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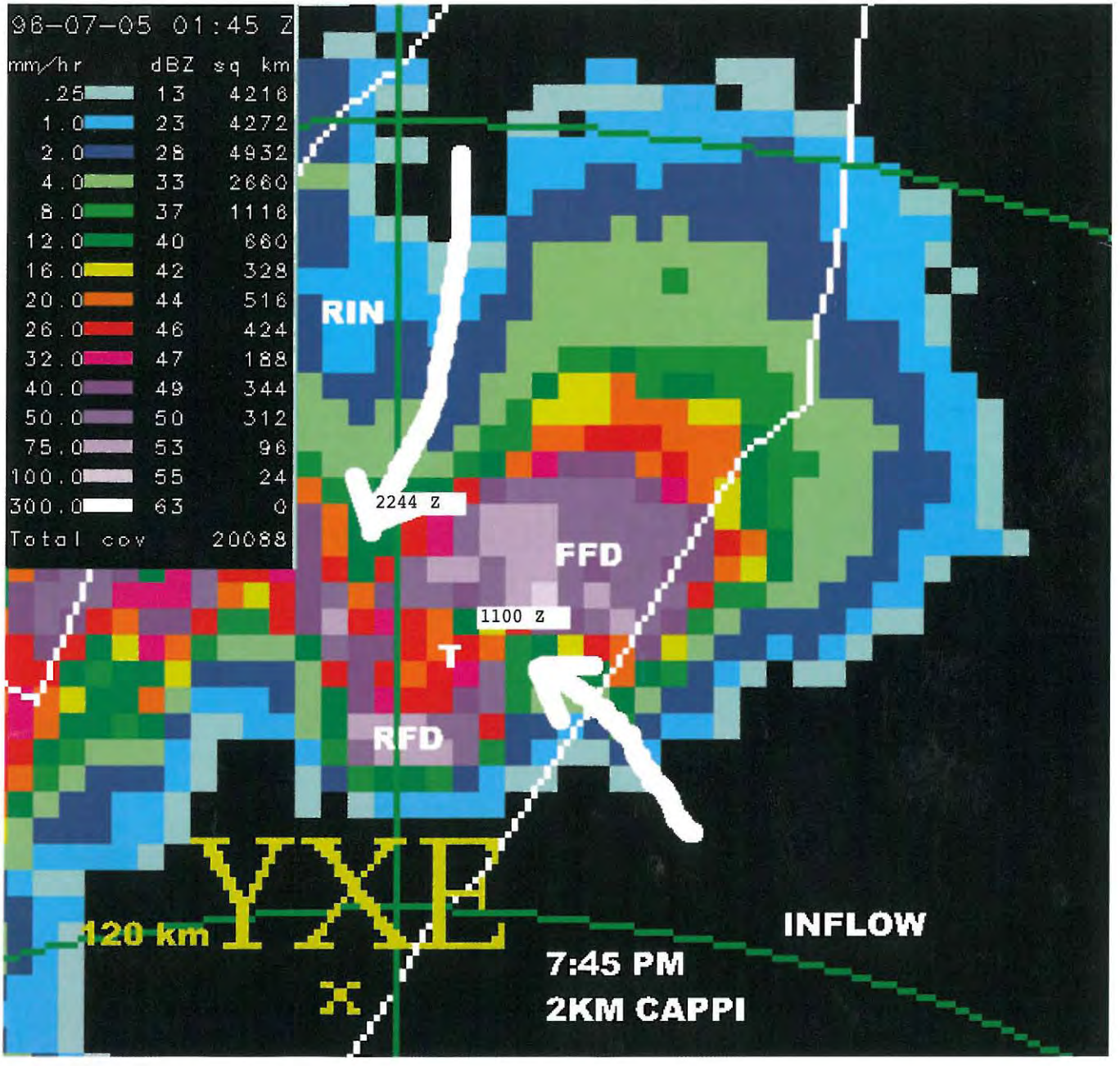

CMOS Bulletin SCMO
"at the service of its members
au service de ses membres"

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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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Adresses électroniques de la SCMO

....Last summer e-mails to and from the President's Desk

I am writing to you from the Adaptation and Impacts Research Group at Environment Canada where we are currently assessing the wind-chill indices and evaluating their usefulness in Canadian public weather reports. I am seeking any input that you may have on the current methods used to calculate and report wind chill, and was wondering if you find those methods effective and accurate. Also, how is wind chill reported in the forecast? Please forward me any information or documents that I may find useful. I would appreciate this information by September 10, 1999 if possible due to time restrictions, hence, I apologize for the short notice. Thank you for your co-operation,

Melynda Bitzos

Melynda,

What follows is a strictly personal point of view and not the point of view of the organisations that I represent.

As a former DG of Weather Services (in the days when there was such a thing) I was heavily involved in the initial implementation of wind chill information in Canadian public weather forecasts. We insisted from the beginning that this should be expressed in terms of heat removal from exposed bare skin in watts/m^2 and provided information on various thresholds beyond which skin would freeze in such and such a time. Of course it is easy to translate this information in terms of the so-called equivalent wind-chill temperature and indeed the little wallet cards and other graphs that we provided make such conversion easy.

All of this was done with the supposed good intention of educating the public on the physics of heat removal from exposed human flesh. We pretended that it was somehow more "physical" than providing just the equivalent temperature and avoided the misinterpretation that the temperature of anything left outside would fall to the level of the wind-chill equivalent temperature.

Only on the Prairies did wind-chill in watts/m^2 attain anything like public comprehension. When Ontario region attempted to introduce these units last winter there was a huge negative reaction. The plain truth is that ordinary people relate much more easily to thresholds expressed in terms of equivalent temperature than they do to watts/m^2. They are interested in the effect, not the cause, and analogues like the equivalent temperature are instantly understandable. The media react to this situation by translating watts/m^2 to equivalent temperature anyway.

Volume 27 No. 5
October 1999 - octobre 1999

Inside / En Bref

Last summer e-mails to and from the President's Desk **p. 129**

Articles

A Strategy for Long-Term Ocean Observations by Worth D. Nowlin Jr. **p. 131**

The 4th July 1996 Maymont-Osler High Precipitation Supercell by Stephen R.J. Knott **p. 137**

UBC Neural Network Model Forecasts another La Niña Winter by William W. Hsieh and Benyang Tang **p. 144**

Our regular sections / Nos chroniques régulières

News - Nouvelles
Announcements - Annonces **p. 145**

Conferences / Conférences **p. 153**

CMOS-Accredited Consultants - Experts-Conseils accrédités de la SCMO **p. 160**

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In the final analysis all that matters is whether people act on the information provided and avoid unnecessary exposure and injury. This is much more likely to occur when the information is provided in a form that people can instinctively relate to. Equivalent temperature wins hands down. It doesn't really matter if farmers think the temperature of their poor tractor is going to fall to this temperature. They understand that tractor will cool down more quickly when the wind-chill is more severe and that's useful too.

Ian D Rutherford

My own personal opinion - I agree 100% with Ian's comments.

John Falkingham

Hi Ian: Here is my own personnal view (like you, nothing official here...). I stated at the time when watts/m^2 was being proposed that I did not like this at all, for reasons very similar to what you mention here.

I also mentioned that degrees Celsius was the only choice that the public would readily understand and act upon.

I also added that the name "equivalent temperature" is the source of all the confusion, and should never be used. It

should be replaced by "equivalent cooling rate" or even more simply "windchill". Hence, the temperature would be -15 and the equivalent cooling rate would be -35... The real confusion comes from naming two different things as temperature, not from the use of Celsius.

Pierre Dubreuil

Pierre,

Sorry to disagree with you on this, but I think your suggestion will be shot down because cooling rate cannot be measured in temperature units (or so the physicists will say!). How about calling it the "windchill temperature" rather than "equivalent temperature"? At least you would negate that argument. You heard it here first!

Ian D. Rutherford

P.S. The full form would be "exposed flesh windchill equivalent temperature" but only in English can you get away with a string of modifiers like that! The media in fact use the expression "windchill", which is your second suggestion and it's as good a short form as one can think of. On the other hand, the media frequently refer to wind speed in "kilometres", so usage can't be the only criterion!

I beg to differ. If we used this logic, we would still have the English system of units in use. Many radio stations still give the temperature in Fahrenheit but I don't hear anyone proposing that we return to using Fahrenheit officially (or gallons instead of litres). Ontario Region made the decision many years ago to revert to, or allow, equivalent temperature, and that has, in part, led to the situation we face today. Of course, my comments come from a prairie perspective where wind chill in watts/m^2 has received wider acceptance than elsewhere in the country.

Ron Hopkinson

Hi Melynda and Ian,

I didn't want to cc this to the entire group as these things can generate a lot of e-mail traffic. I agree with Ian that the 'effective temperature' is a much more easily understood quantity than heat loss in watts/m^2. The way I have often heard this reported is "the temperature is -XX, and with the wind chill, this will feel like -YY". I think this is straightforward and effective. It doesn't really matter that the average person (or I) can define precisely what this wind chill temperature really means or how it is computed, what does matter is that when expressed in this way it provides the information in a concise, self-explanatory, and intuitive manner. People hear the '-YY' number and say "I have to remember my gloves today".

Greg Flato

P.S. As others have stated, this opinion is my own, not that of Environment Canada, AES, etc....

Communicating with the public demands that the meteorological community use terms the ordinary person in the street can relate to directly ... preferably without having to "educate" them.

Temperature whether C or F is a universally understood concept - thermometers are everywhere ...so it is not surprising that temperature or equivalent temperature is a preferred communications unit. Watts/m^2 is not a unit with which the average person grows up (the prairies excepted perhaps). There are no meters to measure wind chill in watts/m^2 and if there was one, the average person would only own one if it were inexpensive enough to be mass marketed.

If we take the media to be reasonably representative of the average (or better) knowledge level in weather and if they prefer (or relate better to) equivalent temperature than watts/m^2, then it is likely as well that the average person in the street prefers equivalent temperature too.

Much of this is conjecture of course....there is a tendency in the meteorological community to assume that it knows best. The only way to determine if the public really understands how to react appropriately to equivalent temperature or watts/m^2 is to sample their reaction when wind chill is expressed one way or the other.... does anyone have a study?

Rick Lee

Hi Ian,

I've been so pleased with the response to wind chill, it has become quite an interesting debate! Thanks for circulating my request!

Melynda Bitzos

Personal note from the Editor

I thought that the above series of e-mails going back and forth over the President's desk was kind of interesting for the *CMOS Bulletin SCMO* readers. Particularly when I received a copy of the whole package of e-mails, it was 30-degrees Celcius outside, no chill factor!!!!!

Paul-André Bolduc

Next Issue - Prochain Numéro

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

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

A Strategy for Long-Term Ocean Observations

by Worth D. Nowlin Jr.

Résumé

Pendant plusieurs années, j'ai participé aux efforts de la recherche du Programme mondial de recherches sur l'atmosphère et du Programme mondial de recherches sur le climat, et au cours de la dernière décennie, j'ai aussi contribué au développement du Système mondial d'observation océanique (SMOO) et du Système mondial d'observation du climat (SMOC). Parmi la communauté océanographique, on constate plusieurs différences d'opinion sur la façon de mettre à exécution et à nous assurer à long terme d'un système d'observation océanique dont on aura besoin pour la recherche et les objectifs de société. En rapport avec ces constatations, j'ai pris en considération des éléments qui peuvent, dans l'ensemble, constituer la base d'une stratégie pour la mise en oeuvre et l'assurance d'un système d'observation océanique. Ces éléments pour une stratégie, en plus de ceux obtenues de discussions générales et de quelques opinions, sont présentés. Quoique la plupart des éléments caractéristiques présentés dans cet article s'appliquent aux États-Unis, on peut dire que le concept est d'envergure internationale. Si nous devons nous assurer de posséder un système d'observation océanique, je crois que nous devons avoir une stratégie, même si ce n'est pas celle suggérée ici. Pour cette raison, une stratégie est un avantage considérable, si non une nécessité, d'abord pour les scientifiques qui étudient les phénomènes à long terme et puis pour d'autres usagers de l'information et de produits nécessitant un système d'observation océanique. De plus, les gens qui sont impliqués dans l'étude de phénomènes de courte échéance pourraient en bénéficier également en rapport avec la description et la compréhension de ces phénomènes.

1. Introduction

For many years I have participated in research efforts of the Global Atmospheric Research Programme and the World Climate Research Programme, and over the last decade in the development of the Global Ocean Observing System (GOOS) and the Global Climate Observing System (GCOS). Within the ocean science community one observes many differences of opinion, and consequently of approach as to how to implement and sustain long-term observations needed for research and for societal needs.

Based on such observations, I have considered elements that may, in aggregate, constitute the basis of a strategy for implementing and sustaining ocean observations. Those elements of a strategy, together with some opinions and general discussions, are offered here. Though most of the specifics offered here pertain to the United States, the concepts are international in scope.

I believe that we must have a strategy (though perhaps not the one outlined here) if we are to have a system for sustained ocean observations. For this reason, a strategy is of considerable benefit, if not a necessity to scientists studying long-period phenomena and other users of information and products derived from sustained ocean observations. Moreover, those concerned with relatively short-period phenomena also will benefit from sustained observations; they can be used to describe the background against which shorter period events are viewed and understood.

It seemed appropriate to submit this manuscript to the Bulletin of the American Meteorological Society for several reasons. One reason is the Bulletin's broad readership by ocean and atmospheric scientists and by users of products based on sustained environmental observations. Another is the clear need for improved communication and cooperation among the ocean and atmospheric communities if we are to achieve combined global observing systems (e.g., GCOS).

2. Needs for long-term ocean observations

There is now much documented evidence of the need for long-term ocean observations. Uses for sustained ocean observations include those shown in Table 1. Some are for research; others are for information needed to protect and manage the environment; still others are for economic benefits or hazard/disaster mitigation. Broadly, these cover the needs of GCOS, GOOS, and the Climate Variability and Predictability Programme. Rationale for and status of sustained ocean ohservations are summarized in the document "The GOOS 1998" (Intergovernmental Ocenanographic Commission 1998).

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Table 1. Uses for long-term ocean observations
Provide data for numerical weather predictions.
Describe and predict marine meteorological and ocean surface conditions to facilitate safe and efficient marine operations.
Ensure national security.
Describe and understand the energetic variability and predictability of the physical climate system on timescales of seasons to centuries through analyses of observations and modeling.
Monitor and predict, as feasible, climate variability.
Detect and assess importance of the effects of climate change on ocean conditions.
Preserve and restore healthy marine ecosystems.
Manage living marine resources for sustainable use.
Assist in the mitigation of natural coastal hazards.
Ensure public health.

