southern Oscillation
NOAA	National Oceanic and Atmospheric Administration
PNA	Pacific North American
QBO	Quasi-Biennial Oscillation
RCM	Regional Climate Model
RPN	Recherche en prévision numérique
SEF	Spectral Éléments Finis
SGCM	Simple General Circulation Model
SVD	Singular Value Decomposition
UBC	University of British Columbia
UQAM	Université du Québec à Montréal
UVic	University of Victoria

LONG-RANGE CLIMATE and IMPACTS FORECASTING WORKING GROUP MEETING V

by Ron Hopkinson[3] and Louis Lefaivre[4]

A workshop on long-range weather forecasting was held in Guelph at the Ramada Hotel and Conference Centre, March 15-17, 2004. Approximately 50 persons attended including scientists involved in development of seasonal weather prediction, representatives of water management and agricultural agencies and a number of farmers/producers. This was the fifth such meeting organized by the ad-hoc working group on long-range weather forecasting and the second one that involved producers. Agriculture and Agri-Food Canada has taken the lead in organizing this and the previous workshop in Regina in 2001.

The workshop proper was preceded by a presentation on field measurement of greenhouse gas and by a tour of the Land Resource Science Agrometeorology Laboratory at the University of Guelph. A reception was held at the University faculty club on the evening of March 16.

About half the presentations addressed the science of seasonal climate prediction. An overview of Environment Canada's seasonal forecast products set the stage for the workshop. Canada's operational seasonal forecast for season 1 is produced by the Canadian Meteorological Centre (CMC) and is entirely based on model output, making use of an ensemble of runs by two models. Seasonal forecasts for seasons 2 to 4 are produced using a statistical approach. One presenter demonstrated that an ensemble composed of different models gives better seasonal predictions than an ensemble of a greater number of members using the same model. Also, it was reported that more resources will be devoted to the development and production of the seasonal forecast. Other work at CMC which explored the use of upper air model predictors to improve the seasonal precipitation forecast had disappointing results. Finally, a statistical approach was used to demonstrate that summer precipitation extremes (droughts and floods) and winter temperature extremes (warm and cold spells) could be attributed to low frequency oceanic anomalies such as ENSO, PDO, etc.

Two presentations were more diagnostic in nature. One showed the importance of including the non-linear projection of tropical Pacific sea-surface temperature anomalies to explain winter temperature and precipitation patterns over North America. An analysis of the Canadian drought of 2001-2002 showed that it lacked the usual meridional pattern associated with other dry periods. Also, this drought was unusual in its geographic extent.

Most of the other presentations focused on the use of climate and seasonal predictions in various agricultural and water management applications including drought monitoring. Currently, very little use of seasonal predictions is made in Ontario for either water management or agriculture decision-making. Also presented was a description of AAFC/Environment Canada initiatives under a new letter of understanding. As part of the MSC transition, a new National Services Unit on agriculture will be established in Regina and collocated with the AAFC's National Agroclimate Information Service

The workshop identified the need for a text message to accompany the seasonal forecast to express the confidence in the prediction. Also, a more frequent update of the seasonal predictions was advocated. There is a lot of potential in the use of seasonal forecasting but producers saw a need for significantly improved predictions before there would be decisions made using the seasonal forecast. The workshop highlighted the need for climate monitoring for day-to-day decisions. There was a general plea for better communication between the scientists and producers.

[3] Custom Climate Services, Regina, SK

[4] Numerical Weather Prediction, Meteorological Service of Canada, Dorval, QC

CINQUIÈME RÉUNION du GROUPE DE TRAVAIL SUR LES PRÉVISIONS À LONG TERME et LEURS IMPACTS

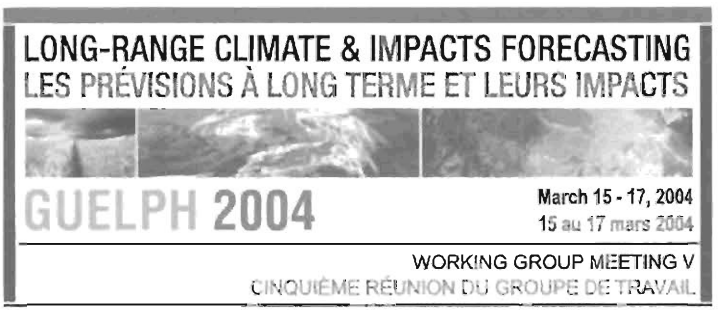
par Ron Hopkinson[4] et Louis Lefaivre[5]

