



CMOS BULLETIN

Canadian Meteorological
and Oceanographic Society

La Société canadienne
de météorologie et
d'océanographie

SCMO

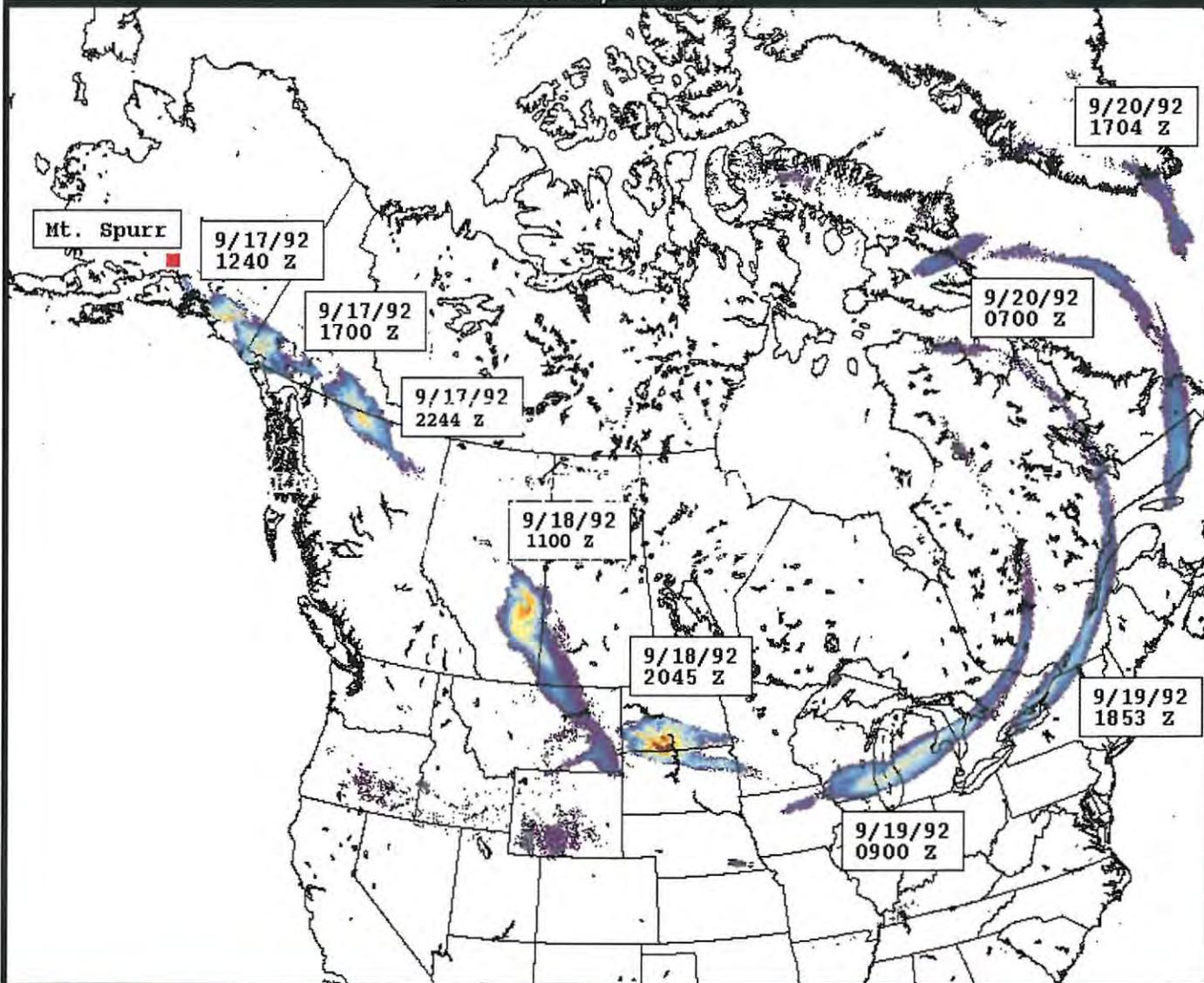
August / août 1999

Vol. 27 No. 4

VOLCANIC ASH MOVEMENT

DÉPLACEMENT DU NUAGE DE CENDRES VOLCANIQUES

Mt. SPURR, ALASKA



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AVHRR

IR 4 - IR 5

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CMOS Bulletin SCMO

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

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Cover page: A composite of images from NOAA polar orbiting satellites (Infrared band 4 minus infrared band 5 in degrees Celsius; time and dates in Universal Coordinate Time) showing the displacement of volcanic ash from a cloud originating from a 3.5-hour explosive eruption of Mount Spurr, Alaska on 17 September 1992. The ash cloud traveled thousands of kilometres to the coast of Greenland over a 3-day period. Airborne volcanic ash is a major threat to aviation safety and has nearly resulted in the crash of a jumbo jet on a few occasions. For more details, please read the article on page 106 (Image courtesy of Bill Rose, Michigan Technological University and Dave Schneider, Alaska Volcano Observatory, United States Geological Survey).

Page couverture: Une image composée de plusieurs images obtenues à partir des satellites circumpolaires NOAA (canal infrarouge 4 moins canal infrarouge 5 en degrés Celsius; les dates et heures étant en Temps Universel Coordonné). On y voit le déplacement d'une nuage de cendres volcaniques suite à une éruption de 3.5 heures du Mont Spurr, Alaska le 17 septembre 1992. Le nuage de cendres s'est déplacé sur des milliers de kilomètres en trois jours avant d'atteindre le Groenland. La cendre volcanique est un danger important pour la sécurité aérienne et a failli causer l'écrasement d'un avion gros-porteur à quelques occasions. Pour plus d'information, veuillez lire l'article débutant à la page 106. (L'image de la page couverture est une gracieuseté de Bill Rose, Michigan Technological University et de Dave Schneider, Alaska Volcano Observatory, Unites States Geological Survey).

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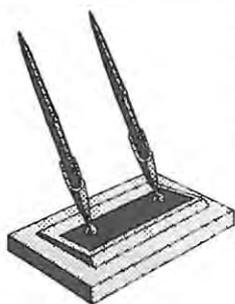
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Adresses électroniques de la SCMO

....from the President's desk



On 18 July the Ottawa Citizen published an article that picks up on a theme that I mentioned in the last Bulletin. The article is entitled "Federal user fees hinder research" and states "Federal penny-pinching to recover the cost of collecting a vast array of information, from weather records to maps, is hindering university research and stifling computer-age business

ventures in Canada, critics say." It then went on to contrast this situation with that in the US, where researchers can obtain the same kind of information almost free of charge, paying only shipping and handling fees. The article argues that if such fees were lowered or eliminated, the economic growth so stimulated would generate far more revenue in taxes than the paltry amount raised by such fees.

Je crois que la SCMO devrait promouvoir fortement des mesures qui favorisent une augmentation de l'utilisation des informations météorologiques, océanographiques et climatologiques par les individus, les entreprises et par la société en général. Il faut encourager l'élimination des barrières à la recherche et à l'application des résultats aux problèmes pratiques. Unreasonable fees for basic information gathered and processed at taxpayer expense may well be hindering this kind of advancement, as the Citizen article argues. The article mentions that government is reviewing the cost-recovery program but that it is unlikely to disappear because "the public supports it". A few more voices raised along the lines of the Citizen article would help change the perception that there is public support for cost-recovery fees.

Elsewhere in this issue you will find an open letter from former CMOS President John Reid, inviting CMOS members to support the formation of a Special Interest Group (SIG) to promote the highest quality of weather services for Canadians. It would do this through a number of activities designed to raise public support for higher quality weather services from both the public and private sectors. If you are concerned about these issues, I urge you to respond to his letter.

(Continued on next page - Suite à la page suivante)

Volume 27 No. 4
August 1999 - août 1999

Inside / En Bref

- From the President's Desk / Un mot du président
by Ian Rutherford p. 97
- Interview with Alberta's longest serving CMOS
member by Claire Sowiak p. 98

Articles

- Canada's best newspapers for weather information:
Press release and Backgrounder p. 99
- Les meilleurs journaux canadiens en matière
d'information météorologique: Communiqué p. 104
- A Meteorological Beard
by U. Schwarz p. 104
- Volcanic Ash: A Major Threat to Aviation Safety
by R. Servranckx, P. Bourgouin, R. D'Amours, J.P.
Gauthier, K. Little, M. Jean and S. Trudel p. 106
- Ocean Issues - The Intergovernmental Oceanographic
Commission - and Me by G. Holland p. 112
- Our regular sections / Nos chroniques régulières**
- Book Review - Revue de littérature p. 114
- News - Nouvelles p. 117
- Conferences / Conférences p. 121
- Memories from last Congress - Souvenirs du dernier
Congrès p. 126
- CMOS-Accredited Consultants -
Experts-Conseils accrédités de la SCMO p. 128**

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Next Issue - Prochain Numéro

Next issue of the *CMOS Bulletin SCMO* will be published in October 1999. Please send your articles, notes, reports or news items at the earliest to the address given on page ii. We have an urgent need for your articles.

Le prochain numéro du *CMOS Bulletin SCMO* paraîtra en octobre 1999. Prière de nous faire parvenir au plus tôt vos articles, notes, rapports ou nouvelles à l'adresse indiquée à la page ii. Nous avons un besoin urgent d'articles.

Dans le domaine de la formation vous vous souvenez sans doute du projet InterMET qui fut présenté il y a deux ans par Nathalie Gauthier. Nathalie nous informe que la nouvelle adresse électronique pour InterMET est <http://Galileo.CyberScol.qc.ca/InterMet/accueil.html>. Visitez-le! Another site geared to education in meteorology is the site for COMET, www.comet.ucar.edu. The UCAR Board of Trustees established the Cooperative Program for Operational Meteorology, Education and Training (COMET) in 1989 at the request of the NWS. The COMET Program was originally envisioned as a broad effort to affect meteorology education and training in the United States. However, the program has recently been involved in activities to enhance meteorology education in universities and meteorological services throughout the world. It too is worth a visit. Connaissez-vous des sites semblable pour l'océanographie? Si oui, nous serions heureux de pouvoir en faire la promotion.

In the last round of NSERC re-allocations, an exercise in which each sector gives up 10% of its share of the pot for re-allocation to new initiatives, there was a lot of disappointment with the relative lack of success of the earth sciences sector in general and the oceanic and atmospheric sciences in particular. CMOS will be writing to NSERC in the near future in order to offer its services in preparing for the next exercise and to help define a coherent vision for the future of earth science research in Canada.

*Ian Rutherford,
President / Président
CMOS / SCMO*

Interview with Alberta's Longest Serving CMOS Member

It was recently brought to my attention that, within the fine ranks of the Alberta chapter (!!), there resided a fellow who had been a member of CMOS for 58 years. In this age of dwindling membership, as Bill Pugsley says, "anyone who has stuck with us for 58 years deserves a bit of a writeup in the bulletin".. I wholeheartedly agree!



Clarence Thompson, or "Tommy" Thompson, as he was nicknamed back then, joined the Canadian Met Service in July 1941, just after WWII started. He was trained to be an observer before completing his Masters degree in Toronto, in Maths and Physics. His first posting, as a forecaster, was to Lethbridge, where he stayed until 1948. At that point, he was transferred to Edmonton. He was promoted to Superintendent of General Weather Services in the Regional Office in 1965, and remained in that capacity until his retirement in 1978.

"Tommy" is a rather spry gentleman with a keen sense of humour.. When asked what prompted him to join CMOS in the first place, he said "Oh I don't know - I think I joined everything back then"! He thoroughly enjoys reading the Bulletin still, and says he even remembers writing "junk" for it back in the '50s! He says the most exciting part of what he did in the early stages of his career was "real meteorology", that the "science was still ascending rapidly back then". Even now, "Tommy" is a true weather-man.. he "always looks to the sky" and somewhat profoundly states "you know, the weather in Alberta is really pretty good".. and you know what, I have to agree with him!

*Claire Sowiak
CMOS Alberta Chair*

CANADA'S BEST NEWSPAPERS FOR WEATHER INFORMATION

The Canadian Meteorological and Oceanographic Society (CMOS) has released recently ratings of the weather information presentation in sixteen Canadian daily newspapers. The ratings are:

A	Toronto Star, Ottawa Citizen
B	Calgary Herald, Edmonton Journal
C	Victoria Times-Colonist, La Presse (Montréal), Vancouver Sun, Globe & Mail, Winnipeg Free Press, London Free Press, National Post
D	Journal de Montréal, The Gazette (Montreal), Halifax Chronicle Herald
E	Le Soleil (Québec), Toronto Sun

The Toronto Star was the top-rated paper the second year in a row, and gained the highest rating for content quality.

The Ottawa Citizen showed the most improvement of any paper from last year's assessment. Its use of colour was effective, and the overall weather presentation was both attractive and informative.

This, the second annual evaluation, was conducted by a three member panel of CMOS members, based on papers published from May 6-10, 1999. Three criteria were used: placement of weather information, the space devoted to it, and the quality and clarity of the presentation. Bonus points were given if the newspaper provided additional weather information sources through telephone service or through a web site-which was assessed as well.

Analyzing the results, CMOS outgoing-President, Bill Pugsley, noted that Western Canada is well served, with all five papers rated receiving either a B or C grade, that is, average or above average. *"On the other hand, it is disappointing that neither of the national papers, the Globe and Mail and the National Post, excelled for weather content."*

The results were released during the CMOS Annual Congress, taking place in Montréal from May 31 to June 4. CMOS is a federally registered, non-profit society that exists for the advancement of meteorology and oceanography in Canada. The Society expects the evaluation will promote improvements in the standard of newspaper weather presentation.

BACKGROUND

CANADA'S BEST NEWSPAPERS FOR WEATHER INFORMATION

How were the newspapers rated?

For each page with weather content, a score was assessed for three factors: placement of weather information, the space devoted to it, and the quality and clarity of the presentation. These placement, area and quality scores were multiplied together, and summed over each page to give a total for the newspaper. Space devoted to feature weather-related stories was not included in the score. This year, for the first time, an additional bonus was given for quality of the weather page reached through the newspapers' main web site, in recognition of the additional information available from the Internet to supplement that from the print medium.

Placement of Weather Information

Most newspapers had some weather presence on the front page as well as more extended coverage elsewhere. In a tabloid, or above the fold on a broadsheet, coverage rated a ten for placement. Below the fold, it rated seven. Weather content on the front of any other section rated three for placement; on the back page of a section or near the front inside the first section (only one case) rated two, and elsewhere rated one. For most papers with multiple sections, the main weather information was most frequently found on the back page of a section rather than on the first page.