3. Some general considerations

Our institutional infrastructures for financial support and implementation are generally designed to support ocean observing systems meeting a single use and for a specific time period. However, 1) a given ocean observing system frequently can meet the needs of multiple users; 2) there often are multiple, in situ systems deployed independently in the same ocean regions, each justified for its own specific, single use; and 3) there are both research and operational uses (and a range of uses between) that require sustained observations. I offer three key points as background when contemplating the implementation of sustained ocean observations.

I many cases a particular sustained ocean observation is required for multiple uses. For example, satellite altimeter observations support monitoring of regional sea level changes, monitoring and predicting El-Niño-Southern Oscillation variability, monitoring ocean currents, and basic research into energetic variability. One can think of many other examples, starting with sea surface temperature and surface wind stress. Moreover, the need for an observation in support of a single use may not provide compelling justification for the support of a sustained measurement program. However, in those cases for which support is justified (e.g., fisheries, tsunami warning, or oil spill response), costs may be even better justified when multiple uses are made of the observations. Thus, my first background point is:

- there are multiple needs for sustained ocean observations, but there are few initiatives for observing system components that harmoniously combine measurements of multiple variables for multiple uses.

My second point is:

- there currently is a lack of identified financial support for sustainable ocean observing initiatives.

Some readers may have tried to sustain observations for research purposes; if so, you probably have experienced difficulty and frustration in attempting to maintain observations over periods longer than a very few years. I submit that there are severe difficulties inherent in supporting long-term systematic observations under our current mode of conducting and financing ocean research. This leads to my third point.

- Quasi-operational ocean observing systems are the primary way forward for long-term, systematic observations.

These points deserve consideration because, as I see it, they point to the need for some fundamental changes in the way business is done within the ocean science communities of many nations (specifically those nations in which ocean observations are mainly by individuals rather than by institutions, including the United States). In the broadest terms, we need evolution of our infrastructure to ensure common use of multiple-data systems by multiple users, so as to capitalize on potential synergy between components and to help justify the collection of sustained observations. To do this, we must entrain into the observing systems those operational users (private and governmental) who require sustained observations for specific single uses, while ensuring that the resulting common-use systems meet the multiple needs of the global observing systems and the research communities for sustained observations.

Table 2. Strategic elements needed for sustained ocean observations.
Implement operational observing systems for different environments.
Determine user needs and design sustained observing systems to meet requirements.
Coordinate observing systems via an integrated global strategy.
Develop mechanisms to involve researchers in the planning and oversi ght of observing system components.
Establish formal relationships between ocean and atmosphere communities for purposes of data collection, communication, and analyses.
Ensure timely release of data for intended uses.
Implement data and information management systems, supplementary to existing systems, that are attuned to the multiple sources of data and their multiple uses.
Develop and implement enhanced capabilities for the production of products - Syntheses of different data types; gridded, interpolated fields; nowcasts; forecasts; and assessment and warnings, among others.
Establish the coordination and agreements between agencies within nations necessary to integrate observing system activities.
Devise arrangements to provide stable, long-term support for required observing system elements.
Develop and use new technologies.

4. Elements of a strategy

Shown in Table 2 are some strategic elements (structures, mechanisms, and policies) that I believe assist in the implementation of sustained ocean observations. In fact, it can be argued that they are required for such observations.

These elements are elaborated on in the remainder of this section. It should be noted that the strategic elements in Table 2 are not sequential. They must be considered in parallel to achieve the synergy necessary to implement sustained ocean observing systems.

a) Implement operational observing systems for different environments

The ocean, atmospheric and terrestrial communities are organizing three new global observing systems: GOOS, the Global Terrestrial Observing System (GTOS), and GCOS. In some ways they are modeled on the World Weather Watch and Global Atmospheric Watch of the World Meteorological Organization (WMO). Already there are initial observing system designs for the GCOS and for those portions of GOOS focused on climate and the health of the oceans. Implementation is under way, though proceeding slowly - but that is expected. The remaining parts of GOOS and most of GTOS are still in the design phases but are developing rapidly.

b) Determine user needs and design sustained observing systems to meet requirements

The observing systems are intended to address economic, social, and environmental needs, as well as those of researchers. Therefore, the first step in designing observing systems is to determine the needs of potential users. The GOOS, GCOS and GTOS are being designed on that basis. It is expected that government, private and academic sectors will contribute to system designs based on needs. Within the United States, a GOOS Steering Committee has been established with interagency support and representation from all sectors to relate user needs to observations and products; the Committee also will consider priorities for implementation.

Only by basing sustained ocean observations and products on user needs can long-term support by private and public sectors be ensured. Because the availability of ocean observations, and products and information derived therefrom, will be new to many classes of potential users, user needs are often unclear as observing systems are being designed. Designs will evolve to better meet needs as users become involved in the use of resulting products and information.

c) Coordinate observing systems via an integrated global observing strategy

The need to coordinate the major global observing systems is clear and has been realized at the international level by the space agencies and by major research funding agencies in general. This coordination is referred to as the Integrated Global Observing Strategy. Several activities are under way. These include, among others, 1) the assembly, coordination and joint presentation to the space agencies of space-based measurements required by the combined observing systems; 2) the initiation of a data inventory center jointly between the systems; and 3) closer relationships between the ocean and atmosphere communities regarding sustained observations in the atmospheric marine boundary and the ocean.

Although an Integrated Global Observing Strategy may at first seem a superfluous layer of bureaucracy, it is in fact a *necessity* if we are to ensure that all requirements are properly considered, properly documented and jointly presented for possible financial support. This strategy must be utilized by both the operational and research communities to identify generally agreed-upon observations that will be sustained for long periods of time. Conceptually, the long-term observations needed by the World Climate Research Programme, the International Geosphere-Biosphere Programme and the Human Dimensions Programme would be included.

To achieve a truly integrated global ocean observing system, it is necessary that contributing nations integrate their sustained ocean observing systems. In response to a request from the U.S. Congress, the National Oceanographic Partnership Program is preparing plans for an integrated national system for sustained ocean observations.

d) Develop mechanisms to involve researchers in the planning and oversight of observing system components

Successful sustained observations have been initiated and overseen by dedicated research scientists; for the United States, examples include the Panularis station off Bermuda, the carbon dioxide record from Hawaii, the Tropical Atmosphere Ocean (TAO) array, and the California Cooperative Oceanic Fisheries Investigations records. While it is true that navies do operational oceanography - though for very specific purposes - and that countries such as Japan have significant sustained observational programs, the fact is that oceanography is not yet operational in most countries, and much (perhaps most) expertise resides within the scientific community.

Therefore, a major challenge is to devise mechanisms whereby this expertise can be utilized in the design, implementation, data quality control, data analysis and general oversight of operational subsystems. As examples, the World Ocean Circulation Experiment and Tropical Ocean Global Atmosphere programs have used researchers to assemble and quality control their datasets. Without utilizing such talent, it will be difficult or impossible to implement sustained ocean observing systems producing quality observations. Another such mechanism is building capacity for making, quality controlling, and utilizing observations in less-developed nations using the best local expertise.

We might consider distributed networks with nodes composed of research laboratories coupled with national agency partners, each node being responsible for maintaining specific sustained observations. I do not imply that operational oceanography should not be done by operational agencies. I am suggesting and seeking mechanisms for cooperation between the research community and operational agencies that 1) fully utilize talent, expertise and interest, and 2) remove competition between the two.

When involving the research community in the implementation of ocean observing systems, several problems should be recognized and considered. First, sustained observing efforts by the research community likely will remain closely linked to scientific problems. Second is the problem of perceived ownership of such data by scientists - a problem addressed later in considering timely release of data. Third, at present there is no reward to researchers for their involvement in sustained observing systems; needed are mechanisms for evaluation and reward of such efforts.

e) Establish formal relationships between the ocean and atmosphere communities for purposes of data collection, communication and analyses

A growing number of ocean observations are used by the meteorological community for research, weather forecasting, extended weather prediction and climate forecasts. Likewise, many marine meteorological observations are of growing value to the ocean community. And various datasets from ocean and marine atmosphere are collected or transmitted via the same platforms and systems.

It is only logical then to build relationships between these two communities whereby common systems can be used where feasible for data collection, communication and analyses. Likewise, these two communities should have joint mechanisms for obtaining commitments from nations for the financial resources necessary for these actions. An important new mechanism is now being considered jointly by the WMO and the Intergovernmental Oceanographic Commission (IOC). Proposed is a combination of the WMO Commission for Marine Meteorology and the IOC-WMO Integrated Global Ocean Services System with its Ship-of-Opportunity Programme Implementation Panel into a new WMO-IOC Joint Commission for Oceanography and Marine

Meteorology. Affiliated with this Committee would be the Global Temperature and Salinity Profile Program of IGOSS, the IOC Global Sea-Level Observing System, the TAO Implementation Panel, and the WMO-IOC Data Buoy Coordination Panel. Also related would be the International Oceanographic Data and Information Exchange. Under the guidance of the relevant scientific and operational programs for IOC and WMO, this body would coordinate the definition, development and operation of the global marine meteorological and oceanographic observing systems and supporting communications facilities to meet the needs of IOC and WMO programs, particularly those of the World Weather Watch, GCOS and GOOS.

f) Ensure timely release of data for intended uses

To use sustained observations for a multiplicity of needs, or to use them in nowcast and forecast systems, it is necessary that the observations be transmitted and released as required. In many cases the communication of data must be essentially in real time (e.g., by the Global Telecommunications System); in other cases postsampling processing is necessary and data communication must proceed as rapidly as possible consistent with a quality controlled product. The key point is that quasi-operational observing systems are incompatible with the concept of data being proprietary to the individual(s) supervising the collection. However, data sharing does not preclude the use of data in traditional research ways for analyses and publication in parallel with its real-time use in other products.

If we are to involve scientists in the planning, implementation and oversight of ocean observing system components, the mind-set and rules related to "ownership" of data must evolve. Almost all data are being collected with public funding. Agreements must be made and maintained to ensure timely release of data for specified purposes. This likely will require formulation and enforcement of new guidelines by agencies supporting observing system components. In the United States, most such guidelines are missing, dated or loosely enforced.

g) Implement data and information management systems, supplementary to existing systems, that are attuned to the multiple sources of data and their multiple uses

Data and information management systems already exist for many, if not most, types of ocean data that will be required. However, some of the systems are not well tuned to the needs of the user communities and few of the systems are readily able to exchange data with each other. Moreover, end users or product producers may need to acquire data from many different data management systems and thus now must deal with varying formats and access requirements.

The fundamental requirements are 1) an integration of existing data management systems, 2) more attention to the needs of end users (especially including timeliness), 3) responsive and sufficient quality control, 4) provision of adequate metadata, and 5) free and open access.

h) Develop and implement enhanced capabilities for the production of products - Syntheses of different data types; gridded, interpolated fields; nowcasts; forecasts; and assessments and warnings, among others

As C. Wunsch has said to me, "an outsider (to ocean science) would be entitled to say, 'You already have a wealth of global-scale information and you aren't using it. Why should anyone pay you to get more?'" To some extent this criticism may be legitimate. But, on the other hand, the ocean science community in most countries does not have the computational/technical capability to make maximum use of the observations in hand.

We must set in place the capability to carry forward massive modeling and assimilation projects if we are to realize the potential from ocean observations for research and societal goals. Different countries are at different levels of capability; the United States is not well positioned in this game because of limited computing and data assimilation capabilities available to the ocean science community. The Global Ocean Data Assimilation Experiment (GODAE) may prove to be a major impetus to the development of quasi-operational data assimilation capability and the resulting production of products. That experiment, planned by GCOS and GOOS for 2002-2005 as a demonstration of the power of a global ocean observing system, will assemble and use in the best numerical ocean models both satellite and in situ datasets. To achieve its maximum potential, GODAE must be connected to or embraced by existing operational activities.

More generally, we must expand our capabilities to produce the range of products required by the multiple users of ocean observations. This will involve user feedback and long-term evolution.

i) Establish the coordination and agreements between agencies within nations necessary to integrate observing system activities

In most countries, there seems to be a disconnect between the agencies providing space-based and in situ observations. The fact that space-based observations offer the potential of relatively frequent, global coverage and also offer some measurements that infer considerable subsurface information (e.g., altimetry) means that required in situ observations may be reduced relative to those needed without the range of satellite measurements. Of course, it is still true that

a very substantial in situ dataset is required to both validate and supplement space-borne observations, but the existence of satellite missions may make this requirement within reach of the operational agencies. So there are excellent reasons for cooperation, both national and international, between satellite agencies and agencies providing in situ observations.
Another key challenge is the common lack of coordination between agencies with fundamental responsibility for research and those with mandates for specific socio-economic responsibilities. For example, the level of data quality required by "nonresearch" agencies is sometimes sacrificed to obtain data as cheaply as possible. Given the synergy possible from multiple data uses, quality should become a general requirement. Each country potentially has the task of integrating the activities of agencies responsible for sustained ocean observations. This is a nontrivial task.

At present within the United States, the overlapping of efforts between agencies is substantial and without obvious benefit to the community. (Each agency is responding to opportunities as it sees them; the rewards for coordination and cooperation must not be clear or viewed as worthwhile.) Failings in coordination and cooperation extend to the highest levels of government. The integration of activities composing a U.S. system of sustained ocean observations is a necessity.

j) Devise arrangements to provide stable, long-term support for required observing system elements

The way this is best accomplished is not clear; surely it varies from nation to nation. Such arrangements are inextricably connected with national policies regarding environmental, economic and social needs.

Within the United States, the congressional funding process for agencies supporting ocean observations involves many committees and staffs; this is a major impediment to coordination and cooperation. Perhaps an ocean caucus would improve communication and lead to less conflict.

To ensure the success of a long-term ocean observing system, governance must be set in place to ensure long-term financial support for required elements. Also, this governance must enable needed systems that have been developed and proven with research funds to be transitioned without loss of continuity to operational support. The orderly transition of proven ocean satellite systems from research and development support by the National Aeronautics and Space Administration to operational support is an example of the problem; analogous problems are encountered in transitioning in situ observing elements developed with the National Science Foundation support.

k) Develop and use new technologies

As part of WOCE, R. Davis directed the development and use of the profiling autonomous (PALACE) float to the point that it may change the way in which we observe the thermal, salinity and density structure of the upper ocean (as well as the horizontal velocity field at some depth). It now seems possible to provide global coverage of the upper ocean at relatively reasonable costs and to do this on a real-time data collection basis.