Un atelier sur les prévisions à long terme et leurs impacts a été tenu à l'hôtel Ramada de Guelph du 15 au 17 mars 2004. Une cinquantaine de personnes y ont assisté, incluant des scientifiques impliqués dans le développement des prévisions saisonnières, des représentants d'agences agricoles et de gestion de l'eau, de même que plusieurs fermiers et producteurs agricoles. Il s'agissait de la cinquième réunion de ce genre, organisée par un groupe de travail ad hoc sur les prévisions météorologiques à longue échéance, et la seconde qui impliquait des producteurs. Agriculture et agroalimentaire Canada (AAC) a pris en charge l'organisation de cette réunion ainsi que de la précédente, tenue à Régina en 2001.

L'atelier comme tel a été précédé d'une présentation sur les mesures de terrain des gaz à effet de serre et par une visite du laboratoire scientifique de ressources de sol de l'université de Guelph. Une réception a été donnée au club des professeurs de l'université le soir du 16 mars.

À peu près la moitié des présentations se sont intéressées à la prévision saisonnière. Un survol des produits de prévisions saisonnières d'Environnement Canada (EC) a démarré l'atelier. Les prévisions saisonnières canadiennes pour la saison 1 sont produites par le Centre météorologique canadien (CMC) et sont entièrement basées sur les sorties de modèle, utilisant un ensemble de sorties provenant de deux modèles. Les prévisions saisonnières pour les saisons 2 à 4 sont produites à l'aide d'une approche statistique. Un présentateur a démontré qu'un ensemble composé de différents modèles donne de meilleures prévisions saisonnières qu'un ensemble composé d'un plus grand nombre de membres, mais provenant d'un seul modèle. On a aussi mentionné que plus de ressources seront attribuées dans le développement et la production des prévisions saisonnières. Une autre étude au CMC, qui a examiné l'utilisation de sorties de modèle en altitude comme prédicteurs pour les prévisions saisonnières de précipitations, a montré des résultats décevants. Finalement, une approche statistique a été utilisée pour démontrer que les précipitations extrêmes en été (sécheresses et inondations) et les températures extrêmes en hiver (périodes de chaleur et de froid) pouvaient être attribuées à la variabilité lente des anomalies océaniques telles que ENSO, PDO, etc.

Deux présentations avaient une saveur plutôt diagnostique. Une a montré l'importance d'inclure la projection non-linéaire des anomalies de températures de surface de la mer du pacifique tropical pour expliquer les patrons hivernaux de températures et de précipitations sur l'Amérique du Nord. Une analyse de la sécheresse canadienne de 2001 et 2002 a montré qu'elle manquait le patron méridional habituel généralement associé aux autres périodes de sécheresse. Cette sécheresse était aussi inhabituelle quant à son extension géographique.



La plupart des autres présentations se sont concentrées sur l'utilisation des prévisions climatiques et saisonnières dans diverses applications agricoles et de gestion de l'eau, incluant la surveillance de la sécheresse. Présentement, l'information sur les prévisions saisonnières est peu utilisée en Ontario dans le processus de prise de décision, tant pour la gestion de l'eau que pour l'agriculture. Une description des initiatives entre AAC et EC sous le nouveau protocole d'entente a aussi été présentée à la conférence. À l'intérieur de la transition du Service météorologique du Canada, une nouvelle unité nationale de services en agriculture sera installée à Régina et co-localisée avec le Service agroclimatique national d'AAC.

L'atelier a identifié le besoin d'un message écrit qui accompagnerait les prévisions saisonnières pour exprimer la confiance en la prévision. De plus, des mises à jour plus fréquentes ont aussi été poussées. Il y a beaucoup de potentiel dans l'utilisation des prévisions saisonnières mais les producteurs voient un besoin d'améliorer significativement ces prévisions avant qu'il y ait des décisions prises en utilisant ces prévisions. L'atelier a mis en lumière le besoin de surveillance climatologique pour les décisions quotidiennes. Il y a finalement eu une demande générale pour de meilleures communications entre les scientifiques et les producteurs.