Space Devoted to Weather

The area on each page devoted to weather was measured and tabulated in square centimetres. Block areas containing advertising were excluded but information on natural phenomena, such as sunrise and set, moonrise and set, phases of the moon and tidal information were considered weather content. The average area devoted to weather for all papers rated was 704 square centimetres, an increase from last year.

Quality and Clarity of Presentation

On the front page we expected to see summary information on today's weather, the daily high and low temperature and a direction to additional information inside the paper. Depiction with a pictograph, and in colour helps the front-page presentation. On the main weather page, most papers included a continental scale weather map, a regional map, a three- to five-day local forecast, statistics on the normal, record and year ago temperatures for the date, information on sunrise and set, moon-rise and set, phases of the moon, the UV index, Canada-wide, US and

world weather conditions and temperatures. We expected to see credit given to the source of the information, and a toll free telephone number or web site address for updated information. In many cases, additional information specific to the local situation was given; for example, air quality information in areas subject to pollution, tides in coastal areas. The majority of papers presented their information using colour maps and pictographs. A panel of three CMOS members rated this presentation factor. Over all newspapers rated, the average score for this factor was 6 out of 10.

Although space for weather information on page one was included in the scoring totals, it accounted for less than 10% of the score, and usually made no difference to the rating.

We did not evaluate the accuracy of the forecast or other information. To do so would require a much more extended study.

Web Weather Page

We evaluated how well Internet was used to complement the weather information that appeared in print: how long did that weather page take to load and how comprehensive was the information? The loading time varied considerably, depending partly on the complexity and quantity of data and partly on the design of the web page. The content of the web weather page (if it existed; four newspapers did not have a web weather page) was either quite complete and comprehensive (and produced by one of several professional weather information providers) or skimpy. An important aspect was whether a click on the newspaper's weather link produced the weather for the city where the paper is located or if it simply gave a general menu which required more work to find specific weather. The web score was computed by multiplying the quickness to load by the content factor, marked out of 6. The web score was then added on to the newspaper's overall score and, on average, amounted to less than 5% of that total.

How did you allow for different readership and formats?

CMOS assessors made allowance for the different constraints in publishing broadsheet and tabloid formats, and for a national or a local readership. Although tabloids and broadsheets were scored using exactly the same system, they were rated in separate categories. In assigning grades, account was taken of the generally lower score for the tabloids because they have only one front and one back page, and a smaller page format. The assessors judged the best of the tabloids to be on a par with the broadsheets in the B- category and adjusted the rating for the other tabloids accordingly.

Rating national newspapers has to take into account the lack of a local readership on which to focus the weather

information. The raters expected to find less detailed coverage for a particular area, but more detailed coverage across the country than for a local paper.

What was the assessment of individual newspapers?

Only the best-selling 20 papers in Canada were rated. Some papers were not readily available in Ottawa where the assessment was conducted, and so were not evaluated.

Toronto Star

For the second year in a row, this was the top-rated paper in the survey earning a solid A. The information was carried on the top half of the back page of the B section, and gained our highest rating for quality of the content. The continental scale map was clear. Data were comprehensive, including airport and downtown sites, locally. Both air pollution and UV index information were given. An unusual and effective west to east cross section of the weather at Canada's major cities complemented the well-designed weather map. A toll-free telephone number and web site for updates were listed. The Star was one of the few papers that noted the times when the observations were taken and when the forecasts were valid. The web weather page was easy to find and an extension of a small graphical display for Toronto on the paper's main site. The weather page (Accuweather) displayed forecast weather for 40 Canadian cities and additional links for satellite images. No information was available for UVB radiation or pollen count. <http://www.thestar.com/weather/>

Ottawa Citizen

Showing the most improvement of any paper from last year's assessment, the Citizen was rated an A. Appearing on the back page of Section B, and filling half a page with an effective use of colour, the Citizen's weather presentation was both attractive and informative. The Citizen stands out, as well, for the extent of the forecasts given for locations around the world, and not just for one day ahead, but two. Specific contacts (telephone, web site) for additional information were listed. The web link took us directly to Ottawa's weather for 5 days ahead and a page (The Weather Network) that scrolled forecasts for the rest of Canada across the bottom of the screen. A secondary link produced information on UVB and pollen counts and weather for the rest of Canada. <http://www.ottawacitizen.com/weather/>

Calgary Herald

Although the Herald devoted the second most amount of space to the weather of all the papers rated, most of the space was given to a large map which lacked certain features. Although it was in colour, no shading or contours were used to indicate precipitation or cloud areas. There were only a few weather icons (sun, cloud, rain) shown to indicate what the weather might be in a region. Most of Canada's Northwest Territories (north of 63 deg. N) was inexplicably deleted, although the entire continental USA was shown. Three black lines that ended at coastlines left

the assessors puzzled - were these isobars, thermal contours or what? There was no legend to define the lines or the time of the observations or forecasts. On the other hand, centres of pressure systems and fronts were clearly marked. Overall, the Herald rated a B. The web weather page was spectacular with a colourful topographical map of Alberta and links to regional forecasts, as well as a direct display of the local weather for 5 days ahead (The Weather Network). The amount of graphical content slowed the loading time of the page, however.

<http://www.calgaryherald.com/weather/index.html>

Edmonton Journal

Falling only slightly behind its southern Alberta competitor, the Edmonton Journal also rated a B. In contrast with the other leading papers, this paper's weather map is quite small (only 17% of the weather page compared to an average of 33%) - but comprehensive with effective use of colour and symbols. Most of the space was devoted to an extensive table of weather forecasts that was as complete as any we saw - and for two days ahead. The Journal had no web weather page. <http://www.edmontonjournal.com/>

Victoria Times Colonist

This was the first time we rated this paper which had the largest weather page of any of the papers surveyed, covering three-quarters of an entire page, but not placed on a prominent page. However, when one looks critically at the map, although it was in colour, no attempt was made to shade or contour areas of similar weather with reliance on spot icons where there were observing stations. No weather fronts or centres of pressure systems were indicated, let alone circulation patterns or isobars. On the other hand, solar, lunar and tide tables were provided, along with specific contacts for additional weather information. Overall, the Times Colonist rated a C. The Times Colonist had neither a web weather page nor a specific site for the paper itself, sharing space with a number of other small newspapers on a shared web site.

http://www.infomart.ca/todays_news/index.html

La Presse

This was the top Québec paper, and it rated a C overall. Weather information was found on the back page of the sports tabloid insert. A reasonable size continental map and forecasts for national (for two days), world and resort centres (for only one day) were clearly presented. On the negative side, the local forecast was limited to three days, and it failed to give any telephone or web source for updates. La Presse had a small amount of weather on its main news web site but no specific web weather page. <http://lapresse.infinit.net>

Vancouver Sun

At first glance, the Sun appeared to devote a large area to weather. This was reinforced because the lower quarter of the page was devoted to a feature article on El Niño. On closer examination considerable space had to be discounted as it was given over to information on traffic

conditions and the ferry schedule. Despite its C rating, the Sun offers an attractive weather product, including two-day international weather forecasts, and could have been the top-rated paper if the information was given more prominence than inside the second section of the paper. As expected from a newspaper on the coast, marine forecasts and a tide table are given. The weather link brought one directly to the weather for Vancouver and the other national information available from The Weather Network.

<http://www.theweathernetwork.com/city/can/data/vancouver.html>

Globe and Mail

It was a challenge for a panel of meteorologists to rate the presentation only C. This was the only paper that featured a weather map with isobars and a separate cloud map, technically appealing to the weather professional who realizes this provides an indication of where the weather is coming from or moving to. As a national paper, the demands on the Globe are different from those of a local paper. The paper met these by giving a summary of the forecast province by province, the UV index for major cities, and a three-day forecast for Canadian, US and world cities. The Globe has yet to consistently embrace colour and gave only a toll telephone number for weather updates. But even if these deficiencies are remedied it will be difficult to improve the rating while the content is consigned to the obscurity of page B13. The only weather information on the Globe's web site is on the main news page and consists only of temperatures and weather for 24 cities. <http://www.globeandmail.ca/>

Winnipeg Free Press

Weather information occupied the lower third of the back page of the third section of the Free Press. The continental weather map was slightly enhanced by (two small) arrows showing warm and cold airflow. The layout was exceptionally clear with areas of rain shaded and frontal systems clearly noted. In the national/international temperature section, it was not evident that these were forecasts for today, and no weather conditions were given along with the temperatures. Also there was no source for updated information. The overall rating was C. The weather link on the main web site only connects with the national menu of Environment Canada's (Weather Office) weather page. To get Winnipeg's weather, one must click on Manitoba and then Winnipeg - a slow process.

http://www.weatheroffice.com/scripts/generator.pl?Winnipeg_YWG

London Free Press

Although nearly half a page is devoted to weather, it does not stand out because it is on an interior page and there is no use of colour. The weather map is small and lacks any information on temperature, not even weather icons. Northern Canada is cut off above 62 deg. North. Fronts and centres of pressure systems are given along with shaded areas of precipitation, but that is all. Two-day forecasts for national and international weather are given.

Curiously, wind-chill was given (the wind-chill forecast was a balmy 22!) but there was no indication that the paper realized it was late spring and that UVB radiation information is called for. The overall rating was D. A click on the weather link brings one immediately to Canoe's weather for London and additional information such as pollen count and UVB forecasts.

<http://www.canoe.ca/Weather/CityLondonON.html>

National Post

This is the first year for this paper. Weather is given a low priority by being placed on an interior page on a moderate-sized black and white map with little information, except for temperatures, sparsely represented by two contour lines (at a rather generous 10 deg C interval). One feature of the weather page was the extent of national and international coverage with forecasts for three days ahead shown. Overall, the paper was given a C. The weather link brings you to a web page with a second menu of pull down menus for individual cities for each province which in turn produced basic weather information.

<http://www.theweathernetwork.com/NationalPost/>

Journal de Montréal

A large (ugly) coloured map with sparse information dominated the information given on page 66 in this tabloid. The Montréal and area forecast was for three days only, national and international information was given without indicating if these were actual or forecast conditions, and there was no source for updates. Given the constraints of the tabloid format this presentation rated a D. The main web site had no mention of the weather and had no weather page. <http://www.journaldemontreal.com/>

The Montreal Gazette

The weather information was presented on an interior page. The 50 square centimetre, continental, black and white map was inadequate, and a forecast for only a single day was given for national and international cities. Under the heading UV Index, an arrow showed a moderate value, but no index value was given except for the note "26 minutes to sunburn". Health authorities are discouraging use of "time to burn" owing to misuse. Only a toll telephone number was given for weather updates. The Gazette rated a D. Despite the lack-lustre print treatment, the Gazette had much more to offer on its web page. The weather link produced a four-day, nicely done graphic for Montreal's forecast and secondary links to the very extensive world-wide collection of radar and satellite images from WSI/Intellicast.

<http://www.intellicast.com/LocalWeather/World/Canada/Canada/Montreal/Forecast/>

Halifax Chronicle Herald

This was the only paper from Atlantic Canada in the top 20 bestsellers for Canada as a whole. Weather information was found at the bottom of page 2, considered equivalent to appearing on the back page of a section. The presentation, in black and white, included a tiny 17 sq. cm

map of the eastern part of the continent with a minimum of information - only isotherms and fronts. Coverage of conditions outside the region was poor and despite a plethora of telephone numbers for local help lines, none was listed for weather updates. The Chronicle Herald rated a D. The weather link brought one to the national Canoe weather menu from which one can select Halifax and get the 3 day forecast and other information that Canoe provides (pollen counts, UVB etc).

<http://www.canoe.ca/ChronicleHerald/home.html>

Le Soleil

The weather information in this paper was buried on an interior page, only 286 square centimetres and was presented without colour. Although the weather map was tiny, it did cover all of Canada and showed fronts and weather through the use of icons. Forecasts for Canada and international locations were rather sparse and only for today's conditions. No indication of contacts for further information was provided. Overall the ranking was an E. Le Soleil had today's weather for Quebec on its main web page but the link to weather brought one to a map of the province of Québec (from Environment Canada). Then, a click to a city forecast brought text only, no graphics or other information as one would expect from the "Weather Office" service from Environment Canada.

http://www.lesoleil.com/encours/Framesets/mep1_haut.html

Toronto Sun

The Sun devoted 195 sq. cm to weather information on page 36, of which 21% was a weather map of the northern half of the continent. The black and white presentation listed high temperatures and weather for only 11 cities (foreign), with no indication if they were actual or forecast. The four-day metro forecast was not given the perspective of how they related to the normal. A southern Ontario synopsis and forecasts for the area around Metro, not "Across Ontario" as in the title, was included. On the plus side, there was a reference to a web site with information that it is updated hourly and is highly rated. Overall, the Sun rated an E. The weather link for this paper was a high point, directly taking you to the Canoe weather page for Toronto and providing secondary links for pollen counts and UVB as well as basic satellite imagery.

<http://www.canoe.ca/Weather/home.html>

What about other Canadian papers?

The survey was only for the twenty best selling newspapers. Two papers in that category, the Hamilton Spectator and Vancouver Province, could not be rated because the papers were not available in Ottawa at the time of the survey. Several papers that were not rated last year were added this year - le Soleil, London Free Press, the Victoria Times Colonist and the National Post.

How do Canadian papers compare internationally?

Because there are only two national papers in the sample, we examined three others, two from the USA and one from the UK.

USA Today is recognized as a paper which gives prominence to weather. It would have rated above any other paper in this survey and provides a useful model for a national daily paper weather coverage. The publishers operate a web site and publish a book, both of which give strong support to the material in the paper. The information is given on the entire back page of the first section and occupies almost twice the area that the top-rated paper in this survey, the Toronto Star, devotes to weather. USA Today's coverage includes a large and impressive weather map, but one deficiency is that it has no pressure system centres and fronts which help explain the weather. USA Today's weather web page is, like their back page, a beauty to behold with in-depth treatment of the weather, both operational aspects and educational.
<http://www.usatoday.com/weather/>

The New York Times takes an unusual and informative approach by the use of five small maps each showing one feature, rather than trying to put everything into one large coloured map. It also makes use of contoured areas to show regions of the country with the same conditions, be it drought severity, or clouds/sunshine or weather during the week ahead. However, because the weather is buried on an interior page and does not stand out because it is in black and white, this paper would be rated close to the C average of the Canadian papers. The web weather page (Accuweather) brings up lots of international weather forecasts (800 U.S. and 700 international cities) and a good world coverage of satellite imagery but lacks the depth of information one saw on the printed version.