However, PALACE technology is only one weapon in the arsenal we need. We require the capability to make long-term current (and temperature and conductivity) measurements from fixed locations for very long times; we require the capability to make surface salinity measurements from satellite; we require the ability to economically monitor sea ice thickness; and there are many other requirements that may be met by new technologies.

Finally, it is very important not to become complacent once an observing system is in place. New technology must be considered and introduced in a manner to ensure continuity of the required quality. Moreover, it is very important to ensure the continued availability of measurements now being taken for granted, including sea surface height, sea surface temperature, sea ice cover and winds. For example, satellite systems have very long lead time and it behooves us to have a continuing activity to ensure the next series of sensors.

5. Summary

In summary, a number of elements forming the basis of a strategy toward the implementation of sustained ocean observations for research and for more immediate societal needs are suggested. Some already are under way; others are not. All require change from a dominant attitude of competition to one of cooperation. I remind you that a motto of the American Geophysical Union, a society to which many of you belong, is "unselfish cooperation in research." Projects of the World Climate Research Programme and the International Geosphere-Biosphere Programme are demonstrating the value of such cooperation in research, but this needs to be extended to operational ocean observing activities.

Acknowledgments. This piece began as a talk at the WOCE Conference in Halifax during May 1998. I thank those who have suggested improvements or provided text, especially Mel Briscoe, Piers Chapman, Ed Harrison, and Stan Wilson.

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The 4 July 1996 Maymont-Osler High Precipitation Supercell

by Stephen R.J. Knott[1]

Résumé

Cet article est le compte rendu d'un événement extrême concernant un orage qui a eu lieu près de Saskatoon, en Saskatchewan, le 4 juillet 1996. Il y a eu 10 tornades dans la région, ce jour-là. Parmi ces tornades, il y en a eu deux de catégorie de force F3 et deux autres de force F2. On a constaté aussi des dommages sur une superficie de 950 km2 causés par une ligne de vent significatif (de catégorie près de force F1 et plus grande). Une supercellule à fortes précipitations a été observée dans au moins une localité. La caractéristique principale d'une supercellule à fortes précipitations est reliée à beaucoup de précipitations, quelques fois comprenant de la grêle, et qui s'observe sur le bord postérieur ou sur le courant descendant de traîne du mésocyclone.

Knott (1996) a produit une Note technique d'Environnement Canada sur le suivi des tornades et les localités dévastées par les violentes rafales descendantes d'un orage soudain qui a eu lieu en juillet 1996 à Saskatoon/Maymont/Osler. Ce document a fourni de l'information sur les nombreux événements du temps violent (principalement en rapport avec le vent et la tornade) et les observations entre 6h00 et 9h00 HNC le 4 juillet 1996 sur le centre ouest de la Saskatchewan ; de plus, on a fait une synthèse de l'analyse spatiale détaillée du suivi des tornades et des localités dévastées par les violentes rafales descendantes.

Des sources d'information variées ont été utilisées pour produire cette analyse spatiale. En effet, les sources de données comprennent : des rapports sur les bases de données de la Veille météorologique d'Environnement Canada ; des comptes rendus lors de cette journée par deux équipes de chasseurs d'orage ; de l'information recueillie par les médias locaux ; des enquêtes antérieures dans les localités de Maymont et d'Osler ; un relevé aérien des localités de Saskatoon, d'Osler et de Maymont ; enfin, des discussions personnelles avec la protection civile de la Saskatchewan, l'équipe de secours de Mennonite, les administrateurs locaux du conseil municipal et un historien local. Afin d'étudier la forte convection qui a eu lieu en cette journée mémorable, cet article se base sur les observations de Knott (1996) en association avec des données météorologiques, en particulier de la disponibilité de l'imagerie radar.

Introduction

The following is an account of an extreme thunderstorm event which took place in the vicinity of Saskatoon, Saskatchewan on 4 July 1996. On this day there were 10 tornadoes in the area. Among these tornadoes two were categorized as F3 in strength and two others as F2 tomadoes. This is in addition to approximately 950 km^2 of significant (near F1 strength and greater) straight line wind damage as well. A High Precipitation (HP) supercell was found to occur in at least one location. The primary characteristic of an HP supercell is that considerable precipitation, sometimes including hail, is observed on the trailing side or rear flank downdraft (RFD) of the mesocyclone.

Knott (1996), produced an Environment Canada Technical Note entitled *Tornado Tracks and Damaging Downburst Areas of the 4 July 1996 Saskatoon-Maymont-Osler Thunderstorm Outbreak*. This provided documentation of the numerous severe weather events (primarily wind and tornado) and observations between the hours of 6:00 PM and 9:00 PM CST 4 July 1996 over west central Saskatchewan and synthesized a detailed spatial analysis of tornado tracks and damaging downburst areas.

Various information sources were used to produce this spatial analysis. Data sources include reports from the Environment Canada Weather Watcher database, accounts from two storm chasing teams on this day, information gathered by local media, post event investigations in the Maymont Fielding areas and the Osler area, an aerial survey of the Saskatoon, Osler and Maymont areas and personal communication with Saskatchewan Emergency Preparedness, Mennonite Disaster Assistance, local town council administrators and a local Historian.

This paper will use the observations from Knott (1996) in combination with meteorological data, primarily available radar imagery, to study the severe convection which occurred on this extraordinary day.

Synoptic Setup and Pre-Storm Environment

At 12:00 UTC the 500 mb flow over western Saskatchewan was from the southwest at 30 knots with no major 500 or 700 mb cooling or height falls anticipated in the next 12 hours (although significant 500 mb height falls were anticipated in the 12 to 24 hour time frame). The Upper level jet stream was located over southern Alberta with little appreciable eastward motion expected.

There was diffluence at this level combined with a weak vorticity short wave forecast to affect the area as indicated by CMC's (Canadian Meteorological Centre) GEM (Global Environment Model) model by evening which was expected to produce weak mid level lift in the area.

1: Prairie Storm Prediction Centre, Environment Canada.

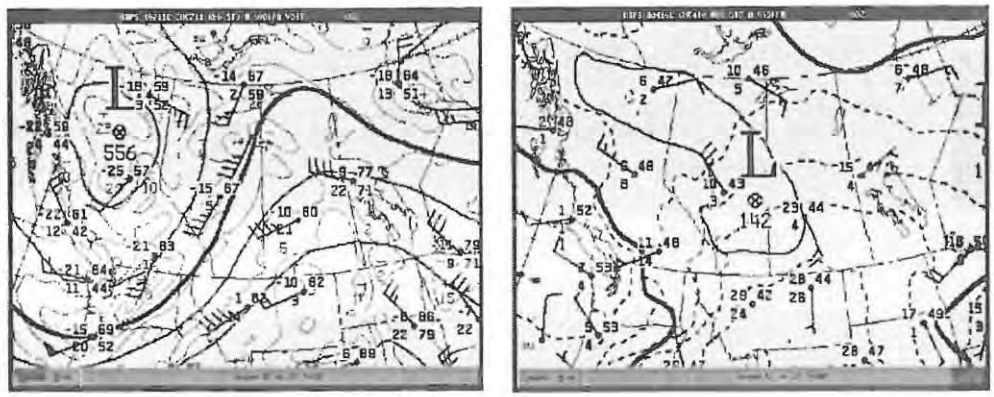

Figure 1: 5 July 1996 0000 UTC: 500mb and 850mb Upper Air Analysis

The low level flow in this area indicated a weak southeast low level jet of 15 knots. The storm relative helicity for the area of interest was in the 100-150 m^2s^{-2} range as indicated by the CMC summer severe weather convective numerical guidance.

The surface pressure pattern exhibited a low in east central Alberta with a warm front extending eastwards approximately 60 km north of Saskatoon and a cold front extending southwestwards. Model data indicated the Saskatoon area would remain in the warm sector for another twenty-four hours before the cold front would sweep through from the west.

The 6:00 AM (1200 UTC) temperature and dewpoint temperature at Saskatoon airport was 17° C and 16° C respectively. With a forecast high in the low thirties, substantial CAPE (Convective Available Potential Energy) would be available for this day.

Severe Thunderstorm Watches were issued at 12:15 PM CST for west central Saskatchewan including the Saskatoon area. At 4:00 PM the local radar (Elbow) detected a developing thunderstorm near Wilkie, about 120 km west-northwest of Saskatoon. The first of many severe thunderstorm and tornado warnings were issued for this thunderstorm complex at 4:24 PM.

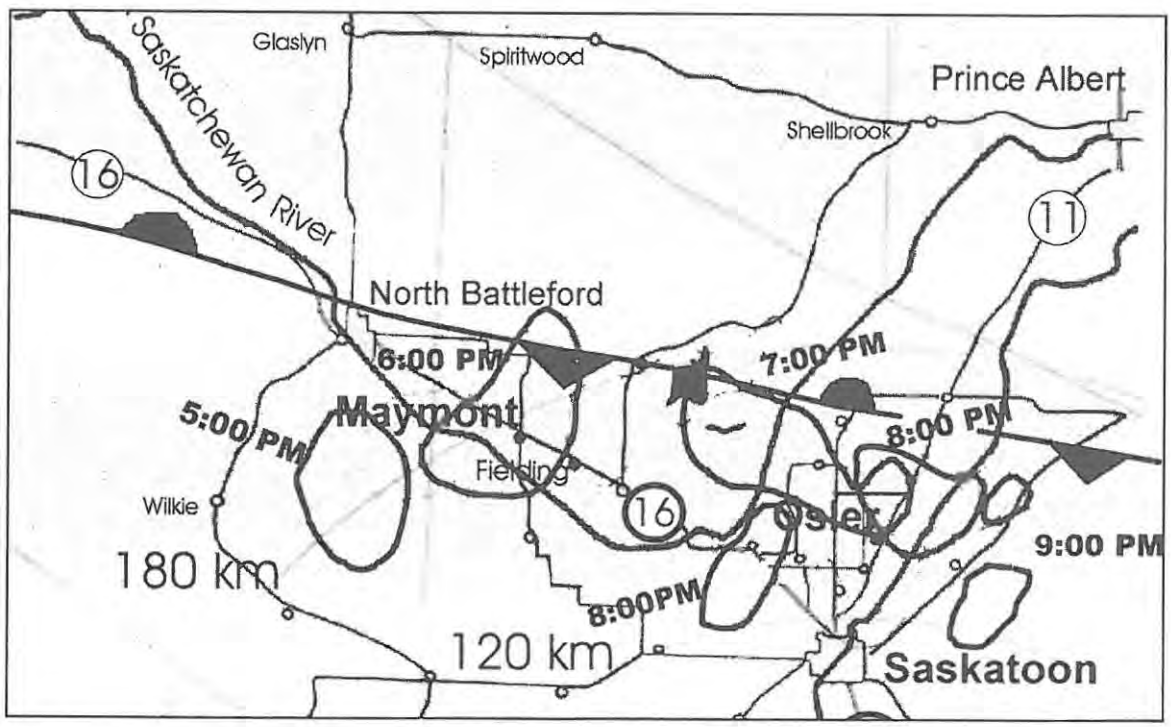

Figure 2: 4 July 1996 Echo Trace of the 7 km CAPPI imagery from Elbow radar. Echo Trace time labels in one hour increments. Front location based on 6:00 PM analysis

This thunderstorm grew rapidly and tracked east-northeastwards, quickly becoming supercellular in nature. Figure 2 illustrates an echo trace (7 km CAPPI) of the thunderstorm track starting from 5:00PM until 9:00 PM time. In addition, a quasi-stationary warm front was analyzed at 6:00PM between Prince Albert and Saskatoon. Airmass conditions north of the front generally exhibited northeasterly winds near 25 kmh^{-1}, temperature and dewpoint temperature values of 26 to 28° C and 16 to 18° C respectively. Airmass conditions in the warm sector typically displayed southeasterly winds of 20 kmh^{-1}, temperature and dewpoint temperature values of 30 to 33° C and 20 to 23° C respectively. It appears this frontal boundary may have had an effect on the storm motion as the storm veered considerably upon approach of the front, always remaining in the analyzed warm sector.

One of the many interesting features of this case is the proximity of the 0000 UTC upper air sounding which was released from Saskatoon. The sounding launch was just 90 km southeast of the severe thunderstorm on the inflow side - a great location to observe the pre-storm environment.

The wind profile indicated significant veering of winds from 160^0 in the lowest few thousand feet to 240^0 at 10 000 feet as indicated in Figure 3. However the wind speeds through this layer were quite light being no greater than 15 knots below 9 000 feet until reaching 21 knots at 10 000 feet. Employing a calculated storm motion (density weighted 0-6 km mean wind) of 220^0 at 30 kmh^{-1} resulted in a storm relative helicity (SRH) value of 69 m^2s^2 which is low for the generation of supercell thunderstorms.

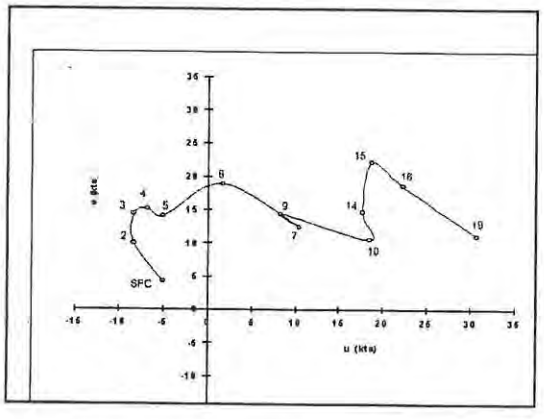

Figure 3: Saskatoon Hodograph 4 July 1996. Heights indicated in thousands of feet

The thermal and humidity profile revealed a substantial increase in time of low level moisture. The surface dewpoint at this time had exhibited a 12 hour rise of 8^0 C to a value of 24^0 C and the moisture was quite deep with an 850 mb dewpoint temperature of 19^0 C. (This dramatic rise is believed to be due to local evapotranspiration as there were no significant advective processes readily observed on this day). A surface temperature of 32^0 C and dewpoint temperature of 24^0 C generated a LI (Lifted Index) value of -13° C and a tremendous CAPE value of 5 885 Jkg^{-1} !, a value not too often realized in the Canadian summer climate. Thus the pre-storm environment could be categorized as one of considerable thermodynamic instability, but weak helicity.

