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Canadian Meteorological and Oceanographic Society

La Société canadienne de météorologie et d'océanographie

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INTERNATIONAL YEAR OF THE OCEAN 1998 ANNÉE INTERNATIONALE DES OCÉANS

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

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Cover page: The photograph shown on cover page is that of a new medal cast in honour of Rube Hornstein, a longstanding member and supporter of CMOS. The medal, cast this year, will be known as the Rube Hornstein Medal in Applied Meteorology and will replace the Applied Meteorology Prize named after Mr. Hornstein. The first award of the medal was to Rube Hornntein himself, presented at the banquet of the 32nd Annual Congress of CMOS in Halifax, N.S. You may read the full story at page 93.

Page couverture: La photographie en page couverture illustre la nouvelle médaille moulée en l'honneur de Rube Hornstein, un membre et supporteur de la SCMO de longue date. La médaille, moulée cette année, sera connue sous le nom de Médaille Rube Hornstein en météorologie appliquée et remplacera le Prix en météorologie appliquée du même nom. La première présentation de la médaille a été faite à Rube Hornstein lui-même lors du 32e congrès annuel de la SCMO à Halifax, N.É. Vous pouvez lire plus d'information en page 93.

Next Issue

Next issue of the *CMOS Bulletin SCMO* will be published in August 1998. Please send your articles, notes, reports or news items at the earliest to the address given above. Don't miss your chance!

Prochain numéro

Le prochain numéro du *CMOS Bulletin SCMO* paraîtra en août 1998. Prière de nous faire parvenir vos articles, notes, rapports ou nouvelles au plus tôt à l'adresse indiquée ci-dessus. Ne manquez pas votre coup!

Canadian Meteorological and Oceanographic Society (CMOS)

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....from the President's desk

The election of your new executive at the Annual General Meeting in Dartmouth on June1 did not imply the same degree of change as last year's did - when the executive moved from Montreal to Ottawa. In fact, aside from the increased responsibilities for the undersigned, the main changes on CMOS Council are John Reid as Past-President, Ian Rutherford as our new Vice-President, Paul Delannoy replacing Rebecca Milo as Corresponding Secretary and Susan Allen from UBC as a new Councillor-at-Large. Former Past-President, Peter Zwack, moves off the Council after three years of significant contributions on the national executive - with our sincere appreciation.

Thanks also are due to the exceptionally well planned Congress which Clive Mason and his entire team gave to those members lucky enough to be able to attend. It is events like this that energize the entire Society!

This Year's Priorities

John Reid had two main objectives during his tenure:

- to improve the quality of the *CMOS Bulletin SCMO* and maintain a strong *Atmosphere-Ocean*; and,

- to undertake external services initiatives.

Largely due to John's determination and imagination, CMOS is a stronger society today than it was a year ago. The Bulletin is thriving; we are testing a prototype on-line version of *Atmosphere-Ocean*, and a number of other initiatives have been started with progress in sight:

a) the CRTC agreed with CMOS to work toward more timely radio broadcasts of weather warnings. It called for a meeting of interested parties to find solutions. We will be there!

b) further joint development of educational materials with the Royal Canadian Geographical Society and its journal, Canadian Geographic, will be pursued.

c) continued attempts to influence decision makers on Parliament Hill to enhance the roles of meteorology and oceanography.

In addition to playing a lead role as a partner/stakeholder in the Alternate Service Delivery consultations being undertaken by Environment Canada and Treasury Board, and in consultations on the new Ocean Strategy with Fisheries and Oceans Canada, CMOS will continue to support the broader goal of support for science and technology in general.

(Continued next page - suite à la page suivante)

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INSIDE / EN BREF

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John Reid was the first representative of CMOS on the Partnership Group for Science and Engineering (PAGSE), a group made up of about 25 Canadian engineering and science societies. Ian Rutherford is the present CMOS representative.

PAGSE has organized a number of important conferences and meetings, often at the CEO or Minister level and a series of breakfast seminars on Parliament Hill to ensure that parliamentarians understand the science they affect with their decisions. CMOS member Andrew Weaver was the first breakfast speaker in this series this spring on the topic of global climate change.

■ ensure that each member sees a value in and wants to remain a member of CMOS; and

■ try to find ways to attract new members, perhaps by attracting new groups of members such as educators.