[4] Custom Climate Services, Regina, SK

[5] Prévision numérique du temps, Service canadien de météorologie, Dorval, QC

Report on the Global Ocean Ecosystem Dynamics (GLOBEC) Project
An Update

by Ian Perry[5]

The Global Ocean Ecosystem Dynamics (GLOBEC) Program is a collaborative project between SCOR, the International Geosphere – Biosphere Program (IGBP) and the Intergovernmental Oceanographic Commission (IOC). GLOBEC programs began in the United States in the early 1990s, and the program as a whole was adopted by IGBP, SCOR and IOC as a Core Project in 1996. Its goal is *"To advance our understanding of the* ***structure and functioning of the global ocean ecosystem****, its major subsystems, and its response to* ***physical forcing*** *so that a capability can be developed to forecast the responses of the marine ecosystem to global change".* The specific objectives of GLOBEC are:

- To better understand how multiscale physical-environmental processes force large-scale changes in marine ecosystems;
- To determine the relationship between structure and dynamics in a variety of oceanic systems which typify significant components of the global ocean ecosystem;
- To determine the impacts of global change on stock dynamics using coupled physical, chemical and biological models linked to appropriate observation systems;
- To determine how changing marine ecosystems will affect the global earth system by identifying and quantifying feedback mechanisms.

To date, there have been over thirty National GLOBEC programs, four Regional GLOBEC programs (with two more expected to be approved shortly), plus other affiliated projects. In addition, there are four Working Groups under the direct supervision of the International Scientific Steering Committee, on:

- Retrospective and Time Series Studies;
- Process Studies;
- Modelling; and
- the Human Dimensions of Marine Ecosystem Changes – see Figure 1 for the organisational structure.

The general web site is www.globec.org. The anticipated conclusion of this international coordination by IGBP/SCOR/IOC is expected to be in 2009. An excellent thirty-page brochure has been published on the international GLOBEC program, and is available as a pdf file from

http://www.igbp.kva.se//uploads/IGBP_5_GLOBEC.pdf

Canada had a national GLOBEC program from 1996 to 1999, co-chaired by Dr. Brad deYoung (Memorial University, St. John's) and Dr. Dave Mackas (DFO, Institute of Ocean Sciences, Sidney) [web site http://www.globec-canada.mun.ca/globec/] and funded by NSERC and DFO. The Canadian program sought to understand how living marine resources are affected by variability of the physical environment, and included over fifty scientists on both East and West coasts of Canada in seven university and five government laboratories. Project results have been published in a number of journal articles, including several special collections (e.g. see *Canadian Journal of Fisheries and Aquatic Sciences* 56(12), 1999, and 58(4), 2001). A second proposal was submitted to NSERC and DFO in 1999, but was unsuccessful. Since then, Canadian GLOBEC projects have largely been completed, although some synthesis work continues. On-going field studies are being carried out under other project titles.

While Canada no longer has an active formal GLOBEC program, Canadians continue to play major roles in the IGBP/SCOR/IOC GLOBEC activities. Two Canadians are members of the Scientific Steering Committee for this international program: Dr. Ian Perry (DFO, Pacific Biological Station, Nanaimo, BC) and Dr. Rosemary Ommer (a social scientist at the University of Victoria). They also co-chair the Focus 4 Working Group of GLOBEC on the Human Dimensions of Marine Ecosystem Changes. Dr. Brad deYoung co-Chairs the Modelling Working Group. Canadian members of GLOBEC working groups include Dr. Dave Mackas (Process Studies) and Dr. Barb Neis (Memorial University, who is a member of GLOBEC's Focus 4 on the human dimensions). Canadians have been instrumental in developing this novel Working Group in GLOBEC on the human aspects of marine ecosystem changes, which includes the active participation of social scientists.

[5] Fisheries & Oceans Canada, Pacific Biological Station, Nanaimo, BC.