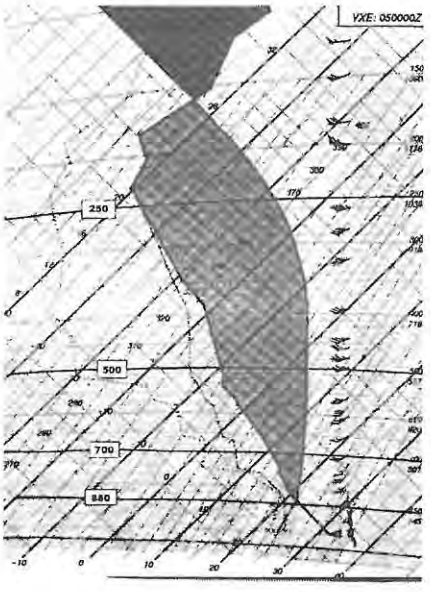

Figure 4: Saskatoon Tephigram for 0000 UTC July 5, 1996

Mesoscale Discussion

1) Maymont Area

The town of Maymont is located north of the North Saskatchewan River and roughly 80 km west-northwest of Saskatoon. This region was the first area to experience major property damage (there had been several reports of golfball hail and a funnel cloud report prior to this time) by the thunderstorm complex between the hours of 5:30 and 7:00 PM.

Three tornadoes of F2 or F3 strength were documented in this area whose path characteristics are illustrated in Figure 5. One tornado originated south of Maymont near the North Saskatchewan river bank and moved northeastward for approximately 10 km. The Maymont tornado was estimated to be an F2 tornado based on damage incurred to Latticed Metal Transmission towers built to withstand wind speeds up to 176 kmh^{-1}. Rather than altering its track and moving southeastwards towards the Fielding area, it is reasoned that the Maymont tornado eventually lifted northeast of Maymont with a new parent mesocyclone and tornado reforming further south (just north of the town of Fielding). The Fielding tornado (F3) formed approximately 3 km north of Fielding and tracked northeastward. Based upon an aerial survey the tornado reached a maximum width of 1 to 1.5 km over an unpopulated forested area damaging

90-95% of forest growth (Birch forest bluff heights ranging from 6 to 13 metres high with diameters 8 to 30 cms) before roping out south of Redberry Lake. This resulted in an estimated track length of 20 km. This tornado was classified as an F3 based on its large path width and movement of heavy farm machinery including, among other things, carrying an Old Super 92 Combine (estimated 2700 kgs) 12 metres into the woods. A third tornado (F2) was observed 9 km north of Maymont by a tandem of storm chasers. The tornado was strong enough to lift a 12 metre wide cultivator airseeder 25 m over a 1.5 metre pine tree hedge. The storm chasers observed that the tornado was quite close to heavy rains in the rear flank downdraft area indicative of an HP (High Precipitation) supercell. Unfortunately, the tornado track was not adequately documented as these observations were received a few months after the event.

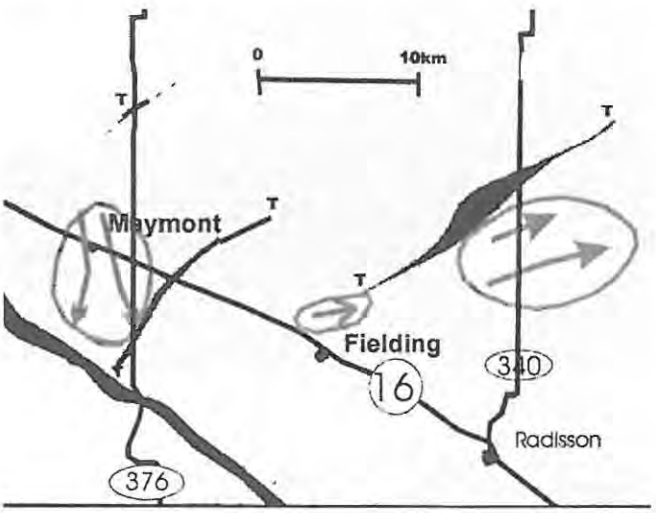

Figure 5: Tornado tracks and damaging downburst winds in the Maymont area. Tornado tracks are indicated by straight lines with the letter T at beginning and end points. Downburst areas as oval regions

A few major downburst areas were also observed including areas west of Maymont, just north of Fielding, and a large area about 10 km north of Radisson. Winds in these downburst areas were estimated to be in the range of 100 to 180 kmh^{-1}.

Przybylinski et al states the following conceptual models concerning radar echo characteristics of HP supercells...

> " 1) Large hook echo at low levels on the right flank of the storm;
>
> 2) one or several weak echo notches, signifying an updraft centre;
>
> 3) a singular rear inflow notch (RIN) having vertical depth along the trailing edge of the storm suggesting the presence of descending flow;
>
> 4) a spiral echo structure at low and sometimes middle levels indicating a mesocirculation."

The above mentioned radar echo characteristics were studied when determining the nature of the convective processes occurring on this day.

The closest and only operating radar site was at Elbow, Saskatchewan located 120 km south of Saskatoon. The Elbow radar was strictly a conventional radar with no radial velocity measurement capabilities. A full suite of products were generated every five minutes. The display resolution provided was 2 km x 2 km. Although this thunderstorm was within conventional radar coverage, it was still 180 km away from radar. Consequently, the 2.0 km CAPPI (Constant Altitude Plan Position Indicator) imagery provided was really only scanning the thunderstorm at approximately 3.5 km AGL (above ground level), thus overshooting the lowest levels of the storm. Nevertheless, the Elbow radar did reveal some critical information.

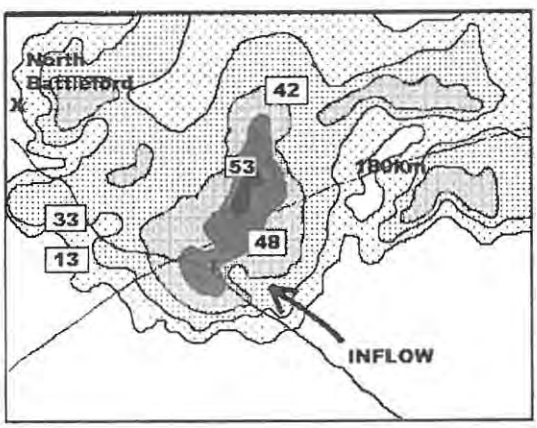

Figure 6: 6:00PM 2 km CAPPI image from Elbow radar. Reflectivity contours are 13, 33, 42, 48, 52 dBz. T signifies location of tornado. Arrow indicates weak echo notch or low level inflow into the thunderstorm. Thunderstorm is located in vicinity of 180 km range ring

The storm motion vector near Maymont was approximately from 250° at 45 kmh^{-1} a significant departure from the expected storm motion of 220° at 30 kmh^{-1}. The radar echo tops of these thunderstorms were in excess of 16 km (i.e., above radar display capabilities). The echo top display also indicated two distinct relative maximums at times characteristic of a multicellular structure. Radar measurements also indicated the height of the 39 dBz returns to be above 12 km between 5:45 PM and 6:30 PM indicative of strong updraft strength. Bounded Weak Echo regions (BWER) were observed by taking numerous cross sections through the radar imagery. The height of the BWER being in the 6 to 7 km range. The 2 km CAPPI of 6:00 PM, Figure 6, did exhibit signs of rotation including a weak echo notch or inflow and hook echo just to the south. This image corresponds to the time the transmission towers were damaged. A time series of the low level CAPPI imagery (not shown) indicated a relatively

persistent kidney bean shape with a hook although not overly filled with precipitation. A curious feature of the hook echo was that it was oriented 90 degrees to the right of the storm motion vector or oriented more parallel to the storm motion vector. A rear inflow notch (RIN) from the north was observed at select times by a deficit in radar return strength feeding into the RFD portion of the storm. Thus the thunderstorm displayed a hybrid of multicell, classic supercell and HP supercell characteristics. It is unfortunate the radar site could not have been closer at this time.

2) Hepburn-Osler-Saskatoon Area

The thunderstorm complex continued northeastward on a west-southwest motion vector until approximately 7:00 PM when it came very close to the quasi-stationary warm frontal boundary. At this point it dramatically altered its course. After 7:00 PM, the storm motion vector of the supercell, approximated from radar imagery, was 310^0 at 20 kmh^{-1}. This translated to a right deviation of 60^0 and speed reduction of 25 kmh^{-1} from its historical storm motion vector.

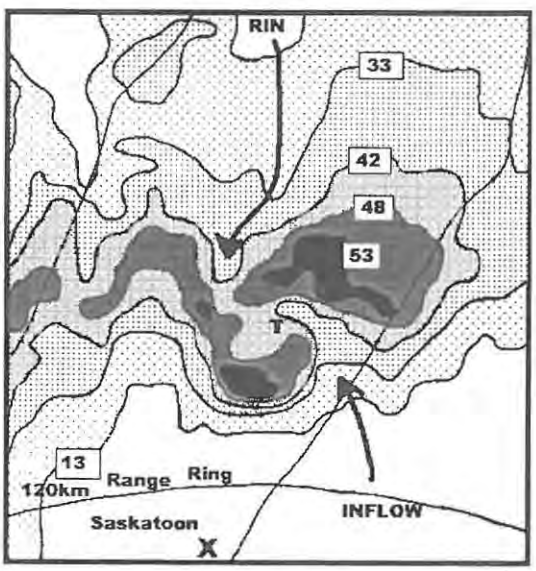

Figure 7a. Low Level CAPPI of HP supercell over Osler at 7:45 PM. Reflectivity contours are 13, 33, 42, 48, 52 dBz. T signifies location of tornado. Arrows indicate RIN near top of figure and low level inflow near lower right. The T indicates likely tornado location. HP supercell located 140 km north of Elbow radar

The storm structure and evolution observed by radar continued to be quite complex. Given the numerous tornado reports in the area, it is believed there was more than one mesocyclone in the complex. At times the 2 km CAPPI imagery appeared somewhat disorganized resembling a Line Echo Wave Pattern (LEWP). However, between 7:20 PM and 8:00 PM an HP supercell became readily apparent on the north end of the convective line closest to the warm front. Observed characteristics included a rain and hail filled RFD, an obvious inflow and spiral shaped echo pattern, strong reflectivity gradients particularly on the southern edge of the RFD and a notable RIN. The presence of a rear inflow notch was also supported by a photograph taken in the area which showed a clear slot on the northwest edge of an obvious wall cloud. These features are evident in Figure 7a.

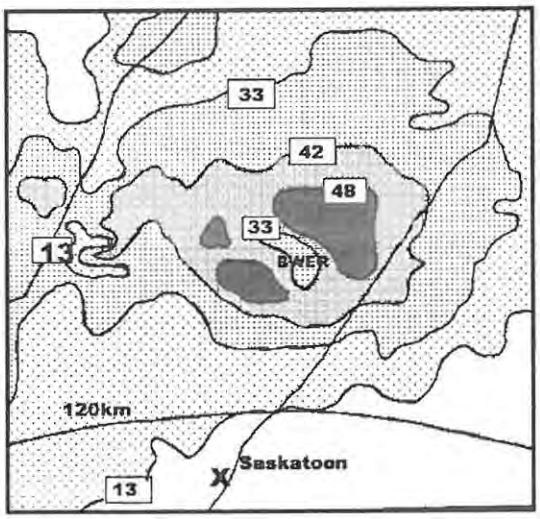

Figure 7b. Mid Level (7 km) CAPPI over Osler at 7:45 PM. Reflectivity contours are 13, 33, 42, 48 dBz. BWER signifies location of strong updraft

From 7:15 to to 7:45 the 7 km CAPPI revealed a donut shape around the strongest part of the storm. The hole in the middle was close to the location of the BWER (which was found to be in the 9 to 10 km range) and the circular shape suggests a large meso low centre, approximately 30 km in diameter, see figure 7b. Certain cross-sections through the cell along an assumed inflow vector from the east revealed two BWERs as high as 9 km in height indicative of multiple updrafts. These observations are consistent with the conceptual model of an HP supercell outlined by Moller et al (1990) and Przybylinski et al (1993).

Between the hours of 7:00 and 9:00 PM, major damage occurred to the Hepburn Osler and Saskatoon areas. The strongest reflectivity echoes tracked right over the Osler area. The damage incurred in this area was due to large hail (up to softball in size), heavy rain (125 mm), tornadoes, downburst winds, and surprisingly enough, *inflow winds*. There was one report from an off duty meteorologist of southeasterly winds of 150 to 200 kmh^{-1} occurring for 5-10 minutes before shifting to northwesterly at about the same speed. In this particular instance, the tornado tracked just a few km south of his residence. It appears the SRH value from the Saskatoon hodograph was not at all representative of the true environment of this HP supercell. Observations of snapped or uprooted trees and structural damage to buildings in this area and to the south support the severe southeast wind observation.

Seven confirmed tornadoes occurred in this area. The most violent tornado formed approximately 5 km north of Osler and tracked southeastwards 15 km just across the south Saskatchewan river. The Osler tornado (F3) is the tornado which was associated with the observed extreme inflow winds.

Based on the total destruction of farm property in its path and tipping over of a 3 600 kg Mix Mill, demolition of brick silos and well constructed homes and shaking of basement walls, this tornado is estimated to have been F3 in strength. The path length was estimated to be 15 km originating from 3 km west of Rheinland and lifting shortly after crossing the South Saskatchewan river. Based on detailed accounts of damage in the area, the maximum width of the tornado was estimated to be 1 km. Interestingly enough, the post-storm investigation uncovered no actual photos or observations of the tornado. It is quite possible that the tornado was shrouded in rain and hail, thus not readily observable. When talking to some of the people in the area all they knew was that something dark, loud and nasty was moving their way and they were heading to the basement.

The Osler area also encountered downburst wind speeds which fit easily in the F1 category with some areas likely in the F2 (> 180 kmh^{-1}) category as well. Figure 8 depicts the damaging downburst areas for the Saskatoon-Osler area along with the estimated tornado tracks.

The following bullets are accounts gathered during the post-storm investigation in association with the Osler Tornado. The letters in bold are indicated on Figure 8 to illustrate the exact geographic location of the observation.