<http://www.nytimes.com/partners/weather/international.html>

By contrast, the UK's **Daily Telegraph** is notable for providing two weather maps with isobars and fronts, one for the UK, the other for the North Atlantic. Forecasts for the world are sparse and only for one day ahead. Weather information is on the back page but overall the presentation would probably rate no better than a C in this survey. The web weather page is very similar in content to the newspaper with several small weather maps (with isobars) and tables of weather forecasts for local cities.

<http://www.telegraph.co.uk:80/ixweath.html>

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Les meilleurs journaux canadiens en matière d'information météorologique

La Société canadienne de météorologie et d'océanographie (SCMO) a récemment publié le classement des présentations d'information météorologique de seize quotidiens canadiens. Le classement se présente comme suit:

A	Toronto Star, Ottawa Citizen
B	Calgary Herald, Edmonton Journal
C	Victoria Times-Colonist, La Presse (Montréal), Vancouver Sun, Globe & Mail, Winnipeg Free Press, London Free Press, National Post
D	Journal de Montréal, The Gazette (Montréal), Halifax Chronicle Herald
E	Le Soleil (Québec), Toronto Sun

Le Toronto Star a été le journal le mieux coté pour la deuxième année d'affilée et a obtenu le plus haut classement pour la qualité de son contenu.

Le Ottawa Citizen est le journal qui a démontré le plus de progrès comparativement à l'évaluation de l'année dernière. Son utilisation de la couleur a été efficace et la présentation générale des informations météorologiques était attrayante et informative.

Cette évaluation annuelle, la seconde à se tenir, a été menée par un comité de trois membres de la SCMO à partir de journaux publiés entre le 6 et le 10 mai 1999.

Trois critères ont été utilisés: endroit où l'information météorologique était placée, l'espace consacré et la qualité et la clarté de la présentation. Des points de boni ont été accordés aux journaux qui fournissaient de l'information météorologique additionnelle par l'entremise d'un service téléphonique et d'un site Web.

Lors de l'analyse des résultats, le président-sortant de la SCMO, Bill Pugsley, a noté que l'Ouest canadien est très bien desservi avec cinq journaux recevant des notes de B ou C, donc dans la normale ou au-dessus de la normale. *"Par contre, il est décevant de constater qu'aucun des quotidiens nationaux, le Globe and Mail et le National Post, ne possède un contenu météorologique de qualité."*

Les résultats ont été publiés lors du congrès annuel de la SCMO, qui a lieu du 31 mai au 4 juin à Montréal. La SCMO est une société à but non lucratif qui a comme objectif l'avancement de la météorologie et de l'océanographie au Canada. La Société croit que l'évaluation aidera à promouvoir le perfectionnement des présentations météorologiques dans les journaux.

A Meteorological Beard by Uri Schwarz¹

Among the many pleasures of attending our yearly Congresses is meeting friends and colleagues one hasn't seen for a year or more. These meetings update us about activities since we last met, permit the exchange of reminiscences about previous Congresses, and the discussion of papers presented at the present one. And most of these encounters start with: "Oh, nice to see you again! You're looking great!"



Well, our Montréal Congress this year was true to form, and as it was well attended, it permitted many pleasant encounters. Only in my case it was just a little different. Why? Well, several people on meeting me, instead of saying: "You look great", said: "Oh, you look different! You have a beard now you didn't have before, I think. Isn't that true?"

My answer to this usually was: "Yes, that's quite true, and it is a "meteorological beard" at that!" And then I would try and explain this seemingly nonsensical combination. My explanation usually amused the questioners, and at least one suggested that I should write it up for our Bulletin. I thought about that, and as writing it down has the added advantage of providing information about my facial transformation to friends who either did not dare to ask about the beard or were unable to attend the Congress, I decided to put pen to paper (or rather fingers to computer key-board) and tell the story of my meteorological beard. As you will see, it's really not so strange a story at that.

Well, since my (second) retirement, despite helping a bit around the CMOS office, I have time to spare. So, when I was asked to give talks to some Senior Clubs on weather-related subjects, I gladly took up the challenge. My first talks dealt mostly with "Weather and Health", a subject of particular interest and concern to many seniors. Also, I had become interested in this matter when helping to prepare the AES/CMOS Weather and Health Workshop held in Ottawa in 1992, and through subsequent contacts with one of its prime movers, Denis Bourque, an expert on the subject.

My talks were usually well received and there were always many questions, ranging from: "What's the minimum sunscreen strength we should use?" to "What is the role of the full moon in causing weather changes and increasing my arthritic pain?" I don't know whether I answered all of these satisfactorily, but am sure that those watching or listening to weather forecasts on TV and radio will now understand better what humidex, windchill, UV radiation, etc., are and what they can do to lungs, skin and bones unless we take precautions.

While most of these talks were given in Ottawa, where I live, I also received invitations to talk on this subject and others close to my heart, like "Global Change" and "Weather and Aviation" in other places, particularly Montréal. And that is where I went in January last year to talk to a Senior Club on Weather and Health at the request of friends who help running the club. They also invited me to stay with them while in Montréal.

Yes, you've guessed it. January 1998 was the "Ice Storm" month. I arrived a day or so before it started, and by the day when the talk was to be given, the clear ice coated trees and power lines outside our windows, and all over town. Electricity was an early victim, transportation was at a minimum, and outside walking on the slippery streets and sidewalks was a hazard, especially for seniors. The talk, of course, was cancelled.

We thought I should try and wait it out. My friends were well stocked with food, their highrise did not get too cold, and there were plenty of blankets. But except for one or two candles there was no light, especially not enough to light up a cold and dark bathroom. Result: minimum washing and no shaving.

After a couple of days of this I decided to try to get back to Ottawa so as to be at least in my own cold and dark surroundings. The trains were still running (I don't know about buses, but trains seemed a safer bet) and I did manage to get on one, my courageous friends driving me to the station, slithering all over the place on the way.

Afterwards, the train progressed slowly through the glittering landscape, a fairyland if I ever saw one. But even over the train's rumbling one could hear loud cracks as branches, heavily coated with ice, broke off trees. It was the beautiful old trees, not the young ones, that bore the brunt of the suffering.

After a couple of hours we crept into Alexandria. The train stopped for what seemed an endless time, and then came an announcement: "As signals and switches are increasingly iced up, the train cannot continue. Passengers are to disembark, and there will be buses to take them to Ottawa." And after some further waiting in the cold, they came, and a couple of hours later we did reach Ottawa. It had been the last train to attempt the trip during the ice storm.

Oh yes, the beard. Well, when I reached home - many hours after leaving Montréal on what is normally a two-hour journey - I found to my delight that in our building, also a highrise, electricity was still working. As I was very tired I went straight to bed. Next morning, the bathroom mirror showed me an unfamiliar face framed by a strange growth. I studied it at length and thought: "With a bit of trimming, it might not look too bad!"

And then I remembered how as a young man of 18 or so, I had lived a while in Italy. Although life there was very pleasant - agreeable climate, good food, good wine - I did not know many people in the little town and therefore frequented the local cinema. It was there that I became fascinated with Clark Gable's moustache and decided to grow one like that myself. I started it, but it wouldn't quite come; there were empty patches where little or no hair wanted to sprout. It looked rather shabby.

One day I had to go to have my hair cut. After doing his job, the Italian barber noticed my straggling attempts at growing a Clark Gable moustache. He whipped out a ladies' eye-brow pencil and with a flourish carefully pencilled in the missing parts. I thought it looked stunning. After giving the barber a good tip I went home and did not wash that part of my face for a whole week!

So, now looking back at my face in the mirror I thought: "Yep, let's leave it. Let's see what the world will think about it. And even if opinions are divided (which they are), at least it is a 'meteorological beard', something quite suitable for a weatherman".

(Comments on my bearded appearance will be gladly relayed to me by the Editor of the *CMOS Bulletin SCMO*, Paul-André Bolduc; particularly if they are uncomplimentary!)

¹: Uri Schwarz is CMOS Executive Director Emeritus.

Volcanic Ash: A Major Threat To Aviation Safety

by R. Servranckx¹, P. Bourgouin¹, R. D'Amours¹,
J.P. Gauthier¹, K. Little², M. Jean¹ and S. Trudel¹

Abstract

Since 1980 more than 100 volcanic ash-aircraft encounters world-wide have been reported, causing hundreds of millions of dollars in damage and lost revenue. Of much greater concern is the fact that at least 3 jumbo jets nearly crashed as a result. In response to this threat, a truly international effort involving numerous organizations and agencies was undertaken. It led to the creation of a real-time operational volcanic ash observing, tracking, and warning system for the aviation community. Environment Canada contributes to this effort through its Montréal Volcanic Ash Advisory Centre and its Meteorological Watch Offices located in Kelowna and Gander.

Résumé

Depuis 1980, on a rapporté à travers le monde plus de cent incidents au cours desquels un avion a pénétré dans un nuage de cendres volcaniques. Ces "rencontres" ont causé des centaines de millions de dollars en dommages et en perte de revenus. Ce qui est beaucoup plus inquiétant, c'est qu'au moins trois avions gros-porteurs ont failli s'écraser. En réponse à ce danger, une mobilisation internationale a été faite avec la participation de nombreuses agences et organisations. Cette collaboration a permis l'établissement d'un système opérationnel de réponse en temps réel ayant pour but de détecter, d'observer et de prévoir le déplacement des cendres volcaniques pour l'aviation. Environnement Canada contribue à cet effort par l'entremise du Centre d'avis des cendres volcaniques de Montréal et des bureaux de veille météorologique situés à Kelowna et Gander.

Introduction

PILOT: "KLM 867 heavy³ is reaching [flight] level 250 heading 140."

AATC⁴: "Do you have good sight of the ash plume at this time?"

PILOT: "It's just cloudy, it could be ashes. It's just a little "browner" than a normal cloud."

PILOT: "We have to go left now... it's smoky in the cockpit at the moment sir."

AATC: "KLM 867 heavy, roger, left at your discretion."

PILOT: "Can we climb to [flight] level 310? We're in a black cloud heading 130."

PILOT: "KLM 867 we have flame out all engines and we are descending now."

AATC: "KLM 867 heavy... Anchorage."

PILOT: "KLM 867 heavy, we are descending now... We are in a fall!"

This dramatic exchange between the pilot of a new B747-400 aircraft and the Anchorage Air Traffic Control took place on 15 December 1989. As the crew of KLM Flight 867 struggled to restart the plane's engines, "smoke" and a strong odor of sulfur filled the cockpit and cabin.

The powerless jetliner bound for Anchorage with 231 terrified passengers fell in silence for 5 long minutes towards the rugged, snow-covered Talkeetna Mountains. All four engines had stalled and the aircraft filled with smoke-like fine volcanic ash when it inadvertently entered a cloud of ash from Redoubt Volcano, which had begun to erupt 10 hours earlier and some 150 nautical miles away (Figure 1).

After the crippled jet had dropped to an altitude of 14,000 feet, only 4,000 feet from the mountain tops, the crew was able to restart all engines. The plane landed safely

in Anchorage but the total repair cost exceeded 80 million (US) dollars, including the replacement of all four engines (Steenblik, 1990).

Of course, not all volcanic ash - aircraft encounters are that dramatic. Nevertheless, since 1980 there have been more than 100 such incidents world-wide, causing hundreds of millions of dollars in damage and lost revenue (USGS, 1998). Fortunately, no fatalities have yet occurred.

The world's busy air traffic corridors pass over hundreds of volcanoes capable of sudden, explosive eruptions which can send an ash cloud to high level cruising altitudes in a matter of minutes (Figure 2). In such cases, the ash clouds can drift great distances from their source as they are carried away by the jet-stream (see cover page).

Clearly, volcanic ash is a global threat to aviation.

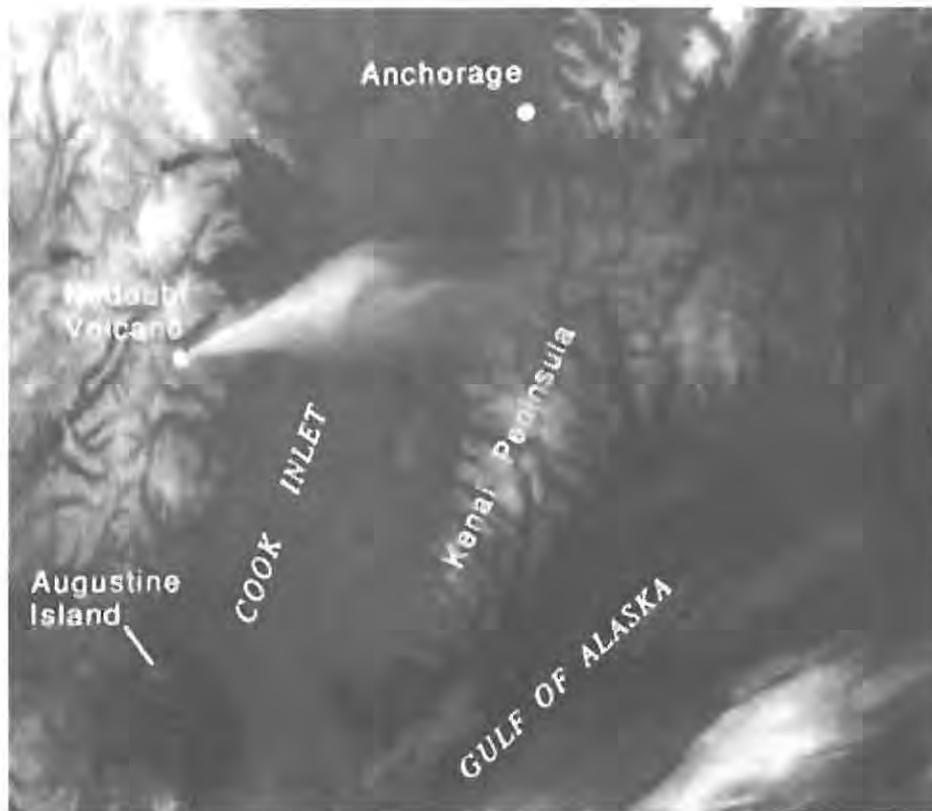


Figure 1. NOAA infrared satellite imagery of a volcanic ash plume from Redoubt Volcano at 1217 UTC on 16 December 1989. This was taken approximately 16 hours after the KLM 867 incident (From USGS, 1990).