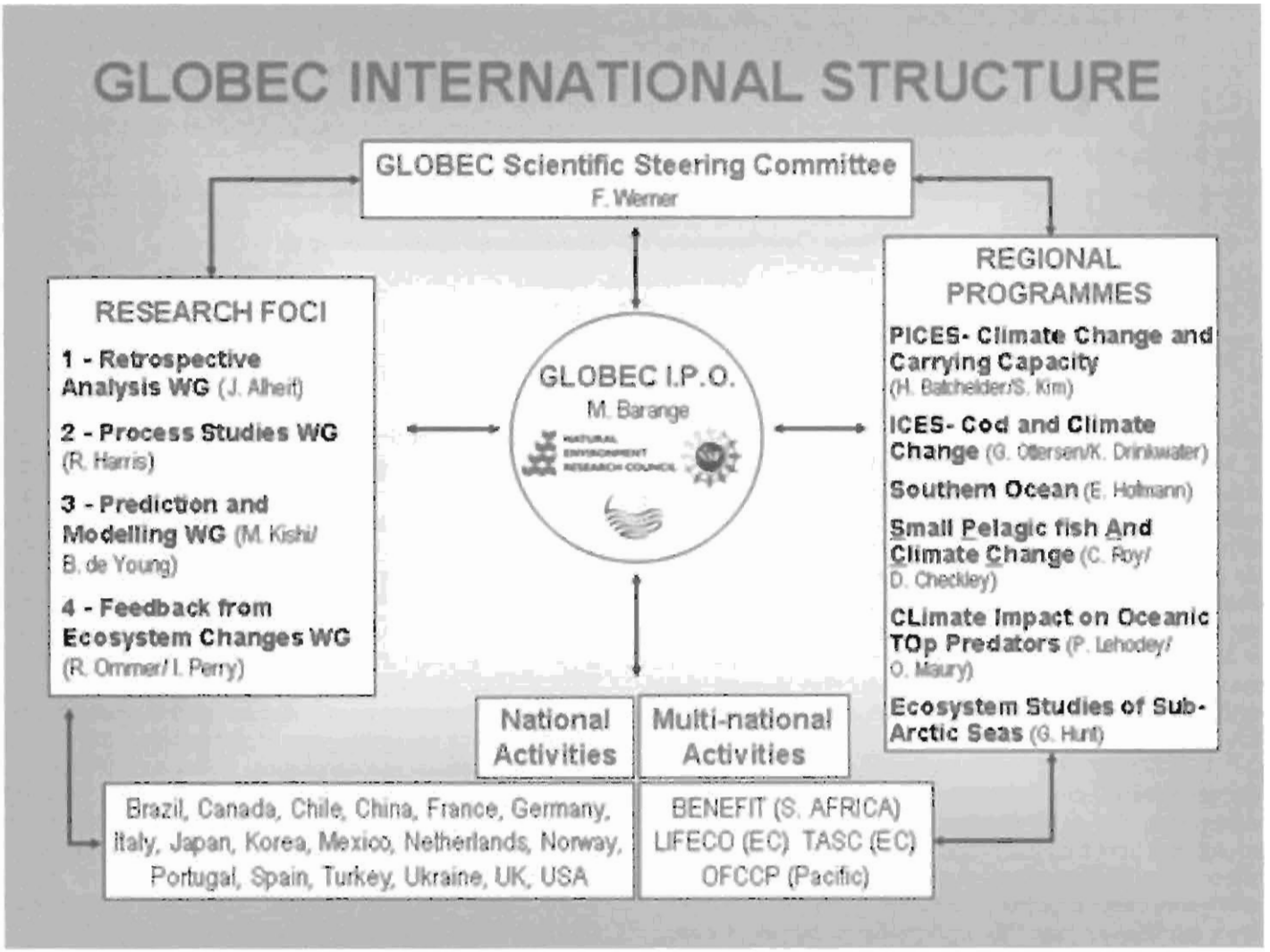


Figure 1: GLOBEC encompasses an integrated suite of research activities consisting of Regional Programmes, National Activities and cross-cutting research foci activities. The GLOBEC programme has been developed by the Scientific Steering Committee (SSC) and is co-ordinated through the GLOBEC International Project Office (IPO).

In addition to the GLOBEC Regional programs in the North Pacific (the Climate Change and Carrying Capacity program of PICES), in the North Atlantic (the Cod and Climate Change program of ICES), the Small Pelagics and Climate Change program in upwelling areas, and the Southern Ocean GLOBEC Program, two new Regional Programs are in development. These are a program on large pelagic fishes in tropical and sub-tropical waters called CLIOTOP (Climate Impacts on Oceanic Top Predators), and a program on sub-Arctic seas called ESSAS (Ecosystem Studies of Sub-Arctic Seas). GLOBEC is also beginning to plan for the synthesis of its activities, in expectation of the program concluding in 2009. Such a global synthesis will be the opportunity to compare the results of GLOBEC National and Regional programs, and the activities of the various Working Groups, to provide the "global-added value" that any single National or Regional program cannot accomplish on its own. This Synthesis Phase will summarise the responses of marine ecosystems to global changes, identify new and outstanding research questions, and will leave a legacy of data and capacity building in global collaborative marine ecosystem research. A busy schedule of symposia and workshops is being planned for the next five years to involve the international community in this synthesis and to contrast and compare the impacts of global changes on different ocean systems.

These include:

- ICES/GLOBEC symposium on The influence of Climate change on North Atlantic fish stocks, Bergen, Norway, May 2004;
- GLOBEC/PICES/ICES symposium on Climate variability and sub-arctic marine ecosystems, Victoria, Canada, May 2005;
- PICES/GLOBEC symposium on Climate Change and Ecosystem impacts in the North Pacific, Honolulu, USA, April 2006; and

- PICES/ICES/GLOBEC 4th Zooplankton Production Symposium, Hiroshima, Japan, June 2007.