A. *3 km west Rheinland: Except for wood structure house which incurred considerable damage all buildings decimated including barn, sheds and grain bins. Neighboring farm had two 80 foot concrete silos demolished. One building lifted from ground and demolished leaving heavy farm equipment on ground though Mix Mill (estimated 8 000 lbs) was turned over. Said "Whole yard looked like giant mixmaster went through it". Could not say if it was a tornado or not as he was down in basement whole time, however evidence of no common wind direction of debris indicates tornado.*

B. *Around 8:00 PM resident meteorologist was outside watching rapid formation of low level mesocyclone to the west as southeast winds increased from strong to severe at which point he and family headed to basement. Looking out basement window was able to observe southeast winds were snapping 1 to 2 foot diameter poplar trees and bending over 14 foot evergreen tree so that the tip was only 3-4 feet off the ground. Estimated wind strength 150-200 kmh^{-1}. After approximately 10 minutes, winds switched around to northwest at similar wind speeds but also accompanied with hail and incredible downpour. Water flooded house through door openings, light fixtures and damaged roof. More poplar trees snapped in opposite direction.*

C. *Total damage to Farm property 5 km south of Rheinland. Wood framed house and barn damaged so badly that they had to be leveled for reconstruction. Concrete silos and sheds were destroyed. No dominant wind direction. Family trapped in basement of house, mentioned the basement walls shaking.*

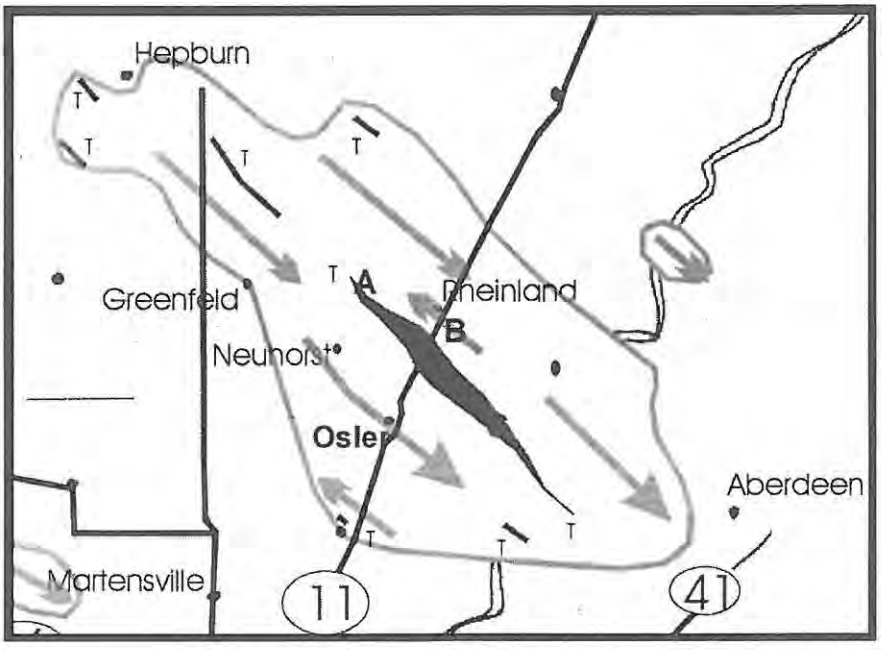

Figure 8: Tornado tracks and damaging downburst winds in the Osler area. Tornado tracks are indicated by straight lines with the letter T at beginning and end points. Downburst areas as oval regions with arrows representing wind direction. Letters A, B and C correspond to observations from the event

It appears from radar imagery that as the HP supercell weakened, a bow echo formed to its southwest flank aided by the RIN and moved southward producing a bow echo and severe downburst winds (no hail) in the Saskatoon city area. Severe downburst winds were recorded around 8:30 PM with measured gusts of 120 kmh^{-1} at Saskatoon airport and 141 kmh^{-1} at the Kernan Farms climate station on the east side of the city. It was indeed the east side which encountered the most damage to trees and structures including the demolition of an outdoor drive-in theatre which just happened to be playing the movie Twister (ironic that it was blown away by a downburst). These downburst wind speeds correlate to F1 in strength.

Tens of millions of dollars damage were incurred on this day, but amazingly enough there were no human fatalities. The rural people knew well enough to head into the basement for protection. Had the HP supercell passed 25 km further south over Saskatoon, the results may not have been as fortuitous.

Conclusion

The 4 July 1996 thunderstorm which affected the Maymont, Osler and Saskatoon areas was an extreme occurrence which devastated several communities. It produced two F3 tornadoes and two F2 tornadoes and a total of 10 tomadoes in the area. In addition, large areas of damage were incurred from downburst winds and hail affecting an area of 950 km^2.

The thunderstorm complex tracked eastwards over 120 km in a 4 hour time frame. Its motion started from 250° at 45 knots in the Maymont area before exhibiting a strong right deviation of 310° and slowing down to 20 knots near Osler. It appears the significant change in storm track was affected by the location of a synoptic scale front.

The characteristics of the thunderstorm, particularly in the Osler area, suggest an HP supercell. The pre-storm environment was characterized by considerable thermodynamic instability but only weak-to-moderate shear. Radar observations confirmed HP supercell characteristics including the presence of spiral-shaped echoes, weak echo notch, RIN, precipitation-filled rear flank downdraft and high reflectivity gradients.

More detailed analysis of radar data would be required to analyze if the evolution of the storm was typical of the classic supercell to HP supercell to Bow echo as outlined by Moller at al (1990). It would also be interesting to explore the relationship between the frontal boundary and its interplay with the HP supercell.

Acknowledgments

The author would like to thank Bob Johns (Storm Prediction Centre, NOAA) for providing clues and insight into the nature of this thunderstorm.

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Note from the Editor

Comments received about "A Meteorological Beard", written by Uri Schwarz which appeared in the *CMOS Bulletin SCMO* (Vol.27, No.4, p.104-105).

"No, not a summary of comments on the beard, but credit for the photo of bearded me. It was taken by a long-time friend and fellow meteorologist/photographer, Ulli Rath. Thank you Ulli!"

Uri Schwarz

UBC neural network model forecasts another La Niña winter

by William W. Hsieh and Benyang Tang

Résumé: Depuis janvier 1999, le modèle neuronal de l'Université de la Colombie-Britannique, qui prévoit un indice Niño 3.4 des anomalies de la température de la mer du Pacifique équatorial, a qualifié à nouveau de conditions de La Niña pour l'hiver de 1999/2000, pour une deuxième année consécutive.

Since January 1999, the University of British Columbia (UBC) neural network (NN) model, which forecasts the Niño3.4 sea surface temperature anomalies in the equatorial Pacific, has been consistently calling for La Niña conditions during the 1999-2000 winter, making it two La Niña winters in a row. Figure 1 shows the forecasts at leadtimes of 3, 6, 9, and 12-months, using data up to the end of August, 1999. Forecasts of the 6- and 12-month leadtimes indicate that the current La Niña conditions in the tropical Pacific will continue into the first few months of year 2000, returning to normal conditions around the middle of year 2000. The cross-validated forecast correlation skills are given in Table 1 for various test periods, showing considerable changes in the forecast skill over the decades. For up to date forecasts, see our web site: www.ocgy.ubc.ca/projects/clim.pred.

Test period	3-month	6-month	9-month	12-month	15-month
1950-59	0.72	0.53	0.4	0.36	8
1960-69	78	0.63	0.57	0.55	0.43
1970-79	0.91	0.77	0.72	0.66	0.51
1980-89	0.85	0.73	0.66	0.71	0.77
1988-97	0.85	0.69	0.51	0.56	0.55
1950-97	0.83	0.67	0.56	0.54	0.42

Table 1. Cross-validated correlation skills for various test periods

It appears that the ENSO forecast skill has improved considerably since 1997 from the low skills of the early to mid-1990s. It should be noted that our present model uses the tropical Pacific sea level pressure (SLP) field as the main predictor, whereas our earlier versions prior to November 1997 used the FSU (Florida State University) wind stress field as the main predictor. M.Cane (personal communication) found that the FSU wind stress at the onset of the 1997 El Niño had anomalous easterlies on the eastern equatorial Pacific, which were absent in the NSCAT scatterometer wind. The Lamont models using NSCAT wind forecasted the 1997 El Niño without problem, but completely missed when using the FSU wind. Cane concluded that the FSU wind stress was likely to be defective in early 1997. Our NN model did not forecast the 1997 El Niño well with FSU wind stress, but did well with the SLP as predictor (Fig.1). In the operational skill comparison of Barnston et al. (1999), our score for the 1997-98 period was dragged down by our old model using the FSU wind stress, as we did not switch to using SLP until November 1997.

Nonlinear canonical correlation analysis (NLCCA) by NN has been developed this summer, and we expect to eventually upgrade our ENSO forecast model from its current nonlinear regression approach to the newer NLCCA approach, forecasting the sea surface temperatures of the entire tropical Pacific (instead of only the Niño3.4 region). The possibility of applying NLCCA to forecast Canadian seasonal air temperature and precipitation is also being pursued with A. Shabbar at AES.

Reference

Barnston, A.G., M.H. Glantz and Y. He, 1999. Bull. Amer. Meteorol. Soc., 80: 217-243.

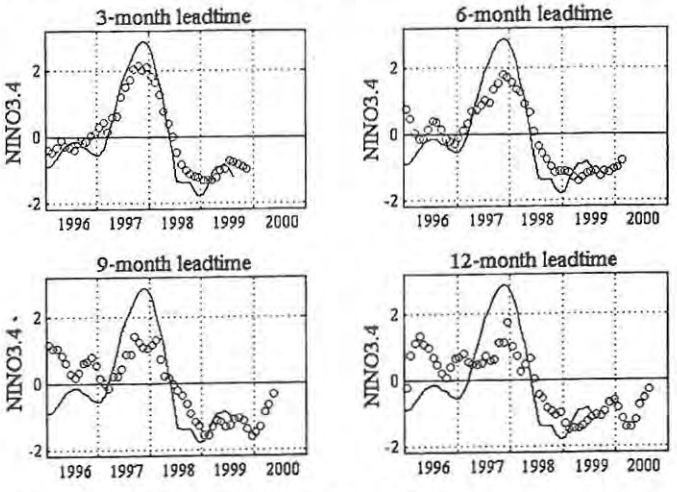

Figure 1. Forecasts of the neural networks at 3, 6, 9, and 12-month leadtimes. The solid curve shows the observed values and the circles, the predicted values.

Global Directory of Marine (and Freshwater) Professionals

The Global Directory of Marine (and Freshwater) Professionals (GLODIR) is a Web-based database (http://ioc.unesco.org:591/glodir/), developed and maintained by the Intergovernmental Oceanographic Commission (IOC) of UNESCO. The Directory contains information about scientists, engineers, managers, policy makers, etc., engaged in marine or freshwater research or management in government organizations, universities, and industry.

GLODIR is developed under the auspices of IOC's IODE Group of Experts on Marine Information Management. GLODIR is a free service and can be used for non-commercial use only. The information contained in the database is NOT passed on to commercial third parties by IOC.

Canadian input to the Directory is being coordinated by Library Policy and Services, Fisheries and Oceans Canada. If you wish to be included in GLODIR, please create an entry at http://www.cmos.ca or http://www.scmo.ca. Canadian records will be edited for consistency and forwarded to IOC for inclusion in GLODIR.

If you have any questions, please contact Heather Cameron at (613) 993-2926 or via e-mail at cameronh@dfo-mpo.gc.ca.

Répertoire mondial des spécialistes des sciences de la mer (et des eaux douces)

Le Répertoire mondial des spécialistes des sciences de la mer (et des eaux douces) (GLODIR) est une base de données élaborée et entretenue par la Commission océanographique intergouvernementale (COI) de l'UNESCO; elle est accessible sur le web (http://ioc.unesco.org:591/glodir/). La base de données contient des renseignements concernant, entre autres, des scientifiques, des ingénieurs, des gestionnaires et des décideurs qui effectuent de la recherche sur les milieux marins ou d'eau douce ou qui occupent des postes de direction au sein d'organisations gouvernementales, d'universités ou de l'industrie.

La base de données GLODIR a été mise au point sous les auspices du Groupe d'experts sur la gestion de l'information marine, qui relève de l'Échange international des données et de l'information (IODE) de la COI. GLODIR est un service gratuit destiné à un usage non commercial seulement. Les renseignements qui figurent dans la base de données NE sont PAS communiqués à des tiers par la COI.

C'est le groupe Politiques et services de bibliothèque de Pêches et Océans Canada qui va s'occuper de coordonner le versement des données canadiennes dans le répertoire. Si vous désirez figurer dans le répertoire GLODIR, veuillez créer votre propre fiche, à l'adresse http://www.cmos.ca ou http://www.scmo.ca. Les fiches canadiennes seront révisées pour assurer l'uniformité et transmises à la COI, qui les versera dans le répertoire.

Si vous avez des questions, n'hésitez pas à communiquer avec Heather Cameron au (613) 993-2926 ou par courrier électronique, à l'adresse cameronh@dfo-mpo.gc.ca.

Results of the A-O Subscribers Survey and Follow-up

QUESTIONNAIRE:

A survey of subscribers, distributed with issues 1 and 2 of ATMOSPHERE-OCEAN, Volume 37, announced our intention to initiate, in January 2000, an electronic version to which access would be free, at least initially. There would be no change with respect to peer review or editorial quality. Quarterly issues could be printed as at present if demand is sufficient. Alternatively, the complete volume could be printed at the end of the year only, while quarterly issues of articles, or even individual articles, are posted on the web as they become available. Subscribers were then asked which of the following options are acceptable to them:

1. Four printed issues of A-O per year (i.e. no change)
2. The electronic version with one printed volume per year
3. The electronic version only.

RESULTS:

Approximately 10% of the subscribers returned the survey form on the opposite of the mailing labels for A-O 37-1 and 37-2. We sincerely thank all those who replied, and particularly those who took time to add comments, which we found very useful.

- 46% of the respondents would prefer, or find acceptable, to retain the four printed issues per year, as at present.

- 25% of the respondents offered no other option than the current formula.

- 65% of the respondents would prefer, or find acceptable, to access the electronic version, one article at a time or quarterly, and to receive one printed volume per year, containing all the articles.

- 10% of the respondents would prefer, or find acceptable, to access the electronic version only.

- 15% of the respondents would find access to the electronic version only, unacceptable.

- 2% would find one printed volume per year unacceptable.

Some of the key comments indicate:

1) that libraries still desire a printed volume for archive purposes;

2) that it is important to post individual articles to the web as soon as possible;

3) that .pdf is the best electronic format, as it can be both read and printed accurately;

4) that an annual CD-ROM, containing past and recent papers, together with a search facility, should be available;

5) that it is crucial to maintain current peer review and editorial standards;

6) that cost is an important consideration.

FOLLOW-UP:

As a result, we are pleased to inform our readers that we have started on the following developments:

1) Preparing a CD-ROM that will initially contain 10 years of issues, to be updated yearly. The papers will be in .pdf format, while the titles, author list and abstracts will also be in HTML

2) Developing a search engine, operating on the above HTML portion, that will instantaneously return the title, authors and year of all papers meeting search criteria made up of the following: words or word strings, and/or author, and/or range of years. Clicking on any of these papers will link to the abstract in HTML, with option to obtain the full text in .pdf, if desired. Individual word search will also be available within the full text of individual articles.