The nature of the problem

The first and immediate danger of an encounter with volcanic ash is a loss of all engines, as reported by KLM 867. Volcanic ash is fragmented magma (pulverized rock) mostly made up of fine silicate materials that begins to melt at temperatures as low as 800°C. At normal thrust, the operating temperature of jet engines is 1 400°C. The ash melts in the hot section of the engine and fuses on the high pressure turbine inlet area and turbine blades, which can lead to engine surge, loss of thrust and possible engine flameout. With the general tendency to increase engine operating temperatures as each successive family of jet engines is introduced, the melting and fusing effect of volcanic ash on jet engines will therefore continue to be a hazard (ICAO, 1999a).

Volcanic ash being abrasive, it also erodes compressor rotor paths and rotor blade tips causing loss of turbine efficiency and engine thrust. This erosion produces a decrease in the engine stall margin and results in permanent and irreversible damage to the engines. In addition, ash can clog fueling and cooling systems.

Moreover, the ash abrades cockpit windows, the leading edge of the flight surfaces and the tail fin and can sandblast the paint from the airframe. Any part protruding from the

airframe (antennas, pitot-static system, etc.) can be damaged and become inoperable. Following a volcanic ash encounter, virtually the whole fuselage can be contaminated which then requires a thorough cleaning of the cockpit instrument panel, circuit breaker panels, passenger and baggage compartments, etc.

One might then ask why pilots would not keep a sharper lookout and steer away from volcanic ash clouds. The reason is simple: volcanic ash is not easily detected. The crew of KLM 867 reported that they descended into a smooth layer of cloud with a white top surface, which looked like a weather cloud. It is estimated that the density of the ash cloud was approximately 2 g/m³ with particle size in the range of 100 to 400 microns (Foreman, 1991). At night, or when flying in clouds, there may be no opportunity for a pilot to detect a volcanic ash cloud before flying into it. Also, aircraft radar is designed to detect large particles (rain and hail) and cannot see fine volcanic ash and this is unlikely to change in the near future.

Given that at cruising altitudes aircraft travel at approximately 17 kilometres per minute, the safety of air transportation requires a global, quick, reliable and efficient ash warning system.

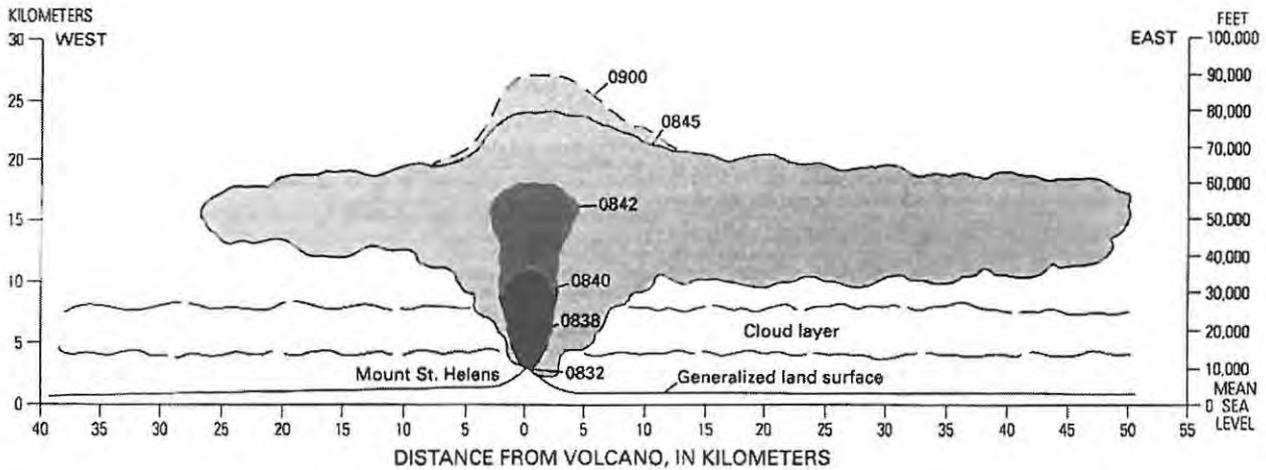


Figure 2. East-West vertical cross section of the Mount St-Helens eruption on 18 May 1980. It shows the vertical growth and lateral expansion of the plume. Times shown are Pacific Daylight Time. From Sama-Wojcicki et al., 1981.

An International effort

In 1982, two B747's had already come very close to disaster in Indonesian airspace because of volcanic ash. The International Civil Aviation Organization (ICAO), the International Air Transport Association (IATA) and the International Federation of Air Lines Pilots' Associations (IFALPA) took the warning seriously and immediately recognized the extreme hazard that a volcanic ash cloud posed for any aircraft unfortunate enough to encounter it (Fox, 1991).

The ICAO Air Navigation Commission formed the volcanic ash warning study group (VAWSG) and this led to the development of formal amendments to the international aviation regulatory material (ICAO, 1998). In 1987 ICAO, with the assistance of other international organizations, established the International Airways Volcano Watch (IAVW; ICAO, 1999b).

Simply put, the role of the IAVW is to keep aircraft in flight and volcanic ash in the atmosphere entirely separate. It relies on the cooperation between a number of agencies from various domains such as air traffic services, meteorology, and volcanology. It consists of two parts (ICAO, 1998; 1999a):

An OBSERVING part:

- a) Observation of eruptions and airborne ash clouds from ground-based stations drawn from all known organized international networks regardless of their particular specialized function. This includes the World Organization Volcano Observatories, the World Meteorological Organization (WMO), the ICAO Contracting States, etc.
- b) Special air-reports and;
- c) observations from satellites (meteorological and non-meteorological);

and a real-time ADVISORY / WARNING part comprising:

- d) NOTAMs (Notice to Airmen) initiated by Air Traffic Area Control Centres;
- e) SIGMETs (significant meteorological hazards Bulletins) issued by Meteorological Watch Offices (MWOs);
- f) volcanic ash advisory messages issued by the 9 Volcanic Ash Advisory Centres (VAACs; Figure3).

The Canadian contribution

There are no active volcanoes in Canada. Nonetheless, volcanic ash has affected the Canadian airspace on a number of occasions. The spectacular eruption of Mount St-Helens in 1980 is but one example of the threat from a series of active volcanoes in the Cascade mountains along

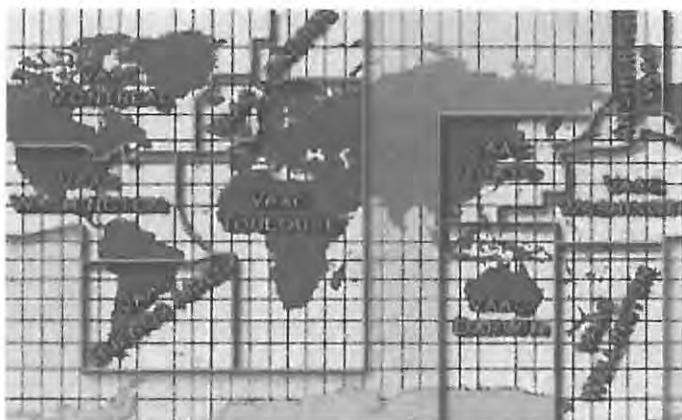


Figure 3. Map showing the area of responsibility of the 9 Volcanic Ash Advisory Centres. Courtesy of Météo-France.

the US west coast. There are also some 40 historically active volcanoes along the Alaska Peninsula and Aleutian Islands. Given the dominant westerly winds in mid-latitudes, it is simply a question of time before an eruption sends volcanic ash again in the Canadian airspace.

To the east, many volcanoes in Iceland have produced large and explosive eruptions. Two relatively minor eruptions recently occurred in September 1996 (Bardarbunga) and December 1998 (Grimsvotn).

A high degree of operational real-time readiness and technological capability is required to achieve the objectives set by the IAVW. In Canada, three Environment Canada centres are tasked with the meteorological responsibility: the Montréal VAAC (located at the Canadian Meteorological Centre) and the MWOs in Kelowna, British Columbia and Gander, Newfoundland.

The Montréal VAAC provides real time information on the current location of the ash cloud and produces guidance, using trajectory and dispersion / transport models, on the expected displacement and dispersion of the volcanic ash plume. Its area of responsibility includes all of Canada, Greenland, the North Atlantic Flight Information Region, and portions of the Arctic Ocean east of Greenland. This information is used primarily, but not exclusively, by the MWOs.

The role of the Canadian MWOs is to coordinate closely with the Area Air Traffic Control Centres and to issue the SIGMETs for all of Canada (MWO Kelowna) and the North Atlantic Flight Information Region (MWO Gander).

The meteorological warning component of the IAVW could not work in North America without the key contribution of other agencies; in particular, the monitoring and advisory services of the Canadian Geological Survey and the US Geological Survey's Alaska and Cascades Volcano Observatories (AVO and CVO respectively). Warning messages are issued by these Observatories whenever an increase in activity is detected at a volcano. For more urgent situations, direct phone calls are made to inform the Canadian VAAC / MWOs.

In addition, close communication and coordination are maintained with the other North American VAACs / MWOs located in Anchorage, Kansas City, and Washington. Efforts are under way to establish a similar cooperation with the London, United Kingdom, VAAC and the MWOs in Reykjavik, Iceland and Sondrestromfjord, Greenland.

Modeling and detection of volcanic ash at Environment Canada

a) Modeling

The use of long range atmospheric transport and dispersion models as tools to predict the movement of volcanic ash in Canada has been described by D'Amours (1991). An application of such tools is presented in Pudykiewicz and Turpeinen (1991).

Two models are presently used in real time by the Canadian VAACs and MWOs: a simple 3D trajectory model and the CANadian Emergency Response Model (Pudykiewicz 1988, 1989. The latest changes to the model are found in D'Amours, 1998).

CANERM is the operational transport-dispersion model at the CMC and one of a few operational models in the world (Heffter and Stunder, 1993; Searcy et al. 1998; Piedelievre et al., 1990). The operational procedures reside on a front-end workstation and are accessible to the duty meteorologist through an X-Window menu. It can be executed at any time and the results are usually available in less than 20 minutes.

The trajectory model and CANERM use the meteorological fields provided by the global data assimilation system in a diagnostic mode, or by the regional or global prediction systems, in a forecast mode. In the diagnostic mode, the last seven days of analyzed meteorological fields are always on-line. In the forecast mode, data are available for periods from 48 to 240 hours depending on the model used, and the time of day.

Both models are used extensively as part of the operational preparedness and response to volcanic ash threats (figure 4) either for current eruptions or in a planning mode when an increased probability of eruption is reported by one of the volcanic observatories. For the latter, automatic trajectories and CANERM outputs are produced in a "watch" mode using a hypothetical release scenario and posted in real time on the Montréal VAAC web. The diagnostic, "hindcast", mode is useful when one tries to identify the potential source of a suspicious ash cloud and for case studies (Little et al., 1999; Jean et al., 1997).

b) Detection

Multi-channel satellite data is used extensively at Environment Canada for the real-time detection of eruptions and to track the ash clouds. This includes visible and IR channels from GOES (geostationary) and NOAA (polar orbiting) satellites. Special processing of the satellite data is also done to discriminate between meteorological clouds (water, ice) and volcanic ash (Schneider et al., 1995; Wen and Rose, 1994). A subtraction of the IR temperatures from two bands is done [channel 4 (10.7 microns) minus channel 5 (12.0 microns)]. Volcanic ash is

often found in areas of negative values, while meteorological clouds usually produce positive values (figure 4 and cover page).

Automatic visible, Infrared and band 4 minus band 5 are produced automatically for specific volcanoes of interest and posted in real time on the Montréal VAAC web page.

The detection of volcanic ash with satellite imagery has limitations and weaknesses. This is one of the reasons why satellite imagery must be used in combination with a variety of forecast and detection tools.

In a more general context, many scientific and operational challenges related to volcanic ash problem remain (Servranckx et al., 1999).

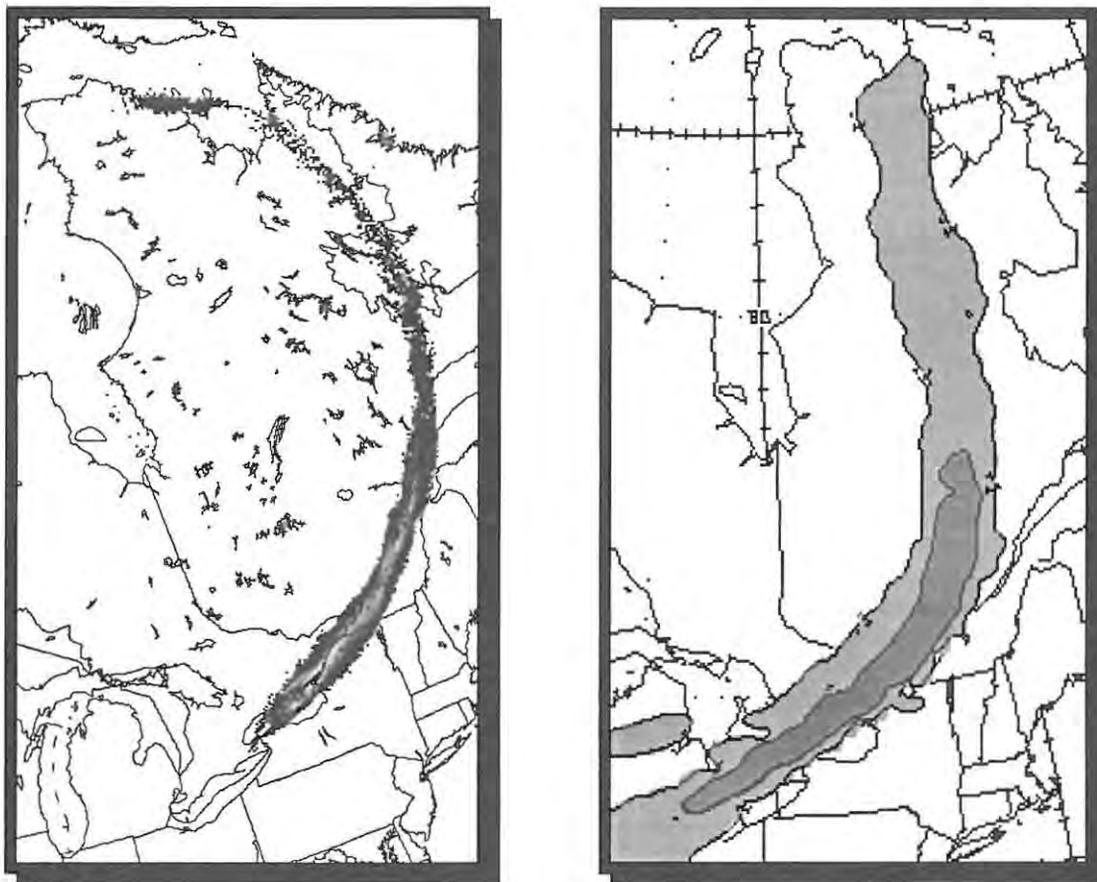


Figure 4. Left panel : NOAA satellite infrared imagery (band 4 minus band 5) showing an ash cloud over the Canada - US border, Eastern Quebec and Labrador following the eruption of Mount Spurr, Alaska, in September 1992 (Courtesy of Bill Rose, Michigan Technological University and D. Schneider, Alaska Volcano Observatory, United States Geological Survey). Right panel : The corresponding Montréal Volcanic Ash Advisory CANERM 54-hour forecast of the average volcanic ash concentration at an altitude of approximately 10 kilometres.