Information on all of these symposia and others that are being developed is available on the GLOBEC website.

Despite not having an active GLOBEC program at present, Canada can and does play an important role in the international activities of GLOBEC. Canadians can continue to play important roles by participating in these symposia and other synthesis activities of GLOBEC.

First World Conference on Broadcast Meteorology
Barcelona, Spain
June 3-5, 2004

by Claire Martin

Introduction

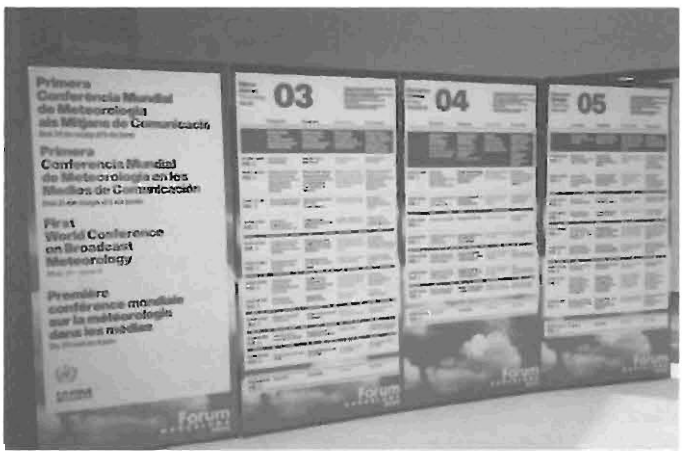
In November 1994 the International Association of Broadcast Meteorologists (IABM) was formed when 25 broadcast meteorologists came together to discuss the rapidly evolving industry of "TV weather" and its growing role with the World Meteorological Organization (WMO). Since then, the IABM has grown to have wider vision of not only being a voice for the industry in international debates, but also providing a framework within which it is possible to create, mould and improve the profession around the world, by sharing and distributing broadcast meteorological skills and information.

Ten years later, and with nearly ten times the original membership, the IABM was therefore immensely proud to develop and host the First World Conference on Broadcast Meteorology in Barcelona, Spain June 3-5, 2004. 210 participants came together, representing over 30 countries with a cumulative potential world-wide audience of over 400 million. It was a truly auspicious occasion. The conference itself was held under the umbrella of "Forum Barcelona 2004" - a 5-month international gathering of scientists, politicians, groups and individuals brought together based on a set of principles and values that revolved around three core themes: "cultural diversity, sustainable development and conditions for peace". This was no small event.

Note from the Editor

Claire Martin is a well-known weather broadcaster for Global TV in Edmonton. This year she is the recipient of a CMOS Citation as for years she has shown outstanding skills in bringing day-to-day weather and its impacts to people in a clear, simple and entertaining manner. In addition, she has been chosen "Broadcaster of the year" by the IABM for the previous two years and this year, at the meeting in Spain, she was elected a Vice-Chair of the IABM.

The World Meteorological Organization (WMO) also decided to use this opportunity to hold a 3-day workshop in conjunction with the IABM's conference. Prior to the start of the actual conference, those attending from lesser developed countries were given the opportunity to receive concentrated training on basic broadcast skills. Both the WMO and the IABM would like to see a concerted effort over the next few years in broadcast skills training for on-air weather presenters (whether they come from a scientific background or not). The Portuguese attendees were especially pleased to hear about the workshop. Apparently in recent years the Portuguese Meteorological Service has taken all National Meteorological Service meteorologists off air, and TV stations have promptly replaced them with "weather-presenters" who lack not only an understanding of the subject, but also lack basic presentation skills. It is precisely this sort of deterioration in quality of the dissemination of meteorological information that the IABM and the WMO would like to curtail.



The Conference

The conference itself was structured almost like a TV weather forecast - starting small scale and growing, in vision, with time. Day one revolved around the role of the forecaster in now-casting and short term forecasting. Day two took a closer look at disaster preparedness and the importance of maintaining a single official voice in the dissemination of public warnings. Finally Day three (which

happened to fall on World Environment Day - June 5) focussed on the broader aspect of global climate change. The format of the conference was structured in a truly unique fashion. Each day of the conference being split in two: the mornings were dedicated to formal presentations while the afternoons were left to round table "open dialogue and discussions". Note: the complete abstracts of the morning speakers are now available on line at http://www.iabm.org/ - the following is merely a summary of the more pertinent points of each presentation and a brief overview of the rather lively afternoon discussions.