3) We are hoping to start offering the CD-ROM for 1990 to 1999 inclusive sometime in 2000.

4) We are hoping to be able to continue to offer free internet access to the most recent papers, as at present. We will attempt to post articles as soon as each one is completely processed. *Please note that we have an electronic "A-O Watchers List", to whom we send a short message announcing publication of recent articles. To get onto the list, please send a message to jonesb@jgs.net*

5) We are also exploring, with our printers, a change of format to 8.5 in. x 11 in. (21.6 cm x 30.9 cm), to take better advantage of pages printed from the net, and easier reading of figures and text.

6) We are contemplating introducing this format change for the year 2001 (Vol 39), and to print all the articles in a single volume at the end of that year (i.e. early in 2002).

7) The price for the printed volume should be the same as the current annual subscription rate.

8) Prices for the CD-ROM have yet to be decided; it may be offered in combination with the printed volume, or separately.

We will welcome any comment on these plans. Please contact the following, by phone (613) 991-0151, fax (613) 993-4658, or email: Pubs@meds-sdmm.dfo-mpo.gc.ca

Richard Asselin
Director of Publications

P.S. Visit our Homepage at www.CMOS.ca or www.SCMO.ca

Résultats du sondage des abonnés et suites

QUESTIONNAIRE:

Un sondage auprès des abonnés, distribué avec les numéros 1 et 2 d'ATMOSPHERE-OCEAN, Volume 37, annonçait notre intention d'inaugurer en janvier 2000 une version électronique dont l'accès serait gratuit, du moins au début. Aucun changement n'est prévu quant à la qualité de l'édition ni au comité de lecture. On indiquait que des numéros trimestriels continueraient à être produits, si la demande était suffisante. Une alternative serait de placer les articles sur la toile au fur et à mesure qu'ils sont prêts, et d'imprimer le volume au complet à la fin de l'année. On demandait ainsi aux abonnés leurs préférences parmi les options suivantes:

1. Quatre numéros imprimés par année (i.e. aucun changement)
2. La version électronique avec un seul volume imprimé par année
3. La version électronique seulement

RÉPONSES:

Environ 10% des abonnés ont retourné le questionnaire. Nous remercions sincèrement tous ceux qui ont répondu, et en particulier ceux qui ont pris le temps d'ajouter des commentaires, qui étaient très intéressants.

- 46% des répondants préféreraient, ou trouveraient acceptable, de retenir les quatre numéros imprimés, comme à présent.

- 25% des répondants n'offraient pas d'autre choix que la formule actuelle.

- 65% des répondants préféreraient, ou trouveraient acceptable, d'avoir accès à la version électronique un article à la fois ou trimestriellement, et de recevoir un seul volume imprimé par année, contenant tous les articles.

- 10% des répondants préféreraient, ou trouveraient acceptable, d'avoir accès à la version électronique seulement.

- 15% des répondants trouveraient inacceptable de n'avoir accès qu'à la version électronique.

- 2% trouveraient inacceptable de ne recevoir qu'un seul volume imprimé par année.

Parmi les commentaires les plus notoires on relève:

1) que les bibliothèques désirent un volume imprimé par fins d'archives;

2) qu'il est important de placer les articles sur la toile aussi rapidement que possible;

3) que le format .pdf est le plus désirable, car il peut être lu et imprimé le plus précisément;

4) qu'un disque compact (CD-ROM) qui contiendrait les articles antérieurs et récents ainsi qu'un engin de recherche, devrait être disponible annuellement;

5) qu'il est primordial de conserver le système de comité de lecture ainsi que les standards d'édition actuels;

6) et que le coût de l'abonnement est une considération importante.

SUITES:

Suite à ces résultats, il nous fait plaisir d'informer nos lecteurs que nous avons entrepris les développements suivants:

1) La préparation d'un disque compact, qui contiendra initialement 10 années de numéros, et qui sera mis à jour annuellement. Les articles seront en format .pdf, alors que les titres, liste d'auteurs ainsi que les résumés seront aussi en format HTML.

2) Le développement d'un engin de recherche, opérant sur la partie HTML, qui fournira instantanément le titre, liste d'auteurs et année de tous les articles rencontrant les critères de recherche formés comme suit: mots ou suite de mots, et/ou auteur, et/ou intervalle d'années. La sélection de l'un de ces articles amènera le résumé en HTML ainsi que la possibilité d'obtenir le texte complet en .pdf. À l'intérieur d'un même article, la recherche d'un mot quelconque sera aussi disponible.

3) Nous espérons pouvoir offrir le disque compact pour les années 1990 à 1999 inclusivement au cours de l'an 2000.

4) Nous espérons maintenir l'accès internet gratuit aux plus récents articles, comme par le présent. Nous essaierons aussi de placer les articles sur la toile dès qu'ils sont complètement traités. *Veuillez noter que nous avons une liste d'adresses électroniques "A-O Watchers List", auxquelles nous envoyons un court message annonçant la publication d'articles récents. Pour ajouter votre nom à la liste, prière d'envoyer un message à jonesb@jgs.net*

5) Nous examinons aussi, auprès de notre imprimeur, la possibilité de changer le format à 8.5 p. x 11 p. (21.6 cm x 30.9 cm), afin de faire meilleur usage de la page imprimée à partir de la toile ainsi que pour faciliter la lecture du texte et des illustrations.

6) Nous pensons pouvoir adopter ce format pour l'an 2001 (Vol. 39), et imprimer tous les articles en un seul volume à la fin de cette année (i.e. au début de 2002).

7) Le prix pour le volume unique devrait être le même que le prix de l'abonnement actuel.

8) Le prix du disque compact reste à déterminer; il pourrait être offert combiné avec le volume imprimé ou vendu séparément.

Nous serons heureux de recevoir vos commentaires au sujet de ce plan. Veuillez contacter le sous-signé par téléphone (613) 991-0151, fax (613) 993-4658 ou couriel: Pubs@meds-sdmm.dfo-mpo.gc.ca

Richard Asselin
Directeur des publications

P.S. Visiter notre page d'accueil: www.CMOS.ca ou www.SCMO.ca

General Announcement

The A.G. Huntsman Foundation is pleased to announce that the winner of the 1999 A.G. Huntsman Award is Prof. I. Nicholas McCave of the University of Cambridge, UK.

This major Canadian award recognizes Dr. McCave's many seminal contributions to the evolution of a process-based understanding of fine-sediment grain size distributions in the sea. His efforts to unravel the environmental record stored in muds have yielded insights that extend beyond marine sedimentology and into the broader field of marine particle dynamics and physical oceanography. His dedicated pursuit of mechanistic understanding of fine-sediment dynamics has led to important contributions in a wide range of marine

sedimentary environments ranging from the nearshore to the deep sea. His groundbreaking theory and observations of fine-sediment deposition, aggregation and hydrodynamic sorting continue to advance a field that in general has suffered from reliance on empirical calibration of poorly parameterized models. His work has led to greater understanding of phytoplankton bloom dynamics, vertical particle flux in the sea (a key element of the Joint Global Ocean Flux Study), and the kinematics of deep-sea circulation in the ancient ocean.

The award will be presented by the Royal Society of Canada at a special ceremony at the Bedford Institute of Oceanography in Dartmouth, Nova Scotia at 14:30 hours on Friday 26 November 1999. The presentation will be followed by the annual Huntsman Lecture, given by Dr. McCave, and a champagne reception. All are welcome to attend.

The A.G. Huntsman Award was established in 1980 by the Canadian marine science community to recognize excellence in research and outstanding contributions to marine sciences. It honours those men and women, of any nationality, who have had and continue to have a significant influence on the course of marine scientific thought. The A.G. Huntsman Award reflects the multifaceted nature of marine research. It is presented annually in one of three categories: marine geosciences, physical/chemical oceanography, and biological oceanography. The award was created to honour the memory of Archibald Gowanlock Huntsman (1883-1972), a pioneer Canadian oceanographer and fishery biologist.

The A.G. Huntsman Award is funded by Fisheries and Oceans Canada, Natural Resources Canada, the Province of Nova Scotia, and the Canadian Association of Petroleum Producers.

Nomination information can be obtained from the A.G. Huntsman Foundation, Bedford Institute of Oceanography, PO Box 1006, Dartmouth, Nova Scotia, B2Y 4A2, Canada. The category for the 2000 award will be physical/chemical oceanography.

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World Bank and World Meteorological Organization Cooperate to Predict and Prevent Natural Disasters

WASHINGTON, August 18, 1999 - The World Bank and the World Meteorological Organization (WMO) have signed a Memorandum of Understanding, agreeing on closer cooperation in areas of common interest, particularly natural disaster prevention and mitigation, climate change, and phenomena such as El Niño. The Memorandum of Understanding, signed by World Bank Vice President for Environmentally and Socially Sustainable Development Ian Johnson and World Meteorological Organization Secretary-General Prof. G.O.P. Obasi, is designed to improve strategic collaboration between the two institutions.

"The signing of the Memorandum of Understanding," said G.O.P. Obasi, "will further contribute to developing synergies between relevant programs of the Bank and those of the WMO and thus promote the development of the capacity of nations in applying scientific and technical advances to national sustainable development plans. WMO's expertise and global network of national meteorological and hydrological services offers a distinct advantage to key activities of the Bank."

One element of more effective disaster management is the better use of climate information and forecasting. At the core of this strengthened co-operation is the establishment of a WMO-World Bank liaison in Washington. With the technical expertise of the WMO and the global touch of the World Bank, this information can be more effectively and expansively disseminated.

Developing countries are likely to be severely affected by climate change and water constraints, so they will need help in developing the financial, technical, and human capacity to adapt to a changing climate and increasing water scarcity. A pragmatic strategy on vulnerability and adaptation concerns will be developed and implemented by the two institutions.

"The promise of this partnership is the opportunity it offers to match the WMO's scientific and technical expertise with the Bank's economic know-how," said Ian Johnson. "Meteorology is central to everything from agricultural production to mitigating the effects of climate-related natural disasters."

Over the last ten years, the World Bank has provided almost US$9 billion [$9,000 million] in emergency loans to help countries recover from the impacts of natural disasters. Recognizing the link between climate phenomena and development, the international development community is starting to increase its capacity to assist client countries in devising and implementing suitable climate adaptation and disaster mitigation measures in the context of sustainable development.

Shackleton's encounter with a "lava-like flow of tumbling ice": what was it?

by Paul LeBlond, Galiano Island

The log books of explorers often include careful descriptions of natural phenomena observed in remote seas which were quite mysterious at the time but for which we can offer explanations today. For example, on his third voyage, Columbus encountered off Trinidad a wave which we can now interpret as a tsunami (I wrote about this in the CMOS Bulletin in 1979). I recently came across another interesting example while reading an account of Shackleton's most famous Antarctic expedition (Lansing, 1986).

Shackleton and his crew of 27 men and 69 dogs of the Imperial Trans-Antarctic Expedition left South Georgia on Dec 5, 1914, on the Endurance, aiming for a landing at Vahsel Bay on the south shore of the Weddell Sea. Another branch of the expedition was to lay supply caches on the other side of the continent. From Vahsel Bay, Shackleton and his men were to set out for the pole with their dog teams, picking up cached supplies beyond the pole to reach the Ross Sea. Things did not go as planned. The Endurance was beset in heavy pack ice within 80 miles of its proposed landing and ended up drifting clockwise within the Weddell Sea for nine months. Finally, Shackleton and his men had to abandon the ship which was broken up by the ice. They set up camps on drifting ice floes which gradually took them northwards towards the open sea. Finally, their ice floe breaking up under them, they scrambled onto boats in a rough sea full of broken ice bits, rowing frantically towards open sea and a welcoming shore. They eventually ended up on the shores of Elephant Island, from which Shackleton and five others sailed 800 miles east back to South Georgia for help.

The last position estimated by Worsley, the navigator, before launching the boats, was at 61°56'S, 53°56'W within Bransfield Strait, a southern part of Drake Passage. I now quote from Lansing's account (p. 142-143):

"Within thirty minutes [of leaving their camp on the ice floe] they had entered an area of very open pack.....Their course carried them close to a high, flat-topped berg which was taking a terrible pounding from the northwest swell. The seas broke against its ice-blue sides, flinging spray 60 feet into the air."

"Just as they drew abeam of it, they became aware of a deep, hoarse noise that was rapidly getting louder. Looking to starboard, they saw a lavalike flow of churning, tumbling ice at least 2 feet high and as wide as a small river bearing down on them out of the ESE. It was a tide rip, a phenomenon of current thrown up from the ocean floor which had caught a mass of ice and was propelling it forward at about 3 knots."

"For a moment they stared in disbelief. Then Shackleton swung the bow of the James Caird to port and shouted for the other two boats to follow. The oarsmen dug in their feet and pulled with all their strength away from the onrushing ice. Even so, it was gaining on them....."

"After fifteen minutes, as the strength of the men at the oars began to fail them, the tide rip showed signs of flattening out. Five minutes later it seems to lose its strength, and before long it had disappeared as mysteriously as it had arisen."

What did they see? How would a modern oceanographer interpret this phenomenon? Rather than barging ahead with my answer to this question, I leave it to the readers to come up with their own explanations and to the editor to decide what to do with the answers.

References

Lansing, Alfred, 1986. "Endurance: Shackleton's Incredible Voyage". Caroll & Graf, New York.

LeBlond, P.H., 1979. First tsunami observed in the Americas. CMOS Newsletter, 7(2), April 1979.

Note from the Editor

Send me your solutions quickly to prove to Dr. Paul LeBlond that modern oceanographers are as good as he was!?!

Opportunities to use ROPOS Canada's world class scientific submersible

ROPOS is a powerful ROV which has been adapted for support of scientific research, including broad-cast quality video, a wide variety of samplers and other tools, a precision navigation system, and a very experienced support team. Owned by the Department of Fisheries and Oceans and operated by the Canadian Scientific Submersible Facility (CSSF), ROPOS can operate at depths from 5m to 5000m. ROPOS has made more than 500 dives in support of scientists from institutions in several countries on a number of international expeditions. More information is available on the CSSF Website: http://www.ropos.com

ROPOS is now available to Canadian university scientists at greatly reduced rates, thanks to an NSERC Major Facilities Access grant. The grant also provides for a mobilization in Eastern Canada, tentatively planned for the year 2002. Funding for use of ROPOS is available through the NSERC Ship Time Allocation Process.