Conclusion

The importance of the dramatic encounters between volcanic ash and aircraft in the 1980s cannot be over-emphasized. They were nearly fatal, cost hundreds of millions of dollars in damage and dispelled any lingering doubts about the operational hazard posed by volcanic ash.

Great advances have been made over the past decade to develop an international volcanic ash warning system for aviation but many challenges remain. Finding and

implementing the appropriate solutions to improve the detection of volcanic ash and to provide and deliver reliable advisory information faster will require time, effort and a continued international collaboration.

At the same time, it must be recognized that the aviation community already benefits from the long-standing close working relationships among various organizations, agencies, and stakeholders around the world with keen interests in the volcanic ash problem.

Given the increase in air traffic and the proximity of dangerous volcanoes along the air routes, it is doubtful that future volcanic ash-aircraft encounters can be completely avoided. However, the probability of such incidents is now greatly reduced, thanks to a truly international effort and collaboration.

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Endnote

1: Montréal Volcanic Ash Advisory Centre /Operations Branch, Canadian Meteorological Centre, Environment Canada

2: BC / Yukon Aviation Weather Forecast Unit, Mountain Weather Services Office, Environment Canada, Kelowna, BC

3: Jumbo jet

4: Anchorage, Alaska Air Traffic Control

5: Select the Environmental Emergency Response link at the CMC home page located at:

<http://www.cmc.ec.gc.ca/indexe.html>. You will find information on the models used, interpretation of the model outputs, automatic real-time trajectory/ CANERM forecasts, automatic real-time satellite imagery, examples of outputs from past eruptions, web links to other VAACs and the Volcano Observatories, etc.

Ocean Issues -The Intergovernmental Oceanographic Commission - and Me

by Geoff Holland¹

I have just completed my four-year term as Chairman of the IOC in UNESCO. It was a frustrating, exciting tiring and enjoyable period of my life. It started with an extremely tight election race against a French candidate and ended with the recent Twentieth Assembly.

For those who are unfamiliar with the Intergovernmental Oceanographic Commission, it is a unique science organization within UNESCO.

Founded in 1960, the IOC has its own Statutes and Member States. Although operating within the overall administration of UNESCO, the IOC has autonomy in deciding its own activities. For example, it conducts its own elections for officers and Executive Council Members and determines its own program at the meetings of its governing bodies. The program and budget must, however, be approved by the General Conference of UNESCO, although about half of the IOC operating funds come from voluntary contributions to a Special Account. The head of the IOC is the Executive Secretary, a post at the Assistant Director General level within UNESCO, and responsible for the implementation and management of the program. The Chairman is an elective position with a mandate to see that the wishes of the Member States, and the decisions taken at the annual governing body meetings, are respected. The Chairman presides over such meetings.

In 1995, I found myself in a two-man race against a French candidate. I was surprised at the effort made by France to win the position, which resulted in many of my "friends" having no choice than to vote for the European Union candidate. For my part, with well over twenty years of involvement with the Commission, I felt I had more credibility than my opponent, who was virtually unknown in that community. I still had to overcome the weight of the combined European and associates vote and the strong political lobbying that the French Government brought to bear. Two days before the elections, France took the unpopular action of exploding an atomic bomb in the Pacific, and that probably made the difference. When the votes were counted, we had a tie and had to do it all over again. If the tie was repeated, the rules instructed that a decision would be taken by lottery. I was not certain that I wanted my future to be decided by someone tossing a coin and was contemplating my options at the time. As it turned out, I won the second ballot and so the situation didn't arise.

When the IOC was established by the leading oceanographers of the time, they recognized that the

resources and capacity required to undertake ocean research, dictated the need for governmental cooperation and an intergovernmental organization. The concept that the IOC carries out its program through the collective efforts of its Member States has remained a central theme in the IOC Statutes, but there have been changes. Originally, the Commission was set up to deal with cooperation in ocean research and there were only a handful of countries with oceanographic capability. Now the Member States of the IOC number 126, and although there are many more countries with a capability in the marine environment, the majority still require training and assistance with the result that capacity building has become an integral part of the IOC program.

With the emergence of the new ocean regime under the Law of the Sea, much of the important continental shelf ocean area is now under national jurisdiction. Programs addressing ocean issues require access to these areas and therefore the full cooperation of coastal states. This again has emphasized the need for the development of ocean science capacity in developing countries. Finally, the economic potential of the marine environment is now being recognized, including the value of the ocean as part of the life support system of the planet. Governmental priorities in pollution, climate change, weather prediction, coastal management, fisheries, marine transportation, offshore hydrocarbon exploration, tourism and the modern search for pharmaceuticals and genetic materials all dictate that intergovernmental program priorities include management and decision-making benefits. The provision of ocean services has become the third leg of the *raison d'être* for the IOC. The Global Ocean Observing System has been recognized in Agenda 21 of UNCED, as a requirement in the sustainable development of the ocean environment.

These three thrusts are not unconnected. Marine management requires accurate information and predictions, which in turn are based, not only on observations but also on basic research and knowledge. The cooperation of all coastal states is also a prerequisite for the solution of regional and global issues.

It was in this context that my tenure as Chairman took place. It was an exciting time. The Law of the Sea coming into force, the attention on global climate change, the flurry of global conventions following the UNCED, the agreement on an action plan on land-based sources of marine pollution and plans in place for the International Year of the Ocean in 1998, one could look ahead for some real progress.

High expectations lay the groundwork for disappointments and there were many frustrations over the next four years. Luckily I had enough experience in intergovernmental affairs

¹Former President of Intergovernmental Oceanographic Commission

to accept that the wheels of the international machinery turn very slowly, but so much more could be done.

I believe that the mindset of economic restraint has become an impediment to progress. Governments have accepted a zero growth creed in the UN system that is stifling creativity. Efficiency and effectiveness are worthy goals to pursue, but sometimes an investment is required to achieve those goals, sometimes a new mechanism must be established to replace unproductive ones and sometimes the magnitude of the global problems facing us demands additional action.

Sometimes I use the analogy of a ship whose safety is threatened by a hole in its hull. Calling a meeting to decide whether the occupants can afford to pay for a repair, or who should do it, would seem so illogical as to be ludicrous. Yet this is precisely what is happening with our planet. To return to the ship analogy, the lower decks may be more vulnerable, but the threat will eventually reach the upper decks; all must cooperate to survive.

The IOC addresses program implementation through regional bodies and maintains global integrity through scientific and technical expert groups. Its resources are very small, with a total professional and non-professional staff of about thirty people, most of its strength is from national involvement in its activities. It cooperates with other Specialized Agencies of the UN that have marine interests, especially with the World Meteorological Organization, with whom it shares joint technical bodies and a common interest in weather and climate changes.

During my term as Chairman, I was glad to see the development of additional cooperative programs with other UN Agencies, in particular a new level of cooperation with a joint IOC/WMO Technical Commission on Oceanography and Marine Meteorology. I hope to see similar developments with UNEP, IMO and FAO. I attempted to encourage better national involvement during the intersessional periods, using Newsletters and editorials on the Internet Website. It was gratifying to see the response in many nations to the International Year of the Ocean, particularly to the Ocean Charter campaign supported by Canada, but also in many other national initiatives. The IYO could have been the impetus to raise the level of awareness of ocean issues to the point where a decision was taken early this year at the UN Commission on Sustainable Development to take action to improve the dialogue on ocean issues at the UN General Assembly. So some progress can be demonstrated.

I will end with some observations on ocean science and its importance to society. The ocean is one of the great global commons. As one of the life support systems of the planet, its continuing health is a matter of importance to everyone. Remember, when I refer to life support, I mean the ecology that supports human life. It is ironic that we discuss the "fragile" environment, when it is the

human race that is frail. The environment has been in existence for millions of years before civilization and will continue for countless more millions of years. Unfortunately, if we continue our present course, the future environment is likely to be one that will support forms of life other than the human variety.

Not only is the ocean critical for our existence, properly managed, marine resources could provide a great source of wealth and benefit for the world population. For these reasons, one would assume that global cooperation in marine science and services would be an important item on the agenda of most governments. Unfortunately, that is not the case. The reasons are probably twofold.

The first is complacency. For years the world ocean has been regarded as an infinite resource with an unassailable environment. This is no longer so, and governments are now alerted to the dangers of over-fishing, losses of coastal habitat, the ocean role in weather and climate changes, declines in marine environmental quality, land-based pollution etc. The translation of these concerns into action however, has not been accomplished.

The second is cost. As a demand to address new challenges, programs will require additional resources for implementation and the necessary action still seems many years away.

So looking back, I see more inaction than achievements, more complacency than effort and more dissension than cooperation. However, I hope the small steps made during the past four years will precede substantial moves in the years to come. I hope that Canada will have the vision to lead in global actions in the next millennium and, in particular, to build on its ocean strategy through restoring its ocean science program to the world position it once held.

I started out with the intention of making this article more of a human interest piece and ended up philosophizing. Maybe I have been Chairman too long. Certainly my thoughts of the IOC will include memories of restaurants and bistros, beers amongst friends, long hours of concentration, laughs, building relationships with friends from all races and creeds, negotiations and the satisfaction of reaching a consensus on a difficult point. I am grateful to have been given the opportunity to be a part of it all.

Note from the Editor

Geoff Holland has now retired from DFO and has moved nearby an ocean: The Pacific!

Air Apparent
**How Meteorologists Learned to Map,
Predict and Dramatize Weather**
by Mark Monmonier

The University of Chicago Press, Chicago, Illinois
ISBN 0-226-53422-7 1999

Book reviewed by Keith C. Heidorn¹

Maps of all kinds have fascinated me for as long as I remember. Even today, I can relieve any hint of boredom by pulling out an atlas and exploring some known or unknown place. I keep a world atlas and North America road atlas next to my couch so I can find the locations of places and cities mentioned in the news or on a TV program or in my reading materials.

When it comes to weather maps. Well! I am as happy as can be. I still remember my first weather map -- a Chicago-area map used by Windy City weathercaster P.J. Hoff in the 1950s on the late night news. It was a circular look at the city and immediate suburbs with a few cloud cutouts attached and local temperatures and other information written on it in black crayon. My favourite feature was the little string which, when pulled, lifted a flag with the predicted high temperature for the next day up above a similar flag which contained the predicted low. Simple, but a real prize for a 10-year-old future meteorologist.

I was in my early teens when I first held an official U.S. Weather Bureau Daily Weather Map. Unfolded to its fullest extent, it filled my desktop. In the centre and dominating the page was the surface weather map for the date. Smaller maps indicated the previous day's maximum/minimum temperatures for selected US cities, precipitation totals and areas with rain/snow hatch-marked and snow-on-the-ground isolines. Also included was the North American 500 mb map. If I remember correctly, the map also contained a simple station model key to the plotted data. I think my first map had on its back side, a large chart giving the complete key for the weather symbols, a regular feature, I was to find, on the Sunday map.

When I saw that Mark Monmonier had written a book on the history of weather maps, I had to get a copy for review. Published by the University of Chicago Press, "Air Apparent: How Meteorologists Learned to Map, Predict and Dramatize Weather" covers a variety of subjects relevant to the display of weather information and the forecasting of weather, including those maps which portray more than just the surface weather features.

The author, Mark Monmonier, Distinguished Professor of Geography at Syracuse University, has written several books on mapping and mapping history. Air Apparent is the first of his works that I have read, but, based on this one, I will be looking for others.



In the Preface, he states that the book is "a broad synthesis intended for the amateur weather enthusiasts likely to appreciate an excursion through meteorology's cartographic history as well as for cartographic historians and map enthusiasts curious about a neglected but momentous area of map use."

I believe Professor Monmonier succeeded in his stated purpose with this very readable and fascinating book. It definitely opened many new areas for me concerning the history of the science of weather depiction and forecasting. The book looks at the early history of the mapping of weather information, the role the telegraph played in early mapping and forecasting dissemination, the increasing role of weather satellites and radars, the entry of weather maps into the print and television media, climate mapping and pollution impact mapping.

Living in the age of air and space travel, many of us find it hard to realize that for centuries, scientists and naturalists did not comprehend the need for plotting weather maps. Monmonier correctly points out that the early studies and mapping of weather data did not consider forecasting as the prime goal. As he writes: "no-one thought that cartographic snapshots of barometric pressure and wind might prove revealing. Interested in describing climate, not in forecasting weather, they had little sense of the atmosphere as a geographic phenomenon." Nor were they aware of the daily dramas unfolding overhead across the continents. Weather was a local event, extending only to the horizon.

Interestingly, it was Edmond Halley of comet fame who produced one of the earliest maps, albeit one focused more on climate information than daily weather. I was surprised, however, that the author did not link Benjamin Franklin's early insight on the structure of storm systems as being a contributing factor in the understanding that weather had an important spatial structure -- a concept that would one day give birth to the daily weather map.

Monmonier paints an interesting account of the American reluctance to accept the Norwegian concept of weather fronts and frontal systems, which may have been partially motivated by US Government budget concerns. The acceptance of the frontal theories by the US Weather Bureau in the 1930s was finally forced on them by the growing US airline industry who demanded more airport weather stations, more forecasts and more reliable upper air measurements. As well they demanded "more explicit

¹ Keith C. Heidorn, PhD, ACM, The Weather Doctor, July 1999, All rights reserved.

depiction of air masses and fronts, which pilots and company meteorologists considered real and relevant." When Bureau Chief Charles Marvin balked, the airlines took their complaints to President Franklin Roosevelt. A commission, charged by Roosevelt to look into the matter, agreed with the airlines and recommended adoption of the frontal theory and replacing Marvin as Chief.

Professor Monmonier develops the evolution of the distribution of weather information from the simple, purely surface depiction on paper weather maps to today's complex mix of multimedia and computer technologies. He devotes chapters to the significant influence of satellite and radar to viewing scales of weather phenomena both larger and smaller than those evident on the standard-scale weather map.