Day One - June 3rd

After welcoming comments and introductions from the IABM board, the speakers began.

1. Mr. John McLaughlin, KCCI, Des Moines - *Nowcasting and the Use of Weather Radar.*
Mr. McLaughlin, the current chair of the American Meteorological Society's Broadcast Board, and an expert in recognising storm characterisitics from radar signatures, detailed the technical capabilities of modern weather radar, and gave some diagnoses of recent severe storms in the central US.

2. Mr. Luis F Lopez-Cotin, Met Service of Spain - *Satellite Application Projects of Meteosat.*
Mr. Lopez-Cotin talked about the difficulties and rewards of forecasting using satellite observations.

3. Dr. Jean Quiby, Meteo Swiss and EUMETNET - *Progress in Limited Area Modelling.*
Dr. Quiby's talk revolved around trends in mesoscale models, and the improvement in model predictions when radar data was added to the initialisation of some European numerical models. She also made some controversial comments about future computer performances: she contends that in 10 years' time, computers will be 50 times faster than today and that grids of 1-2 km resolution will be in place covering all of Europe.

4. Mr. François Lalaurette, ECMWF - *Progress in Medium Range Modelling.*
Mr. Lalaurette gave a fascinating talk that primarily looked at the handling of the forecast of the European Summer 2003 heat wave. In France some 15,000 deaths were directly attributed to the heat wave. The talk therefore revolved around the accuracy of medium range forecasts of the event and the margins of error that were generally ignored in the original deterministic forecasts for the time period in question.

5. Dr. Steven Tracton and Mr. Bob Ryan, NOAA - Ensemble Systems and Forecasting, and the communication of uncertainty.
This "co-presentation" looked at the varying degrees of uncertainty in a forecast and the contention that passing along this information to a user may either add value or possibly even de-value the forecast, depending on how the actual information is being used. The question was posed "When the ensemble forecast shows a 50% chance of a single event going astray, do you incorporate this information into your forecast/broadcast?"

6. Dr. Manfred Kurz, German Met Service (RETD) - *The Role of the Forecaster.*
Dr. Kurz reiterated the need for some basic forecasting experience when delivering a weather broadcast.

Round-table Day One

Following the morning's presentations, a heated discussion broke out in the afternoon regarding PoPs (Probability of Precipitation) and their dissemination. It was decided that terminology was very important, and that the use of 50% PoP was virtually useless. Most participants stated that they had greatest success in using PoPs when the event was small scale, localised, and usually in conjunction with isolated thunderstorms.

Ensemble forecast theorems were also discussed and it was agreed that significant "noise" would be incorporated into newer, higher resolution models if surface weather observations were not increased in the initialisation of the models.

Finally it was noted that there were three differing levels of questions being posed by the participants - a) those from the scientists, b) those from the National Meteorological Service personnel, and c) those from the broadcasters or weather presenters. It was noted however that each type of participant was understanding more about the other roles as the afternoon progressed.

Day two - June 4th

1. Dr. Gerhard Berz, Munich - *The Perspective of the Re-Insurance Industry.*
Dr. Berz looked at weather related and world natural disasters from a financial standpoint. He spent some time covering changing economic risk patterns associated with alterations in global weather patterns. The re-insurance industry basically underwrites the risks taken on by insurance firms, and thus needs to have "good" information about the likely level of risk from severe weather in the coming years.

2. Mr. Reid Basher, UN - *International Secretariat for Disaster Reduction.*
Mr. Basher spoke on disaster risk reduction and the impacts of early warning systems. He took the focus of the debate beyond the hazard itself and into the realm of forecasting risk reduction by discussing the need for public education. Disasters, he contended, could be mitigated when risk is clearly understood, and when there are methods in place to deal or respond to that risk. Mr. Basher also touched on the political ramifications of requiring strong governmental support and community engagement during times of natural disaster.

3. Mr. Kevin O'Loughlin, Bushfire Co-operative Research Centre, Australia - *Droughts and Fires.*

Bushfires in Australia over the past few years have caused an immense amount of damage. Canberra, the capital, was threatened with destruction last year from runaway firestorms. Mr. O'Loughlin is currently heading up a new organisation tasked with collating information on the fires, and spoke at length on the sheer scale of the problem.

4. Dr. Jose Rubiera, Cuban Meteorological Service - *Tropical Cyclones and the Media.*
Dr. Rubiera is not only the Head of the weather forecast office in Havana, Cuba but is also a familiar face on Cuban TV where he regularly presents the nightly weather forecasts. Dr Rubiera's talk revolved around his long experience with tropical storms in the Caribbean, and how his role as a broadcaster is key in ensuring the public are properly prepared and protected from the threat of hurricanes.