In addition to continuing the priorities noted above, we need to concern ourselves with the state of our membership:

- ensure that each member sees a value in and wants to remain a member of CMOS; and,

- try to find ways to attract new members, perhaps by attracting new groups of members such as educators.

While the overall membership is down about 10% over the last year, this is understandable in view of the much larger reductions inside government. Despite this, there are hopeful signs-the number of retired members is up (as well we would hope!) and, thanks to the enthusiastic participation of CMOS Centres in Science Fairs, the number of student exhibits in meteorology and oceanography continues to grow. The success of the first "Education Day" at Congress this year and the proposals that flowed from the discussions with teachers point the way to exciting times ahead - for both CMOS and the education area.

The Internet and the World Wide Web have already had an impact on CMOS. Over 56% of our members included an e-mail address when they renewed their memberships last year - others had e-mail addresses but perhaps forgot to note them. We might contemplate two-way communication on issues and news via direct communication with a majority of our members. The CMOS national web site received more than 300 hits per month - and the Halifax Congress web site had a similar appeal. Perhaps this points to greater use of web sites as a tool for communication both within the local membership areas around Centres and across Canada. The CMOS web editor, Bob Jones, who also is the Chair of the Ottawa Centre, has made a number of improvements which allow for timely posting of news and information, as well as space for each Centre to advertise its meetings. With some funding support from CMOS, the web high school project, InterMET, was completed on time in a form suitable for French-speaking students and teachers. Our Tour Speaker and the Project's lead, Nathalie Gauthier, noted that an English-language version would be available by summer's end. Is there an opportunity to expand this to English speaking schools and to a greater span of ages /grades, or toward the introduction of oceanography in high school?

If any of the priority areas specified above resonate with the interests of you, the CMOS member, please send your suggestions to the Chair of your local Centre or to me. I promise to respond promptly.

Bill Pugsley, President / Président
CMOS / SCMO

Erratum

Unfortunately, an error has been found in the April issue of the *CMOS Bulletin SCMO* (Vol.26, No.2). In the article "Towards operational 10 km forecasts at the CMC", written by Dave Steenbergen, Angèle Simard and Pierre Dubreuil, the regional model resolution would be upgraded to 24 km and not 22 km as stated in the article on pages 42 and 43.

We apologize to our readers but the error was found too late, when printing was already completed.

Correction

Malheureusement, une erreur s'est glissée dans le numéro d'avril du *CMOS Bulletin SCMO* (Vol.26, No.2). Dans l'article "Vers des prévisions opérationnelles à une résolution de 10 km au CMC", écrit par Dave Steenbergen, Angèle Simard et Pierre Dubreuil, la résolution du modèle régional sera de 24 km et non de 22 km tel que mentionné à la page 37.

Nous nous excusons auprès de nos lecteurs mais l'erreur a été décelée alors que l'impression était déjà complétée.

Notre prochain numéro

Notre prochain numéro (Vol.26, No.4) comportera une section spéciale sur les tornades qui, j'en suis certain, saura vous intéresser. Ne manquez surtout pas ce sujet typique d'un été chaud!!!

Our next issue

Our next issue (Vol.26, No.4) will include a special section on tornadoes. I am sure you will be interested in this typical hot summer subject. Don't miss reading it!!!

Paul-André Bolduc,
Rédacteur / Editor, CMOS Bulletin SCMO.

The Creation of a Model Provincial Weather Modification Act[1]

by David A. Crowder[2]

Résumé

Bien que le Canada joue actuellement un rôle actif dans les opérations de la modification météorologique, il n'a pas mis au point sa législation et puisque on s'attend à ce que la pratique de la modification météorologique soit plus prédominante dans un proche avenir, des règlements modernes et compréhensifs seront nécessaires. Les provinces canadiennes ont besoin d'une législation qui soit à la fois juste du point de vue environnemental, économique, politique et social, et qui en même temps n'empêche pas la recherche et l'expérimentation.

En évaluant la législation canadienne actuelle sur la modification météorologique et en la comparant aux lois américaines plus comprehensives, on peut développer une loi modèle pour les provinces sur la modification météorologique. En incorporant les meilleures sections de la législation américaine et canadienne actuelle et en créant de nouvelles sections essentielles qui n'existent pas encore, on peut produire un acte moderne qui servira de modèle pour les provinces sur la modification météorologique.