But a weather map is just a picture of "stale" weather data, of interest only to a few scientists, unless it can convey information of use to special interest groups and the public. Thus, Monmonier shows us how the weather map and attendant forecast have been presented to the public via the newspaper (since 1896) and television (the first weathercast occurred in 1941) and now the internet with its many useful features and far-ranging links.

I have only a few complaints with the book and they are rather small. First, the chapter on Downwind Danger, which deals with mapping air quality hazards, could have been relocated, either preceding or following the chapter on mapping climate. I felt its current position was misplaced and disrupted the flow of the material on daily weather mapping and forecasting. I would also have welcomed more on climate mapping and its history.

Only one statement in the book really bothered me. This was in the brief discussion of global climate change which I feel was not really relevant to the whole book's focus. It could have been dropped without loss because it had little to do with weather/climate mapping. Monmonier wrote: "Scientists remain skeptical about global warming for a variety of reasons." Qualifying this statement to say some scientists remain skeptical (and many of those are supported by the energy industries who fear restrictions on fuel usage) would have made me feel better. While some disagreements are still being discussed as to the direction and magnitude of climate change resulting from energy-production and industrial carbon dioxide emissions, most will agree there is reason for concern. The author's footnote for this statement refers to two of the known energy-industry-sponsored skeptics. While I tend to concur with Monmonier's quoting and agreement with a statement of David Laskin that the issue appears to have been given an independent life of its own by the media and it is not a visage of the end of the world, I still feel we must take the global prospects of major climate change seriously -- whether natural or human-caused.

Finally, I wish that Monmonier had included a figure showing the US Weather Bureau daily weather map of the

1960/1970 period. I no longer have any copies of the many issues I had received over the years. As I read *Air Apparent*, many memories or those maps surfaced in my thoughts, and I longed to once again see its familiar format.

I read this book while flying cross-country: half eastbound and the remainder on the return trip. Never has a flight been so pleasant (except for the cramped leg-room). Any weather historian or map junkie will join all weather enthusiasts in finding this book an indispensable addition to their reading list. If your vice is watching TV weathercasts, you will gain many insights into the evolution of what you see presented daily. If you remember, and miss, the days of the "official" US daily weather map coming in the mail, you will enjoy this book's ramble down memory lane.

The Surface Climates of Canada

Book edited by W. G. Bailey, Timothy R. Oke,
and Wayne R. Rouse (1998)

McGill-Queen's University Press

Book reviewed by William A. Gough²

This book provides a comprehensive overview of the surface climates of Canada. It is unique in its scope and should quickly become a "classic" for climatologists. The editors have assembled a veritable who's who of Canadian surface climatologists to produce a remarkably well synthesized collection of perspectives covering the diversity of surface climates in this country.

The book is divided into three sections. The first, consisting of four chapters, covers climatological concepts as necessary building blocks for the subsequent survey. The first chapter is an elegantly written overview of Canadian climate written by the legendary Kenneth Hare. The next three chapters cover the fundamentals of surface climates. In the second section of seven chapters the full range of surface climates are reviewed. Each section has a different set of authors, well known figures in their respective fields. Great care has been taken to avoid the usual folly of such an approach, i.e. a series of disconnected chapters of variable quality. Terminology has been standardized and although the varied topics have their unique features, some common elements are found in each; for example, standard climatologic budgets of energy, radiation and hydrology.

The organization of chapters is based on both geographical location (such as The Arctic Islands; Low Arctic and Subarctic) as well as climatological regime (e.g. Wetlands; Forest Environments) or a combination of the two (e.g. Oceans and the Coastal Zone; Freshwater Lakes; Alpine Environments). This provides a complementary overlap of

material that serves to strengthen the presentation. The book has been ably edited to take advantage of this feature. The final section focuses on anthropogenic influences on surface climates. In three chapters, climate change (mainly global warming), agricultural land use and urbanization are explored. All chapters of the book come with a reasonably up-to-date list of scientific references. References to the Intergovernmental Panel on Climate Change (IPCC) reports were not always the most recent.

Although commendable in its breadth, I was disappointed that some features were missing. In the book, climate change was almost exclusively synonymous with global warming. This is, of course, a crucial topic and well handled in some of the individual chapters and in D. Harvey's review in the third section. However, changes in land use has a substantial impact on climate. Aspects of this are covered in the chapters on urbanization and agriculture but the impact of deforestation is missing. Another climate change, the impact of acidic precipitation, is only fleetingly mentioned in spite of substantial impacts on eastern forests. A more detailed description of CLASS, a land surface scheme used in general circulation models and other regional modelling, would have added to the book.

This book will serve to be an excellent resource for climatologists. Climate modelers interested in improving surface process parameterization will also find this book of value. It can also, as mentioned in its preface, be used as a companion text for a microclimate university course. Students in environmental science and environmental studies programs will also find this to be an excellent reference.

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Note from the Editor: this review is an expanded version of a review which appeared in the Canadian Book Review Annual.

CMOS Bulletin SCMO Makes the News

1) Ozone or nozone

It could have been foreseen that the general public and not only the scientific community would be interested in the results of a study published in the February 1999 issue of the CMOS Bulletin SCMO on the increases in O₃ episodes found during weekends as compared to weekdays¹.

The Globe and Mail (June 3, 1999) featured the subject in its Facts & Arguments, adding interestingly another report on a statement by Environment Canada on the amount of carbon dioxide emissions that could be saved if people were to switch from personal to public transport when commuting to and from work.

The National Post (May, 29, 1999) goes into more detail reporting on the subject of the study. It quotes Prof. Gough and Mr. Beaney as saying that "when there's not very much sunlight, the nitrous oxide (also an exhaust emission) actually scavenges or gets rid of the forming ozone", which explains the "counter-intuitive" result of the study.

CMOS Executive Director's Office

1: Weekend/Weekday Effect for Tropospheric Ozone Episodes in Ontario, Canada, by Asij J.Kumar (U. of T.), William A.Gough (U. of T.) and David Yap (Ontario Min.of Environment), *CMOS Bulletin SCMO*, Vol.27, No.1, February 1999, p.3-7.

2) Saxby Gale Makes the News²

The Editor of *The Union Advocate* waxed almost poetic in praise of S.M. Saxby at the end of the paper's long article on the "The Great Storm" in the Thursday, October 14, 1869 issue. The article filled columns 1 to 4 on page 2 and the editor, exhibiting little meteorological acumen, wrote:

We have given a lengthy account of the Storm and its doings. Though the prediction of Lieut. Saxby made in December last has not been verified in many places, yet one thing is evident - that the short letter written by that gentleman caused precautions to be taken, which have resulted in saving many lives and many millions of dollars of property. For his timely advice, Lieut. Saxby should not go unrewarded - that he is deserving of a handsome testimonial of some kind or other all will admit; and we sincerely hope that something in this way will be done, not forgetting the motto - "Honor to whom Honor is due."

The Union Advocate, Newcastle, New Brunswick
Vol. II, No. 49, Whole No. 101 (weekly), Thursday, October 14, 1869; p.2, col.4 (bottom conclusion of article).

2: A Multi-disciplinary and Inter-scientific Study of the Saxby Gale: an October 4-5, 1869 hybrid hurricane and record surge, by Alan Ruffman (Geomarine Associates), *CMOS Bulletin SCMO*, Vol.27, No.3, p.67-73.



Open letter to all members of CMOS

Dear CMOS Member:

Many of us who have had a long association with meteorology in Canada are concerned about the future of weather services, public and commercial. With continuing emphasis on public consultation in the formulation of public policy, we need to ensure representation to promote the highest quality of weather services for Canadians. Without it, our voice is not heard and the authorities can justifiably respond to criticism: "we consulted."

An organization "Friends of Canadian Weather Services" could be the mechanism we need as a community to front such representation.

The essential elements of today's weather services are:

- 1) national meteorological infrastructure, federally funded, as the basis for a national system of weather services and warnings;
- 2) a commercially viable Canadian meteorological private sector;
- 3) timely and accessible weather information and warnings.

Infrastructure

Funding for federal weather services has been cut year after year as resources in the Department of the Environment are reduced, part of overall federal expenditure restraints, and also as funding has been redirected to higher departmental political priorities. Weather services managers have done their best to maintain the public service, but the cuts have meant that adoption of important technology has lagged. Several elements of the infrastructure, including skilled human resources, need attention but this is especially true for observations.

Observations are the basis of weather services, both public and commercial. Deficient observations mean deficient services. Canadian companies in many weather-sensitive sectors are at a competitive disadvantage if they don't have access to an equivalent level of publicly funded weather services as their international competitors. Credible forecasts reflect well on meteorology and meteorologists.

No other country can, will or should make the detailed observations of Canada's weather necessary for a modern

weather service. But only now are we seeing the beginnings of a Doppler radar network, vital for severe storm warnings, which is fully in place in the USA. Canada has never launched a meteorological satellite, leaving us totally dependent on the NOAA, and to some extent EUMETSAT, systems. The density of Canada's basic surface and upper air observational networks continues to be well below that of comparable economies in North America and Western Europe.

Private Sector

There can be no debate that the private sector has an important role in weather services in Canada today. Specialized, site specific and media weather services are domains in which private commercial services have proven themselves. With relative freedom from bureaucratic controls, companies have developed new services derived from traditional data, such as mosquito, health-allergy and golf forecasts, and show the potential for expansion of the meteorological services sector.

Canadian meteorology will be stronger if it encourages a healthy private sector. Foreign providers stand ready to satisfy the market if Canadian companies do not.

Media

For two years now CMOS has produced an evaluation of Canadian newspaper weather pages. To read the latest, read article on page 99 (page 104 en français) or check:

<http://www.meds-sdmm.dfo-mpo.gc.ca/cmso/whatsnew.html>

CMOS has previously pointed out problems with commercial radio's broadcasting, or perhaps more accurately lack of timely broadcasting, of weather warnings. Most forecasters are aware of instances of dated forecasts being used when more up-to-date information is available.

There is a need to continue to encourage the media to provide timely accessible weather services, in particular weather warnings.

Proposal

In an attempt to address these concerns I propose the formation of "Friends of Canadian Weather Services." It will be organized as a special interest group under the auspices of the Canadian Meteorological and Oceanographic Society.

The aim of Friends will be to promote the highest quality of weather services for Canadians. Its activities should include:

- a. Advocacy for weather services with federal departments, agencies, Parliament, weather-sensitive industry sectors and national industry associations such as: Federal Ministers, MPs, Parliamentary Standing Committees, Environment Canada, Industry Canada, NSERC, CRTC, NavCan, CAB, etc.
- b. Providing topical information on Canadian weather services.
- c. Compiling an annual evaluation of media weather service.
- d. Organizing a special session at the CMOS Congress; and/or,
- e. promoting presentations on weather services at local CMOS Centres/Chapters.

In addition, in recognition of the importance of long-time-frame research to assist the development of weather service, Friends will pursue federal Granting Council support for advancement of meteorological research.

The organization will be structured as a special interest group within the Canadian Meteorological and Oceanographic Society, according to its By Law, number 6. In accordance with the By Law the officers will be the Chair, Vice-Chair, and Secretary-Treasurer. An Advisory Board will be formed.

Under the By Law, 25 members are required to sponsor formation, which can be approved by CMOS Council. Preliminary feedback from the CMOS Executive is that they see no impediment, and considerable advantages to the formation of Friends.

Friends could request funding through a subvention from CMOS and/or levy its own fees. It might also seek a broader membership than CMOS.

If you are a CMOS member and would like to support the formation of Friends of Canadian Weather Services as a special interest group within CMOS please respond to:

jedr@intranet.ca

Comments on the proposal are also welcome at the same address.

Sincerely,

John D. Reid

CMOS Member Presented a Lead Paper Mohammed El-Sabh Memorial Symposium IUGG99 General Aseembly Birmingham, UK

Madhav Khandekar was invited to present a lead paper at the Mohammed El-Sabh Memorial Symposium which is being organized during the International Union of Geodesy and Geophysics (IUGG99) General Assembly to be held in Birmingham UK, July 18-30, 1999.

Khandekar presented a paper entitled "*Atmospheric Hazards Associated with El Niño/Southern Oscillation (ENSO) Phenomena: A Synthesis*". Khandekar, who is presently a Consulting Meteorologist, has a long-standing interest in the ENSO phenomenon and its global weather impact.

The IAPSO (International Association for the Physical Sciences of the Ocean) has partially funded the travel expenses of Khandekar to attend the IUGG99 General Assembly in Birmingham, UK.

Madhav Khandekar

Festival International de Météo Thème: Les changements climatiques Ville de Québec, Québec, Canada 15-18 Avril 1999 Musée de la civilisation et Hangar du vieux port

Des présentateurs météo et des météorologues du monde entier se sont retrouvés à Québec pour la 9^e édition du Festival International de Météo. Créé en 1991, cette manifestation s'était toujours tenue à Issy-les-Moulineux, France. Le festival a quitté son port d'attache la première fois, ses organisateurs ayant décidé de le faire voyager une année sur deux. Le festival consiste en une rencontre professionnelle dont le point marquant est une compétition entre présentateur de bulletin météo des télévisions et de la radio du monde entier. C'est un festival grand public où chacun peut voir les moyens mis en oeuvre pour annoncer le temps qu'il fera. Une centaines de chaînes de télévisions représentant 63 pays était inscrites dans la compétition officielle.

Le festival a commencé par une journée scolaire qui avait pour but de sensibiliser les jeunes aux phénomènes météorologiques et à son environnement. Trois cents élèves de 4-5^e année après une initiation à la météorologie générale l'école, ont par la suite vérifié leurs aptitudes comme présentateurs météo. Le sourire des enfants et des professeurs en quittant le musée confirme le succès de cette journée.

Pendant toute la durée du festival, des conférences professionnelles et grand public ont eu lieu avec comme thème principal les changements climatiques. D'autres aspects ont été signalés comme l'eau et la qualité de vie par le politologue et économiste Riccardo Petrella ou la reconstruction du Saguenay-Lac St-Jean après les inondations tragiques de juillet 1996.

Un grand nombre d'exposants présentaient des kiosques sur les changements climatiques, l'ozone, le rayonnement UV, une station météorologique opérationnelle et aussi un studio de radio et de télé où chacun pouvait vérifier ses talents de présentateurs météo. Je suis persuadé qu'après avoir rencontré les gens d'Environnement Canada, du Ministère de l'Environnement du Québec ou de Météo Média, ces gens ne regardent plus la météo de la même manière. Il y a eu plus de dix milles personnes qui ont visité les lieux.