Congratulations on the success of the First World Conference on Broadcast Meteorology - Gerald Fleming (left) - outgoing Chairman of the IABM, and Claire Martin (right) the new Vice-Chair.

5. Mr. Harry Otten, Meteo Consult, The Netherlands - *The Role of the Private Sector in Weather Warnings.*
Mr. Otten outlined his view that not all countries in Europe needed a National Weather Service. He discussed the role that he believes the private sector has to play in communicating weather information to the public (thus removing the work from public sector forecasters). Mr. Otten believes that competition in a weather market improves the overall quality of the products being issued, and hence the substantially growing private meteorological sector in Europe is an asset to the field rather than a detriment.

6. Dr. John Zillman, Immediate Past President of the WMO - *The Role of the Public Sector in Weather Warnings.*
Dr. Zillman countered Mr. Otten's argument with an extensive discussion on the non-rival and non-exclusivity aspects of having a public weather service provide public weather warnings. His key argument revolved around the questionable viewpoint that a private sector meteorological organisation may not have the mission of "saving lives, reducing the impact of natural disasters, national security and the quality of life and environment".

Round-table Day Two
Needless to say the second day's round table revolved around the various roles of a private versus public weather sector organizations. Several arguments arose in regard to the issuance of weather warnings. The WMO contends that these should always be issued under "one voice" - the public or national weather service of the country in question. The U.S. participants wanted it noted that many weather warnings are successfully issued in America with strong and frequent collaboration between the private sector (TV stations) and the national weather service.

The question of over-staffing and meteorological service over-representation within Europe arose frequently. Mr. Otten made it clear he would like to see European meteorological services centralize, with the potential loss of almost 20,000 surface weather observers and forecaster staff.

Day three - June 5th
1. Dr. John Kermond, NOAA - *Temperature rise (El Niño).*
Dr. Kermond's talk focussed primarily on the El Niño phenomenon in the Pacific and how improved understanding of it has led to some success in seasonal weather forecasting. Dr. Kermond is also involved in reaching out to teachers by offering them a chance to help maintain the weather buoy array in the Pacific as a guest aboard NOAA science ships. (See: NOAA Office of Global Programs "Teachers in the Field").

2. Dr. Geoff Jenkins, Hadley Centre, U.K.M.O. - *Climate Change -Message from Observations and Models.*
This presentation recapped the basic greenhouse effect in relation to model behaviour. Recent climate change was also discussed in relation to the argument of human activity versus natural variability. The movie "The Day After

Tomorrow" was also discussed. Dr. Jenkins stated that it is, in part, the role of the broadcaster to help offset this kind of "movie truth" with clear and accurate science.

3. Prof. Martin Beniston, Univ. of Fribourg, Switzerland - *Changes in Alpine Climatology.*
The Swiss have noticed dramatic change in recent years in their Alpine areas - not only with increasing average annual temperatures, but also with an increase in heavy precipitation events. Many European models show this trend will continue - which could be devastating to parts of central Europe.

4. Dr. Eva Oriol-Pibernat, ESA - *Our Changing Climate: What is happening and what can we do about it?*
This presentation outlined the contribution of present and future ESA missions, with the emphasis being on observations from space.

5. Lord Julian Hunt, Univ. of London - *The Global Approach to the Climate Change Problem.*
Lord Hunt took the morning discussions one step further by examining the messages coming from the global climate models and moved into the realm of how forecasters may refine their understanding of climate change as we head further into the period of warming.

6. Dr. R. K. Pachauri, IPCC - *The IPCC and how it works.*
Dr. Pachauri is the Chairman of the Intergovernmental Panel on Climate Change, and discussed the latest work by the Panel.

Round-table Day Three
The final day's round table was kicked off with the following open question: "what did the participants feel was the most glaring mistake made, in terms of how the science had been related to global climate change, both by broadcasters and scientists?" The immediate response (from the presenters) was especially lively in regard to recent box-office movies: it was widely believed that science fiction, based on a modicum of science fact, is hampering the world-wide general understanding of the subject of climate change, and its true ramifications. It was noted that it is also incredibly difficult (both for broadcasters and scientists) to linearly link an extreme event to global warming, and that hindsight really was very often 20/20.

The scientists in the audience wanted to know whether satellite measured data sets were as reliable as surface weather observations. Stratospheric cooling, however, was not deemed to be sufficient to corrupt these data sets.