If you might be interested in using ROPOS, please contact the CSSF with information on what you would like to do, where and when. The CSSF will attempt to compile the information received to facilitate coordination of proposals and development of joint expeditions where appropriate.

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North of 60 Survey to Canadians

In the spring of 1999, the Atmospheric Environment Service of Environment Canada initiated a public opinion survey to Canadians north of the 60th parallel. The objective of the study was to measure the attitudes of those living north of the 60th parallel toward the products and services provided by the Weather and Environmental Prediction Business Line of Environment Canada.

Specifically, the focus of the survey was to assess the importance of weather information; determine usage of weather information and forecasts; determine satisfaction levels with the provision of weather information and forecasts; determine sources of weather information; assess awareness and understanding of weather warnings; assess perceptions of forecast accuracy; assess awareness and understanding of windchill; and assess the usage of a number of service delivery systems used to provide weather forecasts and information to those in Canada's north, including Automatic Telephone Answering Devices (ATAD), Weatheradio, Internet, and 1-888 telephone services.

The survey was conducted in two phases. The first phase consisted of six focus group sessions, two in each of the three territories. One of the sessions in the Nunavut Territory was conducted in Inuktitut. These sessions were designed to enhance the quantitative information obtained from phase two of the survey, a telephone survey, with qualitative information. Approximately 70 persons in total participated in the focus group sessions. Phase two consisted of approximately 1200 telephone interviews stratified appropriately by age, sex, education and income level, including a minimum of 100 aboriginals in each of the three territories. Within this sample, 150 interviews were conducted with those who speak Inuktitut. Results of the survey can be considered accurate within +/- 2.9 percentage points, 19 times out of 20.

Although further analysis of the data will be conducted, results from the survey include:

Importance and usage of weather information

- 91% of residents north of 60 consider it at least somewhat important for them to have weather information. Given this, 74% of respondents seek weather information at least once per day (17% more often than once per day). This number is lower than that for south of 60, where 94% of Canadians listen to at least one weather forecast per day.

- The majority of respondents (73%) are most interested in weather information in the morning and 43% responded that the most important season for forecasts is the winter.

- Respondents use weather forecasts to assist them in undertaking a wide range of activities. The one named most often, by 47% of those surveyed, is to plan outdoor activities. The second most frequent usage is to know what to wear, 21%. It is interesting to note, however, that if all categories related to outdoor food- and fur-gathering activities are amalgamated, then it becomes the second most often cited at 33%.

Availability and satisfaction

- Although the majority of residents are satisfied with the information and services they receive, information is not always available in their native language or the meaning of a forecast may be lost in the interpretation.

- Nearly four in five (79%) say that a weather forecast is available either most of the time or all of the time when they want one. This compares with 86% south of 60.

- 67% say that they always or usually receive enough weather information. This compares with 95% south of 60 who say that they always or sometimes receive enough information.

- 75% are at least somewhat satisfied with weather forecast accuracy.

Sources of information

- Environment Canada is cited most often as the source of weather information; however, there are problems with brand recognition of Environment Canada products.

- Television is the preferred main source for weather information (41%), followed by radio (32%). 7% prefer Environment Canada's ATAD system as the main source for weather information.

Weather warnings

- Blizzards are named most often as the type of severe weather of most concern to respondents (42%).

- When radio stations are broadcasting, they are the main source for weather warning information - 78% cite a radio station or network as their source of information on severe weather.

- 68% of respondents receive enough advance warning about severe weather always or most of the time.

- The majority (60%) of respondents indicate they require six hours or fewer advance warning of a storm's arrival.

Dissemination mechanisms

- ATAD and Weatheradio are the most frequently used dissemination media north of 60 that are owned and operated by EC. Usage of these media is significantly higher than south of 60.

- 38% of respondents are aware of ATAD and have used it. This compares with only 26% south of 60.

- 30% of respondents are aware of Weatheradio and have used it. This compares with less than 10% south of 60.

- Even though PC penetration is low north of 60 compared to south, 21% of respondents north of 60 are aware of Environment Canada's website and have used it. This compares with only 7.5% south of 60.

The results of the survey indicate that there are differences in the usage, satisfaction level, methods of accessing forecast information, etc. between Canadians living north and south of the 60th parallel. These differences need to be factored into the design and delivery of weather services for Canadians living in the north.

R&D Needs for Environmental Prediction and Design in the Canadian Offshore

On May 26-27, 1999 the Program of Energy Research and Development (PERD) Workshop on Design and Environmental Prediction was held at the Bedford Institute of Oceanography in Dartmouth, N.S. The objective of the workshop was to review research and development presently being carried out in this program area, and to discuss future ongoing priorities.

The meeting was attended by a wide variety of participants representing research managers from several federal government Departments, government regulatory agencies, the Canadian and international oil and gas industry, private sector consulting firms, and the federal Office of Energy Research and Development (OERD).

Existing PERD projects that were highlighted at the Workshop included:

- Short term real time ice-ocean forecasting;
- Operational ice modelling;
- Ice-structure interaction;
- Operational detection of icebergs from remotely sensed data;
- Ice-ocean-climate processes and variability;
- Improving methodologies for vessel routing in the St Lawrence system;
- Ice pressure and properties in mobile pack ice;
- Ice and snow sensor technology;
- Predictive circulation models for the Atlantic Canadian shelf;
- Offshore wind and wave design criteria;
- Validation of buoy, platform-based and satellite wind and wave measurements;
- Data assimilation into coupled atmosphere-ocean models;
- Computer modelling and field sensor testing for marine icing on offshore rigs.

Projects aimed at improving understanding of the possible impacts of oil and gas operations on the marine environment (such as production wastes, spills, etc.) were not specifically addressed as these issues have been well reviewed with the industry and regulatory agencies in recent fora. It was recognized that there were important synergies between the R&D efforts in offshore environmental prediction and design with those assessing potential impacts.

Overall the ongoing programs of energy R&D presented by the research managers was very well received by all of the client groups. Both the regulatory agencies and the oil and gas industry strongly supported the requirement for this type of research in both the short and long term as an essential integral component of the cost-effective, timely and safe development and transportation of offshore oil and gas reserves. It was noted that much of the information produced in these studies is of direct use to industry, and, in fact, represented research they would otherwise have to carry out themselves. There was also a significant indirect benefit to industry through the establishment of the information bases and expertise required to carry out environmental assessments of industry submissions such as Environmental Impact Statements and Development Plans in a timely and informed manner.

In supporting the research and development being carried out in the areas of winds, waves, sea ice and currents under the present program, industry also had some suggestions for expanded areas of interest. These included general research areas such as:

- continued development of hindcast and statistical techniques;
- investigation of extreme mesoscale features;
- exploitation of remote sensing capabilities;
- improvements to longer lead-time forecasts and forecast products;
- improved reliability of meteorological and oceanographic buoy network;
- full 3-D current modelling;
- wind profiles over ice;
- pack ice property statistics of western Newfoundland shelf;
- iceberg detection and prediction.

A number of short-term specific research areas were also identified, including:

- the variability of wind around and through structures;
- current flow around and under structures;
- currents in the benthic boundary layer;
- adding regional and local currents to the present forecasts;
- forecasts of wave spectra;
- forecast verification and verification techniques;
- prediction of offshore fog for aviation;
- investigation of tropical storms, particularly as they become extra-tropical with major impacts for both design and prediction (a particularly troublesome east coast Canadian problem).

Research priorities were also identified for new geographical areas on the east coast:

- deep water drilling areas and the use of floating, response-based production facilities;
- Gulf of St. Lawrence and west Newfoundland.

In summary, it was the consensus of the workshop that research and development on design and prediction of environmental parameters continues to be an important priority for the sustainable, cost-effective, environmentally responsible and safe development of offshore oil and gas, in the short, medium and long term.

International Association of the Physical Sciences of the Ocean - IAPSO

New nomination

The Canadian Meteorological and Oceanographic Society (CMOS) is responsible for selecting the four members of the Canadian National Committee (CNC) representing Canada on the associations of International Union of Geodesy and Geophysics (IUGG) dealing with meteorology and oceanography. There are 2 members on each of the IAPSO and the IAMAS.

The current senior Canadian member of the IAPSO is Dr.Yves Gratton of the INRS-Océanologie in Rimouski, Québec. Dr. Gratton's mandate will end after the next IUGG meeting in July 1999 in Birmingham, England.

The Canadian Meteorological and Oceanographic Society is inviting Dr. Michael W. Stacey to be a member of the Canadian National Committee of the IUGG's International Association of the Physical Sciences of the Ocean replacing Dr. Gratton. The other Canadian member, Dr. Michael Foreman of the Institute of Ocean Sciences, will become the senior Canadian member of the IAPSO.

A-O 37-3 Paper Order

OC-189

Adam H. Monahan, Fredolin T. Tangang and William W. Hsieh; *A Potential Problem With Extended EOF Analysis of Standing Wave Fields*

OC-190

William R. Crawford, Josef Y. Cherniawsky and Patrick Cummins; *Surface Currents in British Columbia Coastal Waters: Comparison of Observations and Model Predictions*

98-12

Stéphane Laroche, Pierre Gauthier, Judy St-James and Josée Morneau; *Implementation of a 3D variational data assimilation system at the Canadian Meteorological Centre. Part II: the regional analysis*

In Memoriam

Archibald Dunham Gates

Archie Gates (1927 - 1999) was born in Dartmouth, Nova Scotia and a graduate of Dalhousie University. He joined the Meteorological Service in 1952 as a weather forecaster and later shift supervisor. Numerous freshly minted Meteorological Officers were trusted to his patient supervision at Shearwater and Halifax during the first weeks of their postings to benefit from his operational experience. He was elected Fellow of the Royal Meteorological Society in 1959. In 1975 he authored "*The Tourism and Outdoor Recreation Climate of the Maritime Provinces*", the result of a project which also led to several other sectorial studies on climate in Atlantic Canada. He moved to Ottawa in 1980 and worked in science-policy coordination where his friendliness and careful attention to detail, coupled with a wry sense of humour, were widely appreciated. Archie retired in 1984 and pursued an interest in local history and genealogy. He died in Ottawa on September 6, 1999.

John D. Reid

Coastal Zone Canada 2000

4th International Conference
Saint John, N.B.
17-22 September 2000

The Conference

This international Conference will be the fourth in the Coastal Zone Canada Association series begun in Halifax, Nova Scotia in 1994 and continued through Rimouski, Québec in 1996 and Victoria, British Columbia in 1998. Building on the priorities that emerged from these conferences, Coastal Zone Canada 2000 will address the theme "Coastal Stewardship: Lessons Learned and the Paths Ahead". The Conference will focus on four inter-related sub-themes: Aboriginal Practices; Community-based Actions; Coastal Health; and Oceans Governance.

The goal of this Conference is to develop a collective vision and identify products, policies and research which will further integrate coastal zone management. The foundation for discussion will be a review document on the current worldwide status of coastal zone management entitled "Baseline 2000", which will be distributed to participants prior to the conference.

Conference Format

Coastal Zone Canada 2000 has been designed specifically to facilitate the participation of all delegates. The program includes keynote speakers, presentations and case studies related to each of the Conference sub-themes. Conference delegates will then have the opportunity to join Consensus Circles (modeled on Aboriginal "Talking Circles") focusing on the case studies and sub-themes. Trained, well-briefed Circle leaders will assist and record the discussions to reflect the opinions of the participants, and will present their findings at the Conference sub-plenary panels. These panels will be designed to foster further discussion on issues of particular concern, and the development of specific goals, and pathways. The results will be reflected in the Conference products.

The input of youth perspective will be derived through a youth conference immediately preceding the main conference and summarized during a special session of Coastal Zone Canada 2000. Other scheduled events will include a Trade Show, training workshops, field trips, tours and social events. Additional information on Conference activities will be available in the official program of the Conference to be published in 1999.

Coastal Zone Canada 2000 will be a bilingual event. French/English simultaneous translation will be available for all plenary sessions.

Coastal Stewardship: Lessons Learned and the Paths Ahead

The last 50 years have delivered a series of increasingly urgent lessons on the fragility of coastal and ocean environments. Where before we believed that the oceans were vast and robust, we now know that our activities can change, and have changed, the marine ecosystem dramatically. Global contamination of waters, plants and animals, and the collapse of fisheries worldwide have sounded the alarm that many of our present practices are unsustainable. To change this course for the sake of future generations requires much more than technical adjustments; a whole new way of thinking is required. The paradigm of exploitation is being replaced with paradigms of conservation, preservation and restoration - concepts engendered in the term 'stewardship'.

Canada and other maritime nations are mounting major new initiatives in the development of coastal stewardship. It is recognized that governments, business, the scientific community and the public at large are all stakeholders with roles to play in this process.

This international Conference will explore the cultural perspectives and experiences of Aboriginal peoples, the development of coastal stewardship from the perspectives of what coastal communities have been able to achieve, the concept of coastal health and the changing requirements of oceans governance.

- Aboriginal Practices

Aboriginal peoples of the world historically have had a special relationship with their natural surroundings. They have always considered themselves a part of the ecosystem, which is evident in their language and culture. Aboriginal communities have practised responsible coastal management long before western science recognized its importance. This sub-system will allow participants an opportunity to learn from traditional Aboriginal coastal practices and focus on the Aboriginal coastal stewardship practices of the present so that we can plan collectively for the future.

- Community-based Actions

The economic, social and environmental sustainability of coastal communities is critical to the local and national economies of many nations. Numerous public and government initiatives have been undetaken to develop stewardship mechanisms to address coastal issues and concerns. This sub-theme will permit the analysis of a select number of these initiatives to identify the factors that promote or hinder successful stewardship in the coastal zone. Taking time to assimilate lessons learned will help to identify the paths ahead.

- Coastal Health

For the purpose of this Conference, this sub-theme should be interpreted as encompassing all elements of coastal resource management that can be demonstrably linked to the quality of the marine environment - from its degradation to its improvement through bioremediation. Recognized in Canada's Oceans Act, marine environmental quality (MEQ) will contribute the major thrust of many developing policies throughout the world as we strive for cleaner coastal and ocean environments. This sub-theme will provide the opportunity to demonstrate and discuss useful scientific approaches and results in defining, maintaining, and reaching appropriate coastal health standards.

- Oceans Governance

This sub-theme recognizes the need to consider the complex issues that flow from the maze of jurisdictional authorities and institutional arrangements that are at play in the management of coastal and ocean activities. Moreover, it will provide a forum for the discussion of related policy directions being undertaken domestically and internationally, and for the forecasting of policy gaps in the oceans arena.

Location and Dates

Coastal Zone Canada 2000 will be held at the Trade and Convention Centre in Saint John, New Brunswick, Canada, from September 17 to 22, 2000.