Une table ronde présidée par M. René Morin de la société météorologique de France réunissait un groupe d'experts qui ont débattu des questions soulevées sur les changements climatiques et autres sujets soumis par les présentateurs météo.

Pour couronner l'évènement des trophées 'les météores' ont été remis à une dizaine de présentateurs. Le grand prix du festival a été remporté par Evelyne Dhéliat de TF1, la plus importante télévision française. Et une fois de plus, les canadiens se sont distingués: Jocelyne Blouin de Radio-Canada pour le meilleur reportage et Frank Cavallaro de CFCF-12 à Montréal pour le prix des médias.

Enfin, le festival est un évènement relativement nouveau et de nature à susciter de l'intérêt pour les citoyen(ne)s et à faire connaître les diverses facettes de la profession de météorologue et à promouvoir la crédibilité des sciences météorologiques auprès du grand public.

*Michel Ferland: Centre de Québec de la SCMO
André April: Université du Québec à Montréal.*

25-Year Pins

This is the list of people who received the 25-year pin at the last CMOS Congress or subsequently by mail. If you have not received your pin and your name is listed below, please communicate with the CMOS Executive Office as soon as possible. If you have more than 25-year membership with CMOS or its parent body, and your name does not appear below, please communicate with the Office.

Tom Agnew	Richard Asselin
Michel Béland	Byron Boville
Jim Bruce	Jean-Guy Cantin
Bill Crawford	Jacques Derome
Pierre Dubreuil	Howard Ferguson
George Isaac	Bob Jones
Madhav Khandekar	Dave Krauel
Henry Leighton	John Maybank
Gordon McBean	Jim McCulloch
Phil Merilees	Ted Munn
Lawrence Mysak	Bill Pugsley
John Reid	George Robertson
Ian Rutherford	Bill Schertzer
Uri Schwarz	Lou Shenfeld
Ron Stewart	Geoff Strong
Ambury Stuart	Peter Taylor
Morley Thomas	Tom Thompson
John Walmsley	

<p>Stephen Clodman, Ph.D. Atmospheric Electricity, Thunderstorms Satellite and Radar Sensing</p>
<p>Centre for Research in Earth and Space Science York University 4700 Keele St. Toronto, Ontario, M3J 1P3 Canada Tel: (416) 223-8368 Fax: (416) 736-5626 E-mail: sclodman@yorku.ca</p>

What's New at CMOS?²

Through an agreement with the Department of Fisheries and Oceans, CMOS will be providing the secretariats for the National Committees of the Scientific Committee on Oceanic Research (SCOR) and the Engineering Committee on Oceanic Resources (ECOR). Both organizations are affiliated internationally with NRC which is the national adhering member to the International Council of Scientific Unions (ICSU) for Canada.

SCOR and CMOS have had a long association with one another in that CMOS has provided the venue for SCOR meetings at Congress sessions. In fact, many members of CMOS have served on the national committee and participated as members on SCOR International Working Groups. Since its beginning some four decades ago, SCOR has served primarily as a body that facilitates international cooperation in oceanography. It brings together groups of individuals to discuss a variety of oceanographic problems. There are now fifteen active Working Groups but the list of past Working Groups exceeds one hundred.

Working Groups are established by SCOR on the basis of proposals received from national committees, other organizations or even individual scientists. The outcome of their work may be a scientific publication, a book or special volume of a journal. Working Group activities may lead to large-scale undertakings such as the International Marine Global Change Study (IMAGES) which arose from a SCOR Working Group on Sediment Coring for International Global Change Research.

Membership of SCOR is open to all countries with active oceanographic research communities.

ECOR is a smaller and younger body than SCOR but essentially it works in the same way as SCOR but its thrust has an engineering orientation. It has several active Working Groups, two of which are the Wave Energy Working Group and the Marine Pollution Working Group; two others that are under consideration are Tanker Safety and Natural Marine Disasters.

We are expecting to feature reports and articles from SCOR and ECOR in forthcoming issues of the Bulletin which will help in making members aware of some of the current ocean studies.

It is also our intention to establish a SCOR/ECOR Web site.

Neil Campbell
Executive Director

Quoi de neuf à la SCMO?

Grâce à une entente conclue avec le ministère des Pêches et des Océans, la SCMO fournira des services administratifs pour les comités nationaux canadiens du Comité scientifique de la recherche océanique (SCOR) et du Comité de l'ingénierie des ressources océaniques (ECOR). Ces deux organismes sont associés au niveau international avec le CNRC qui est membre adhérent pour le Canada au Conseil international des unions scientifiques (CIUS).

Le SCOR et la SCMO sont associés de longue date puisque les congrès de la SCMO ont été le site des réunions du SCOR. En fait, de nombreux membres de la SCMO ont siégé au comité national et participé en tant que membres aux groupes de travail internationaux. Depuis ses débuts il y a de cela presque quarante ans, le SCOR a surtout été un organisme servant à faciliter la coopération internationale en matière d'océanographie. Il regroupe des individus afin de discuter d'une variété de problèmes océaniques. Il existe à présent quinze groupes de travail actifs, mais la liste des groupes de travail antérieurs dépasse la centaine.

Les groupes de travail du SCOR sont établis en fonction des propositions reçues des comités nationaux, d'autres organisations et même de scientifiques à titre personnel. Leur travail peut aboutir dans la publication d'un article scientifique, livre ou volume spécial pour une revue. Les activités des groupes de travail peuvent mener à des projets à grande échelle telle que International Marine Global Change Study (IMAGES) qui est survenue à la suite d'un groupe de travail du SCOR sur les carottes de sédiments pour la recherche internationale sur les changements planétaires.

Les membres de SCOR proviennent de tous les pays qui possèdent des communautés actives en recherche océanique.

ECOR est plus petit et plus récent que SCOR, mais travaille essentiellement de la même façon avec un angle sur l'ingénierie. Il possède plusieurs groupes de travaux actifs, dont un sur l'énergie des vagues et un autre sur la pollution marine, et deux autres sous études sur la sécurité des navires-citernes et les sinistres marins naturels.

Nous prévoyons publiés des articles de fond et des rapports de SCOR et ECOR dans les prochains numéros du Bulletin qui permettront aux membres de se familiariser avec certaines des études océaniques actuelles. Nous espérons également créer un site Web SCOR/ECOR.

Neil Campbell
Directeur exécutif

²The English text has already appeared in Vol.27, No.3; we are now reproducing it along with the French text.

**Call for Papers
CMOS 2000
34th Annual CMOS Congress**

The Vancouver Island Centre of the Canadian Meteorological and Oceanographic Society (CMOS) will host the 34th Annual CMOS Congress at the University of Victoria from 29 May to 2 June, 2000. The theme is "The Role of the Pacific in Climate and Weather". Contributions are particularly sought on analysis, modelling, and theoretical aspects of this topic including Pacific weather, climate and climate change, El Niño/Southern Oscillation, Pacific decadal oscillation, Arctic/Antarctic oscillation, ocean observations and analysis, and biogeochemical cycles. Sessions will be held on a broad array of other aspects of atmospheric and oceanic science and contributions are sought in all areas of meteorology and oceanography.

Abstracts will be received until February 4, 2000. Authors are strongly encouraged to submit abstracts, of less than 300 words, interactively through the conference web site:

<http://www.cccma.bc.ec.gc.ca/cmos2000/>

The electronic submission of abstracts produces a faster approval process for authors and greatly facilitates the organization of the scientific program and the printing of the program and abstracts volume. Submissions may also be sent by mail to:

George Boer, Co-Chair
CMOS2000 Congress Scientific Program Committee
Canadian Centre For Climate Modelling And Analysis
Atmospheric Environment Service
University Of Victoria
P. O. Box 1700
Victoria, B.C. V8W 2Y2 Canada

Commercial exhibits will be on display during the Congress. For further information contact either:

■ George Boer, Co-Chair
Scientific Program Committee
George.Boer@ec.gc.ca, (250)363- 8226;
■ John Fyfe,
Local Arrangements Committee
John.Fyfe@ec.gc.ca, (250) 363-8236; or
■ Diane Masson,
Commercial Exhibits
MassonD@pac.dfo-mpo.gc.ca, (250) 363- 6521.

**Invitation à Présenter des Communications
SCMO 2000
34^e Congrès annuel de la SCMO**

Le Centre de l'Île de Vancouver de la Société canadienne de météorologie et d'océanographie (SCMO) seront les hôtes du 34^e Congrès annuel qui se tiendra à l'Université de Victoria du 29 mai au 2 juin 2000. Le thème de la conférence est "L'influence de l'océan Pacifique sur le climat et le temps". Particulièrement recherchées sont les contributions touchant à l'analyse, la modélisation ainsi que d'autres aspects théoriques reliés à ce domaine de recherche tels le temps sur le Pacifique, le climat et les changements climatiques, l'oscillation El Niño et l'oscillation australe, les oscillations décennales du Pacifique, les oscillations Arctiques et Antarctiques, observations et analyses océaniques, et les cycles biogéochimiques. Par ailleurs, de nombreuses séances couvriront un large éventail de sujets tant en sciences atmosphériques qu'océaniques, aussi acceptons-nous les communications touchant tous les domaines de la météorologie et de l'océanographie.

On peut faire parvenir des résumés jusqu'au 4 février 2000. Les résumés ne doivent pas dépasser 300 mots. Nous encourageons fortement les auteurs à nous les soumettre électroniquement en utilisant le site Internet du congrès à l'adresse suivante :

<http://www.cccma.bc.ec.gc.ca/cmos2000/>

La soumission des résumés par voie électronique accélère le processus d'approbation pour les auteurs et facilite l'organisation du programme scientifique et l'édition des volumes du programme et des résumés. On peut également nous les soumettre par courrier régulier à:

George Boer, coprésident
SCMO Congrès 2000 - Comité du programme scientifique
Centre canadien de la modélisation et de l'analyse climatique
Service de l'environnement atmosphérique
Université de Victoria
B.P. 1700
Victoria, B.C. V8W 2Y2 Canada

Une exposition commerciale aura lieu pendant le Congrès. Pour obtenir plus de renseignements, contactez soit:

■ George Boer, coprésident
Comité du programme scientifique
George.Boer@ec.gc.ca, (250) 363-8226;
■ John Fyfe,
Comité local d'organisation
John.Fyfe@ec.gc.ca, (250) 363-8236); ou
■ Diane Masson,
Exposition commerciale
MassonD@pac.dfo-mpo.gc.ca, (250)363-6521.

**International Association for
Hydraulic Research
Fifth International Symposium on
Stratified Flows**

**The University of British Columbia
Vancouver, Canada
July 10 - 13, 2000**

Venue

The symposium will take place on the campus of the University of British Columbia, situated on 450 hectares of woodland, a secluded haven only 10 km from downtown Vancouver. The University's setting, with views of the ocean and snow-capped mountains, is one of the most spectacular in the world.

Accommodation

Comfortable, reasonably priced accommodation is available on campus at the Walter Gage residence within easy walking distance of the meeting.

Scientific Scope

The Fifth International Symposium on Stratified Flows will extend the series started in Novosibirsk (1972), and continued in Trondheim (1980), Caltech (1987) and Grenoble (1994). These meetings have acted as a forum for presenting noteworthy advances in all aspects of the study of stratified flows. Topics to be covered will include:

Hydrodynamic instability; Stratified turbulence;
Internal waves; Oceanic and atmospheric flows;
Lake dynamics; Convection, entrainment and mixing;
Intrusions and gravity currents; Exchange flows;
Multilayer hydraulics; Jets and plumes.

Social Program

Social events will include an opening reception and a dinner cruise on Vancouver Harbour. Free time will be scheduled during the conference, and tours emphasizing the attractions of Vancouver and surrounds will be available for delegates and accompanying persons. Wide-ranging recreational facilities are at hand.

Visas

Participants from foreign countries are advised to apply for a visa (if needed) at least three months prior to the conference.

Local Organizing Committee

Susan Allen;
Gregory Lawrence (Chair);
Roger Pieters;
Douw Steyn;
Peter Ward;
Noboru Yonemitsu (Vice-chair).

Deadlines and Key Dates

- November 30, 1999: Submission of abstract
- February 29, 2000: Notice of acceptance of abstract
- May 15, 2000: Receipt of camera-ready papers
- May 31, 2000: Early registration deadline
- July 10-13, 2000: Conference

Further Information

The Second Announcement will call for papers and give registration and accommodation information; it will be available in fall 1999 at the Conference Website at:

<http://www.civil.ubc.ca/ISSF2000.html>

Canadian Hydrographic Conference

The Canadian Hydrographic Conference will be held in Montréal from May 15 to 19, 2000. The Conference, organized by the Canadian Hydrographic Association, is jointly sponsored by the Canadian Hydrographic Service of DFO, the International Hydrographic Organization, the International Federation of Surveyors and the Québec Department of Industry, Trade, Science and Technology.

Conference Theme

The Conference is intended for the marine community in general and for marine science and geomatics stakeholders. The theme of the Canadian Hydrographic Conference 2000 will be *Hydrography: People forging Alliances*. In choosing this theme, members of the Organizing Committee wanted to focus conference activities on people. The Conference will be a forum for exchanges and communication among people working in areas related to hydrography. Participants will be made to feel completely at home with people from different spheres of activity.

Conference Activities

All technical activities (meetings, workshops, exhibits, presentations) will take place at the Queen Elizabeth Hotel in downtown Montréal, Canada. Training workshops will provide an opportunity to examine in depth some of the burning hydrography issues that are of significant importance to the industrial and academic sectors. All of the workshops will focus on activities where developments have been a constant feature and which, in the past, have resulted in spectacular achievements, such as: multi-beam sonar systems, GPS and its applications, AIS technology, remote sensing as applied to hydrography, integrated marine traffic control services and hydrographic modelling: The workshops will be facilitated by leaders in the different fields.

Space has been set aside for commercial and institutional exhibitors in areas adjacent to the conference and meeting rooms. Exhibitors will display products such as satellite

positioning systems, computer assisted mapping systems, acoustic scanning survey systems and many other new products arising out of recent hydrographic developments. The exhibition will introduce participants to the latest technological products in the field of hydrography. During the week's activities, time will be set aside for exhibitors to give technical demonstrations on board vessels or at the Conference site.

Theme Sessions

The Conference will usher hydrography into the XXIst century. But it is by looking at the past that we can appreciate the progress made in the field of hydrography. The Conference's technical program will be an outstanding opportunity for interdisciplinary exchanges on current issues in the field of hydrography. In order to give the Conference a local flavour, all theme sessions will include a presentation related to an activity or an achievement affecting the St. Lawrence. Simultaneous French-English interpretation will be available during all theme sessions.