The problem of data access was discussed - everyone agreed that the transfer and access of raw data should remain globally unimpeded. The broadcasters also stated that WMO – and IPCC – published literature is often wordy, cumbersome and hence poorly circulated. This was cited as a huge problem when the information needs to be transmitted and disseminated through television. The audience was broadly asked "how successful are broadcasters in getting the message out in regard to climate change?" It was resoundingly recognised that viewers are "not adequately concerned" about global warming.

Sr. Salvador Mila, Counsellor of the Environment for Catalonia, then closed the conference with words of thanks and praise to all for making this event such a success.

Conclusion
This was a truly remarkable and unique event. I hope I've managed to capture some of the finer points of the day's discussions. For a more complete synopsis check out the home page of the International Association of Broadcast Meteorologists at http://www.iabm.org

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39th CMOS Annual Congress

Vancouver, British Columbia, Canada
May 31 - June 3, 2005
Theme: Sea to Sky

If you have any ideas for a special session, please contact Rich Pawlowicz at rich@eos.ubc.ca

39e Congrès annuel de la SCMO

Vancouver, Colombie Britannique, Canada
du 31 mai au 3 juin 2005
Thème: Entre ciel et mer

Si vous avez des idées pour une session particulière, prière de contacter Rich Pawlowicz à rich@eos.ubc.ca

SHORT NEWS / NOUVELLES BRÈVES

Ocean Turbulence Measurements in Hawaii

British Columbia, Canada – Victoria-based Rockland Oceanographic Services Inc. was selected to plan and conduct measurements of ocean turbulence and internal wave patterns in Hawaii. The measurements are to be carried out in the vicinity of the Honolulu municipal waste water outfall in Mamala Bay.

According to a company spokesperson, "the measurements are unique and require highly specialized equipment for the detection of ocean turbulence. This is the first time that turbulence profilers are used to study the dynamics of a waste water outfall." The measurement campaign is part of the multi-year international research project, RASP, funded by the U.S. Navy. The RASP project involves teams from the United States, Canada, Russia and Germany. Rockland Oceanographic supplies equipment and expertise for the collection and processing of turbulence data, which are needed to study the nature of anomalies in the sea-surface wave pattern observed by satellites over the outfall area.

Two *MSS* vertical microstructure profilers were procured for the project from ISW Wassermesstechnik, Germany. In addition, the towed ocean turbulence instrument, *TOMI*, will be leased from the University of Victoria, Canada. The experimental work will be carried out in close collaboration with ISW Wassermesstechnik and RGL Consulting, Victoria, Canada. The data collection in Hawaii will take place this summer between August 10 to September 5, while the data processing and analysis portion of the work will extend well into 2005.

Usage of RADARSAT-1 Data for Increased Accuracy in Hurricane Forecasting

Richmond, B.C., Canada – The newly certified RADARSAT-1 network station – the University of Miami's Center for Southeastern Tropical Advanced Remote Sensing (CSTARS) – is using RADARSAT-1 data to locate, track and predict the intensity of tropical storms (hurricanes) as they develop over the entire Caribbean Sea, Gulf of Mexico and western tropical Atlantic Ocean.

Using the ocean surface wind speed and direction information extracted from the RADARSAT-1 data, the scientists at CSTARS are dramatically improving the accuracy of weather analysis and tropical storm forecasting.

Equipped with advanced RADARSAT-1 data reception and near-real-time processing capabilities, the station provides scientists with data within thirty minutes of reception – a capability that is crucial for hurricane forecasting work.

"The RADARSAT-1 images provide unprecedented information on the variability of winds and waves in the vicinity of the hurricane's eye, thus improving hurricane predictions. This is critical to weather forecasters who seek more detailed information on the movement and intensity of storms," said Hans Graber, co-director of the CSTARS facility in Miami.

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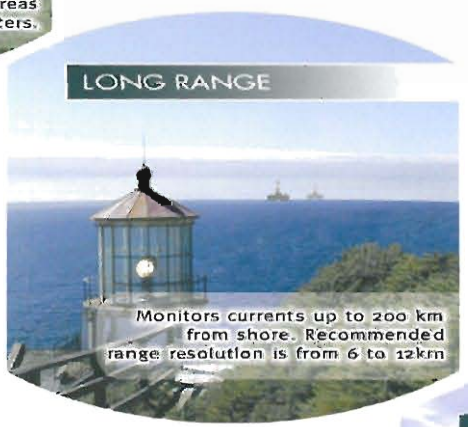

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