The City of Saint John is located on the Bay of Fundy in the Atlantic coast province of New Brunswick. This beautiful and rich-textured city offers over two hundred years of history as well as a great shopping and dining experience for visitors. Saint John is also home to New Brunswick's largest seaport.

To Register

If you would like to receive a registration kit for Coastal Zone Canada 2000 send your name and address to:

Coastal Zone Canada 2000 Secretariat
NB Department of Fisheries and Aquaculture
P.O. Box 6000
Fredericton, New Brunswick
Canada E3B 5H1
Tel: (506) 453-2253
Fax: (506) 453-5210
e-mail: czczcc2000@gov.nb.ca
internet: www.gov.nb.ca/dfa/czc-zcc2000.htm

Zone Côtière Canada 2000

4e Conférence Internationale
Saint John, N.B.
17-22 Septembre 2000

Conférence

Cette conférence internationale sera la quatrième de la série de l'Association zone côtière Canada qui a débuté à Halifax, en Nouvelle-Écosse, en 1994, pour se poursuivre à Rimouski, au Québec, en 1996 et à Victoria, en Colombie-Britannique, en 1998. Se basant sur les priorités établies à ces conférences, Zone côtière Canada 2000 abordera le thème "La gestion des zones côtières: expériences acquises et voies de l'avenir". Cette conférence sera axée sur quatre thèmes sous-jacents et interdépendants: pratique autochtones, actions communautaires, santé des zones côtières et gestion des océans.

Le but de cette conférence est d'élaborer une vision collective et de déterminer les produits, les politiques et la recherche qui seront davantage intégrés à la gestion de la zone côtière. Les discussions seront basées sur un document d'étude de la situation mondiale actuelle de la gestion de la zone côtière intitulée "Baseline 2000". Le document sera distribué aux participants avant la conférence.

Format de la conférence

Zone côtière Canada 2000 a été conçue pour faciliter la participation de tous les délégués. Le programme comprend des conférenciers, des exposés et des études de cas concernant chaque thème sous-jacent de la conférence. Les délégués auront alors l'occasion de participer à ces cercles de consensus (semblables aux "cercles de la parole" autochtones) qui seront axés sur les études de cas et les thèmes sous-jacents. Des animateurs qualifiés et bien renseignés orienteront les discussions et prendront note des délibérations pour refléter l'opinion des participants. Ils donneront un compte rendu de leurs discussions aux ateliers de la conférence. Ces ateliers susciteront d'autres discussions sur les questions d'intérêt et l'établissement d'objectifs et de mécanismes précis. Les discussions seront prises en compte dans les actes de la conférence.

La perspective des jeunes sera établie à partir d'une conférence jeunesse tenue immédiatement avant la conférence principale. Elle sera résumée au cours d'une séance spéciale de Zone côtière Canada 2000. D'autres activités sont prévues, dont un salon commercial, des ateliers de formation, des excursions, des visites et des activités sociales. D'autres renseignements sur les activités de la conférence seront fournis dans le programme officiel de la conférence qui sera publié en 1999.

Zone côtière Canada 2000 sera une activité bilingue. Les services de traduction simultanée seront assurés aux séances plénières.

La gestion des zones côtières: expériences acquises et voies de l'avenir

Au cours des cinquante dernières années, nous avons appris des leçons de plus en plus urgentes sur la fragilité des environnements marins et côtiers. Contrairement à la croyance que les océans sont vastes et résistants, nous savons maintenant que nos activités peuvent modifier et ont modifié l'écosystème marin de façon considérable. La pollution générale des cours d'eau, des plantes et des animaux, et l'effondrement des pêches dans le monde ont sonné l'alarme. Nous reconnaissons qu'un bon nombre de nos méthodes actuelles ne sont pas durables. Afin de changer cette tendance pour les générations futures, il faut une nouvelle façon de penser. Le paradigme de l'exploitation est remplacé par des paradigmes de conservation, de préservation et de restauration - des concepts inhérents à la gestion.

Le Canada et d'autres pays maritimes mettent sur pied de nouveaux projets importants en développement de la gestion côtière. Il est reconnu que les gouvernements, les entreprises, la communauté scientifique et le public en général sont tous des intervenants qui ont un rôle à jouer dans ce processus.

Cette conférence internationale explorera les perspectives culturelles et les expériences des Autochtones, le développement des gestion côtière par rapport aux réalisations des communautés côtières, le concept de la santé des zones côtières et les besoins changeants en matière de gestion des océans.

- Pratiques autochtones

Les peuples autochtones du monde entier ont, depuis toujours, un lien spécial avec leur milieu naturel. Ils se sont toujours considérés comme faisant partie de l'écosystème, comme le démontrent leur langue et leur culture. Les communautés autochtones ont exercé une gestion côtière responsable bien avant que la science occidentale ne reconnaisse son importance. Ce thème sous-jacent permettra aux participants d'apprendre à partir des méthodes côtières autochtones traditionnelles. Il mettra l'accent sur les méthodes actuelles de gestion côtière des autochtones afin que nous puissions collectivement planifier pour l'avenir.

- Actions communautaires

La viabilité économique, sociale et environnementale des communautés côtières est essentielle aux économies locales et nationales de nombreux pays. Un grand nombre de projets gouvernementaux et publics ont été entrepris pour établir des mécanismes de gestion afin d'aborder les questions et les préoccupations côtières. Ce thème sous-jacent permettra d'analyser un nombre choisi de ces projets pour déterminer les facteurs qui appuient ou qui gênent la bonne gestion dans la zone côtière. En prenant le temps de bien assimiler les leçons apprises, nous pourrons déterminer les voies à suivre.

- Santé des zones côtières

Aux fins de la présente conférence, ce thème sous-jacent devrait être considéré comme englobant tous les éléments de la gestion des ressources côtières dont on peut démontrer le lien avec la qualité du milieu marin - depuis sa dégradation à son amélioration en passant par la biodégradation accélérée. La qualité du milieu marin, qui est reconnue dans la Loi sur les océans du Canada, formera la base des nombreuses directives qui seront élaborées partout dans le monde en vue de créer un milieu océanique et côtier plus propre. Ce thème sous-jacent permettra de faire la démonstration et de discuter des approches scientifiques et des résultats utiles pour définir, maintenir et établir des normes relatives à la santé des zones côtières.

- Gestion des océans

Ce thème sous-jacent reconnaît la besoin de discuter et d'examiner les enjeux complexes qui découlent des pouvoirs des instances et des mesures institutionnelles qui influent sur la gestion des activités marines et côtières. Il permet aussi d'établir un forum de discussion sur les orientations stratégiques connexes qui sont prises aux niveaux national et international, et de prévoir les lacunes des politiques concernant les océans.

Endroit et dates

Zone côtière Canada 2000 aura lien du 17 au 22 septembre 2000 au Centre du commerce et des congrès de Saint-Jean, au Nouveau-Brunswick, au Canada.

La ville de Saint-Jean est située le long de la baie de Fundy sur la côte atlantique. Cette ville magnifique et pittoresque possède plus de 200 ans d'histoire. Elle offre aux visiteurs d'excellentes occasions de faire des emplettes et d'apprécier une cuisine intéressante. Sain-Jean possède aussi le plus grand port de mer du Nouveau-Brunswick.

Inscription

Pour obtenir une trousse d'inscription à Zone côtière Canada 2000, faites parvenir votre nom et votre adresse à:

Secrétariat de Zone côtière Canada 2000
Ministère des Pêches et de l'Aquaculture du N.-B.
Case postale 6000
Fredericton, Nouveau-Brunswick
Canada E3B 5H1
Téléphone: (506) 453-2253; Télécopieur: (506) 453-5210
Courriel: czczcc2000@gov.nb.ca
internet: www.gov.nb.ca/dfa/czc-zcc2000.htm

The Centre for Climate and Global Change Research
and
the Department of Atmospheric and Oceanic Sciences
invites you to attend the

Tertia M.C. Hughes Memorial Symposium

Tuesday, November 23, 1999
McGill Faculty Club Ballroom
3450 McTavish St. Montréal, Québec H3A 1X9
14:30 - 16:30 hours
(reception will follow)

To mark the first anniversary of the passing of Dr. 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 in her honour.

The two main speakers at the event, both former supervisors of Dr. Hughes, will be focussing on her contributions to research as follows:

Dr. Andrew Weaver (School of Earth and Ocean Sciences, University of Victoria): *The ocean's thermohaline circulation - contributions by Tertia Hughes and subsequent developments.*

Dr. Jorge Sarmiento (Program in Atmospheric and Oceanic Sciences, Princeton University): *Contributions of Tertia Hughes to our understanding of anthropogenic CO2 uptake in a warming ocean.*

Short tributes will also be given by former professors, colleagues and personal friends:

- Dr. Charles Lin, Chair, Department of Atmospheric and Oceanic Sciences, McGill University;
- Dr. Nigel Roulet, Director, Centre for Climate and Global Change Research, McGill University;
- Vicki Loschiavo, former Administrative Officer, Department of Atmospheric and Oceanic Sciences, McGill University;
- Dr. Bill Gough, Department of Environmental Science, Physical Sciences Division, University of Toronto;
- Dr. Paul Meyers, Department of Physics and Physical Oceanography, Memorial University of Newfoundland;

Trudy Wohlleben, Department of Earth and Atmospheric Sciences, University of Alberta;

- Dr. Lawrence Mysak, Department of Atmospheric and Oceanic Sciences, McGill University.

For further information on the program and/or accommodation please e-mail/call Ms. Angie Mansi, Assistant to Director, Centre for Climate and Global Change Research, McGill University at:
mansi@geog.mcgill.ca; tel.: (514) 398-3759.

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

Stephen Clodman, Ph.D.
Atmospheric Electricity, Thunderstorms
Satellite and Radar Sensing

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

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.

Assistant Professor in Agrometeorology Job Offer

The Department of Soil Science, Faculty of Agricultural and Food Sciences, University of Manitoba invites applications for a full-time tenure track position in agrometeorology at the rank of Assistant Professor. The position, subject to final budgetary approval, will commence January 3, 2000 or as soon as possible thereafter. A Ph.D. degree with specialization in agrometeorology or meteorology is required. Applicants shall have expertise in soil-plant-atmosphere interactions including energy and mass exchanges at the earth's surface and climates of vegetative surfaces. Post-doctoral experience is preferred. The successful candidate will be required to: (1) teach undergraduate and graduate courses in agrometeorology and related areas such as soil and water management, (2) develop an active research program in his/her area of specialization and (3) supervise postgraduate students. The Faculty of Agricultural and Food Sciences encourages staff to initiate and/or participate in interdisciplinary research and teaching. The candidate will be expected to establish collaborative research related to areas such as precision agriculture and effects of weather on agricultural pests and production systems. The candidate will also be expected to participate in outreach and service. Salary will be commensurate with qualifications and experience; the salary range for the Assistant Professor level is currently $41,690 - $63,765 per annum. The University of Manitoba encourages applications from qualified women and men including members of visible minorites, Aboriginal peoples, and persons with disabilities. In accordance with Canadian Immigration requirements, this advertisement is directed to Canadian citizens and permanent residents. Send applications with a detailed curriculum vitae including a summary of teaching philosophy and interests, present and future research interests, academic transcripts, and names of three referees by November 30, 1999 to: Dr. G.J. Racz, Department of Soil Science, Faculty of Agricultural and Food Sciences, The University of Manitoba, 362 Ellis Building, Winnipeg, Manitoba, R3T 2N2. Telephone: (204) 474-6036; Fax: (204) 474-7642; E-mail: raczgj@ms.umanitoba.ca

New faculty position
Radar meteorology and remote sensing McGill University

This new appointment is for a joint, tenure track assistant professor in radar meteorology and remote sensing, shared between the Department of Atmospheric and Oceanic Sciences, and McGill School of Environment.

Applicants for this position should have a Ph.D. degree and will normally have had postdoctoral or industrial experience in radar meteorology and remote sensing.

The successful applicant will be expected to teach at the undergraduate and graduate levels in the programs of the Department of Atmospheric and Oceanic Sciences, and McGill School of Environment; to participate in the research and development activities of the Marshall Radar Observatory; to supervise graduate student research; and to pursue a vigorous research program. The latter could address issues such as severe weather prediction, numerical modelling, health and environment, land use and water management, and the climate system.

Review of applications will begin immediately and will continue until the position is filled, with the latest starting date being September 1, 2000. Applications postmarked before December 1, 1999 will be assured of consideration.

For more information about McGill University and the two units involved, see our Web site: www.mcgill.ca

Candidates should forward 2 copies of a curriculum vitae, a research proposal, and arrange to have 3 letters of reference sent to:

Dr. Charles Lin, Chair, Atmospheric and Oceanic Sciences, and Dr. Peter Brown, Director, McGill School of Environment, c/o Ms. Ornella Cavaliere, Department of Atmospheric and Oceanic Sciences, McGill University, 805 Sherbrooke Street West, Montreal, QC Canada H3A 2K6.

In accordance with the Canadian employment and immigration regulations, this advertisement is directed to Canadian citizens and permanent residents of Canada; however, applications from all outstanding candidates will be considered. McGill University is committed to equity in employment.

Invitation à Présenter des Communications
SCMO 2000
34e 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 34e 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
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AMOS 2000

7th Australian Meteorological and Oceanographic Society National Conference and 5th Australasian Conference on the Physics of Remote Sensing of Atmosphere and Ocean

7-9 February 2000
The University of Melbourne
Melbourne, Australia

The theme of the AMOS 2000 conference is the use and application of meteorological and oceanographic information. Talks on all aspects of meteorology and oceanography are also welcome.

Keynote speakers will include:

The dissemination of meteorological information by Rob Gell, Weather presenter, Nine Network.

The marine environment and fisheries by David Griffin, CSIRO Marine Research.

Fire and weather forecasting by Euan Ferguson, Victorian Country Fire Authority.

Atmospheric and oceanic risks and hazards, by Tom Beer, CSIRO Atmospheric Research.

The contribution of the CRC for southern hemisphere meteorology, by David Karoly, Monash University.

Gravity waves by Bob Vincent, University of Adelaide.

Weather and marine activities by Graeme Hubbert, Global Environmental Modelling Systems.

The global carbon cycle by Peter Rayner, CSIRO Atmospheric Research.

Future directions for meteorology by Geoff Love, Bureau of Meteorology.

The Intergovernmental Panel on Climate Change - towards the next assessment report - Invited speaker.

Please register via the AMOS conference web page: http://www.car.csiro.au/res/amos2000

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