Among the theme selected by the Organizing Committee are:

History of hydrography; Applications; Technology; Integration; Services and Marketing; Standards and Training; Partnerships.

There will also be a Marine Industry Forum on May 19, 2000. It will be aimed at industry stakeholders and those who use their services.

Call for Papers

Presentations to the Conference and to the training workshops are now requested. Summaries of between 100 and 300 words, in French or English, must be submitted by October 29, 1999. Camera-ready versions of the selected presentations, in French or English, must be submitted by February 29, 2000. The Conference proceedings will be published on CD-ROM and will also be available, on request only, on hard copy.

Additional Information

For more information about the Canadian Hydrographic Conference 2000, registration, program, exhibition, hotel facilities and transportation, please write to:

Canadian Hydrographic Conference 2000
Institut Maurice-Lamontagne
850, route de la Mer
C.P. 1000
Mont-Joli, Québec, G5H 3Z4 Canada
E-mail: chc2000@dfo-mpo.gc.ca
URL: chc2000.qc.dfo-mpo.gc.ca

Conférence Hydrographique du Canada

La Conférence hydrographique du Canada aura lieu à Montréal du 15 au 19 mai, 2000. Cette conférence est organisée par l'Association canadienne d'hydrographie et parrainée conjointement par le Service hydrographique du Canada, l'Organisation hydrographique internationale, la Fédération internationale des Géomètres et le ministère québécois de l'Industrie, du Commerce, de la Science et de la Technologie.

Thème de la Conférence

La Conférence s'adresse à la communauté maritime en général ainsi qu'aux intervenants oeuvrant en sciences de la mer et en géomatique marine. Le thème de la Conférence hydrographique du Canada de l'an 2000 est: L'hydrographie: des gens, des alliances. Par ce choix, les membres du comité organisateur ont voulu axer les activités sur la personne. La Conférence stimulera les échanges et la communication entre des gens de plusieurs disciplines ayant un rapport avec l'hydrographie. Les participants se sentiront plus près des autres personnes qui gravitent dans des sphères d'activités variées.

Activités de la Conférence

Toutes les activités techniques (réunions, ateliers de travail, exposition, présentations) se dérouleront à l'Hôtel le Reine Elizabeth au coeur de Montréal au Canada. Les ateliers de formation offriront la possibilité de couvrir en profondeur des sujets chauds reliés à l'hydrographie qui ont des ramifications et des impacts significatifs dans les secteurs industriels et académiques. Les ateliers porteront tous sur des activités marqués par d'intéressants développements qui ont parfois donné des réalisations spectaculaires dans le passé, telles que: les systèmes de sondage multi-faisceaux, le GPS et ses applications, la technologie AIS, la télédétection appliquée à l'hydrographie, les services intégrés pour le contrôle du trafic maritime, ainsi que la modélisation hydrodynamique. Les ateliers seront menés par des experts dans les domaines respectifs.

Des espaces ont été alloués pour les exposants commerciaux et institutionnels dans des aires adjacentes aux salles de conférences et de réunions. Les exposants présenteront des produits tels que des systèmes de positionnement par satellite, des systèmes de cartographie assistée par ordinateur, des systèmes de sondage par balayage acoustique et bien d'autres nouveautés issues des récents développements dans le domaine hydrographique. L'exposition permettra aux participants de se familiariser avec les dernières nouveautés technologiques dans le domaine de l'hydrographie. Durant cette semaine d'activités, des périodes seront spécialement réservées aux démonstrations techniques par les exposants à bord de navires ou directement sur le site de la Conférence.

Sessions Thématiques

La Conférence soulignera l'entrée de l'hydrographie dans le XXI^e siècle. C'est en jetant un regard sur le passé que l'on constate le chemin parcouru dans le développement de l'hydrographie. Le programme technique de la Conférence favorisera le maximum d'échanges interdisciplinaires, portant sur des sujets d'actualité en hydrographie. Afin de donner une saveur régionale à la Conférence, toutes les sessions thématiques incluront une communication portant sur une activité ou une réalisation touchant le Saint-Laurent. La traduction simultanée anglais-français sera disponible durant toutes les sessions thématiques.

Parmi les thèmes choisis par le comité organisateur on trouvera:

Histoire de l'hydrographie; Applications; Technologie; Intégration; Services et commercialisation; Normes et Formation; Partenariat.

De plus, un forum de l'industrie maritime aura lieu le 19 mai 2000 et s'adressera aux intervenants du milieu industriel ainsi qu'à ceux qui y font appel.

Demande de communications

Les auteurs sont invités à présenter des communications à la Conférence et aux ateliers de formation. Des résumés d'une longueur de 100 à 300 mots, en français ou en anglais, doivent être soumis au plus tard le 29 octobre 1999. Les communication sélectionnées devront être soumises sous forme de prêt-à-photographier pour le 29 février 2000 et pourront être rédigées en français ou en anglais. Les comptes-rendus seront disponibles sur CD-ROM mais pourront être obtenus, sur demande seulement, en copie papier.

Renseignements additionnels

Pour plus d'information sur la Conférence hydrographique du Canada 2000, pour les inscriptions, le programme et l'horaire, pour les exposants, les services hôteliers et le transport, prière d'écrire à:

Conférence hydrographique du Canada 2000
Institut Maurice-Lamontagne
850, route de la Mer
C.P. 1000
Mont-Joli, Québec
G5H 3Z4 Canada
courriel: chc2000@dfo-mpo.gc.ca
Site web: chc2000.qc.dfo-mpo.gc.ca

Cat Conferences

The National Hurricane Conference

Halifax, Nova Scotia

Friday, September 24, 1999

The Institute for Catastrophic Loss Reduction is pleased to announce its next conference about managing hurricane and storm surges exposures. Leading scientists will discuss Canada's increased vulnerability to hurricanes and storm surges as a result of climate change. They will also cover the lessons learned from the 1869 Saxby Gale, 1954 Hurricane Hazel and 1996 Hurricane Hortense. There will be presentations concerning the best industry practices to manage this exposure. Focus will be on mitigation investments to reduce Canada's vulnerability and specifically insurance industry losses.

The Cat Loss Institute seeks to strengthen the insurance community's awareness of the risks associated with natural disasters. These full day conferences will be held across Canada to address both the local and national exposure. If you wish to attend The National Hurricane Conference, please confirm your participation by contacting Alan Pang at (416) 362-2031 ext. 342 or apang@iclr.org. The conference will be held at the Radisson Suite Hotel Halifax (902) 429-7233. Registration will begin at 8:00 a.m. and the conference will close at 4:30 p.m. Registration cost is \$150 (\$225 for non-members). Please make your cheque payable to the Institute for Catastrophic Loss Reduction and send it to:

Mr. Alan Pang
151 Yonge Street, 18th Floor
Toronto, Ontario, Canada
M5C 2W7



Check for upcoming events:
Extreme Weather in Toronto on October 14.

WATERSHED 2000

Conference Announcement
and Call for Papers
Hotel Vancouver
Vancouver, British Columbia, Canada
9-12 July 2000

The Water Environment Federation (WEF), the British Columbia Water and Waste Association, and the Western Canada Water and Wastewater Association are sponsoring the international specialty conference WATERSHED 2000, with the support of the International Joint Commission; the U.S. Environmental Protection Agency; Environment Canada; Fisheries and Oceans Canada; the British

Columbia Ministry of Environment, Lands, and Parks; and the British Columbia Ministry of Forests. Building on the success of WEF's 1996 conference in the Mid-Atlantic, and 1998 conference in the Rocky Mountains, WATERSHED 2000 - to be held in the Pacific Northwest - will explore national and international challenges of managing watersheds. The conference will bring together environmental professionals for a showcase on integrated resource management and environmental protection principles using watershed-based approaches.

The Pacific Northwest exhibits many common climatic and ecological features, yet the political and jurisdictional boundaries spanned by many of its watersheds create challenges to effective watershed management. The contrasts and common approaches among Canadian and U.S. federal agencies and among the state, provincial, and tribal/band agencies will be explored. Attendees will see and hear the latest information on implementing watershed planning, protection, restoration, and education. Real-life experiences and lessons will be outlined. The conference will include oral presentations, interactive discussions, posters, exhibits, and tours. Potential speakers are asked to submit an abstract for consideration. Abstracts related to Native American/First Nations issues are encouraged. Topics to be addressed include:

A	Sustainable Watershed Protection
B	Multi-Use Watershed Management - Approaches and Steps
C	Voluntary versus Mandatory Approaches
D	Local, Regional, National and International Jurisdictional Issues
E	Total Maximum Daily Loads and Watershed Pollutant Load Trading
F	Watershed Restoration Activities and Habitat Improvements
G	Effectiveness of Best Management Practices (BMPs)
H	Regulatory, Legislative, and Institutional Issues
I	Forestry, Agricultural, and Mining BMPs and Issues
J	Managing Watershed to Support Fisheries
K	Coastal and Wetland Issues
L	Water Resource Planning and Source Water Protection
M	Urban Watershed Issues
N	Land Management - Public and Private

O	Geographic Information System, Modeling, and Monitoring
P	Use of Environmental Indicators and Standards
Q	Public Education and Stakeholder Involvement
R	Financing BMPs and Watershed Programs
S	Risk-Based Watershed Management Strategies
T	Creative Watershed Programs - Case Studies
U	Balancing Environmental and Economic Issues

Submit abstracts for papers on subjects outlined in the table above. Abstracts must be received no later than 15 November 1999. Authors will be notified of acceptance of papers in early January 2000 and must submit a manuscript by 27 March 2000 for inclusion in the Conference Proceedings. Speakers will be responsible for paying their own travel expenses and registration fees. Registration fees are approximately \$450 for full conference, advance registration, WEF member. Additional information is available by contacting:

Mr. John H. Patterson
 Tel: (604) 666-0524
 e-mail: pattersonj@pac.dfo-mpo.gc.ca

**Tertia M.C. Hughes Memorial Symposium
 November 23, 1999**

**McGill University, Montréal,
 Québec, Canada**

Second Announcement

In remembrance of Tertia Hughes, former graduate student in the Department of Atmospheric and Oceanic Sciences, McGill University, during 1989-1995, a special memorial symposium will be held on Tuesday, November 23, 1999, marking the first anniversary of her passing.

The event, hosted jointly by the Centre for Climate and Global Change Research and the Department of Atmospheric and Oceanic Sciences, will be held at the McGill Faculty Club, 3450 McTavish Street, Montreal, Quebec, H3A 1X9, from 2:00 - 5:00 p.m. The symposium will be followed by a reception.

Tributes from close friends and colleagues will include, amongst others, presentations by Professor Andrew Weaver, University of Victoria, and Professor Jorge Sarmiento, Princeton University. For further information please contact:

Ms. Angie Mansi
 Assistant to the Director
 Centre for Climate & Global Change Research
 McGill University
 805 Sherbrooke Street West
 Montreal, QC H3A 2K6 CANADA
 Tel: (514) 398-3759; Fax: (514) 398-1381
 Web site: <http://www.mcgill.ca/ccgcr>
 E-mail: mansi@felix.geog.mcgill.ca

Note from the Editor

The following table was inadvertently lost during electronic transmission while preparing the 1998 Annual Review. It provides the Ottawa Centre Financial Statement for 1998. We apologize for this inconvenience and, as promised, are publishing the financial table in this issue.

Financial Statement in \$:

Balance December 31, 1997		2,141.07
Plus Income:		
Luncheon (9 meetings)	3,229.00	
CMOS Subvention	270.00	
Bank Interest	1.51	
Minus Expenses:		
Luncheon (9 meetings)	3,571.22	
Stamps & envelopes	226.34	
Photocopying	71.49	
Purchase of 10 CMOS pins	50.00	
Purchase of fax machine	310.56	
Purchase of blank cheques	10.54	
Science Fair	280.00	
Balance December 31, 1998		1,121.43

Memories from the Montréal Congress Souvenirs du dernier congrès à Montréal

Photographs are shown on page 127 - Les photographies sont présentées en page 127.

- ☺ From left to right - de gauche à droite.
- ☺ De haut en bas - from top to bottom.

- 1: Pierre Dubreuil welcoming the participants;
 → Pierre Dubreuil accueille les congressistes.
- 2: A participant visits a commercial exhibit;
 → Un congressiste visite un exposant commercial.
- 3: The famous Kelvin Band performs at the banquet;
 → Le célèbre orchestre Kelvin jouant au banquet.
- 4: Steven Stringer, winner of the Weather Research House Scholarship, receives his cheque;
 → Steven Stringer, gagnant de la bourse Weather Research House, reçoit son chèque.
- 5: The Students who received CMOS travel grants;
 → les étudiants qui ont reçu une subvention de voyage de la SCMO.
- 6: The newly elected President: Ian Rutherford;
 → le nouveau président élu: Ian Rutherford.
- 7: AES ADM, Gordon McBean at the banquet;
 → le SMA du SEA, Gordon McBean au banquet.
- 8: Greg Flato, Chair of the Vancouver Island Chapter (which will host the CMOS Congress, May 29-June 2, 2000);
 → Greg Flato, Président du Chapitre de l'Île de Vancouver (qui sera l'hôte du congrès de la SCMO du 29 mai au 2 juin 2000).
- 9: Chair of the Local Arrangements Committee: Jean-Guy Cantin;
 → le président du comité local d'organisation: Jean-Guy Cantin.

The photographs are courtesy of Jacques Lavigne, Atmospheric Environment Service, Québec Region. We are grateful for his excellent work. More (117) can be viewed at:

<http://www.cmc.ec.ca/scmo99/slideshow>

Les photographies ont été prises par Jacques Lavigne, Service de l'environnement atmosphérique, région du Québec. Nous lui sommes reconnaissants pour ce travail magnifique. Vous pouvez visionner le tout (117) à:

<http://www.cmc.ec.ca/scmo99/slideshow>



**CMOS-ACCREDITED CONSULTANTS
EXPERTS-CONSEILS ACCRÉDITÉS de la SCMO**

Mory Hirt

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Applied Climatology and Meteorology
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E-mail: kel@nexus.yorku.ca*

Ian J. Miller, M.Sc.

Marine Meteorology and Climatology
Applied Meteorology, Operational Meteorology
Broadcast Meteorology

*Météomédia / The Weather Network
1755, boul. René-Levesque Est, Suite 251
Montréal, Québec, H2K 4P6 Canada
Tel: (514) 597-1700 Fax: (514) 597-1591*

Douw G. Steyn

Air Pollution Meteorology
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