Les provinces pourraient adopter cette législation en entier ou en partie qu'elles participent activement ou pas aux opérations de modification. L'acte modèle sur la modification météorologique servirait de repère pro-actif contre lequel les Etats-Unis et les autres pays pourraient mesurer leur propre législation sur la modification météorologique.

Introduction

The Canadian government has often struggled to maintain its legislative policies; to keep them updated, comprehensive and equal or similar to those in other countries. In the case of purposeful weather modification, Canada is involved in operational activities, but its legislation is far from being up to date. With rapid technological and atmospheric research advancements, the legislation needs to be analyzed and revised in such a way that the law is clear, concise and exhaustive, yet also flexible enough to allow for revisions as opportunities present themselves.

That current legislation in Canada is 18 years old should be reason enough to warrant its revision, but further to this, only two of the ten provinces and territories have provincial legislation of any kind. Numerous modification projects were conducted in the 1980s in Alberta, and most recently in 1996. Incidentally, Alberta has only minimal guidelines and no regulations.

The need for updated legislative direction has never been more prominent. New technologies and developments with respect to atmospheric research, coupled with the fact that weather modification operations have been renewed in Alberta in 1996 after a decade hiatus, are all valid rationales for the revision of Canada's current policies. Aside from the antiquity of the legislation, the future also provides grounds for amendments. With global warming becoming more and more of a reality, the already oft-desiccated midwest plains and boreal forest regions will become drier still, increasing the possibility of destructive forest fires and also possibly reducing agricultural productivity. Requests for artificial rain augmentation and hail suppression would increase, and therefore any legislation regarding it needs to be up to date, comprehensive, and leaning towards a proactive stance.

Criteria for a Model Weather Modification Act

In order to create a comprehensive model weather modification act, criteria must be established by which to judge its comprehensiveness. The list is taken primarily from Carswell and McBoyle's characteristics of state weather modification laws (1983), but there have also been a number of additions and omissions. The resulting list of 20 criteria is as follows:

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1 Condensed version of a senior honours thesis completed at the University of Waterloo in May 1997 under the supervision of Dr. Geoff McBoyle.

2 Present address: 2 Yvonne Ave, North York, Ontario, M3L 1C7

Control Measures

1. Licence Requirements;
2. Provisions for Licence Exemptions;
3. Permit Requirements;
4. Provisions for Permit Exemptions;
5. Provisions for Modifying Permits;
6. Notice and Publication of Intent, Submissio of Records;
7. Provisions for On-Site Inspections.

Safety Measures

8. Provisions for Public Hearings;
9. Proof of Financial Responsibility;
10. Conduct Environmental Impact Assessment;
11. Use of Weather Modification by Military must be for Non-Offensive Purposes.

Penalties

12. Revocation of Licence and/or Permit;
13. Conviction of Misdemeanour with Fines and/or Jail Sentences.

Related Matters

14. Sovereignty Over Atmosphere;
15. Provisions for Governmental Financial Support;
16. Provisions for Inter-Provincial and International Cooperation;
17. Provisions for Provincial-Federal Cooperation;
18. Prohibition of Projects that will Affect Outside Jurisdictions;
19. Establishment of a Weather Modification Control Board;
20. Money Set Aside for Intervenor Fund.

The model Act should contain each one of the aforementioned characteristics, which may be taken, if available, from the best existing legislation in Canada and the United States.

A. Control Measures

By establishing the necessary criteria to be met by eligible weather modifiers, and regulating who shall be permitted to conduct such activities, the government is able to prohibit modification of the weather at random by unqualified individuals and/or corporations. The underlying component of the Control Measures is the validation of competency and legitimacy of the modifier through licences, permits and records.

1. Licence Requirements. The purpose to having a licence requirement in the statute is to ensure that the modifier has a legitimate and relevant education and experience in the field of weather modification. These requirements are more concerned with the operator's background and abilities in general than with a specific project and its equipment (Carswell, 1981).

2. Licence Exemptions. Although rare, there may be an occasion to exempt the modifier from obtaining a licence. Such instances would include emergencies, non-profit organizations or federal and provincial agencies. Also exempt, and of particular interest in Canada, are the religious activities of native peoples.

3. Permit Requirements. The permit, referring to the specifics about an operation, is given on a project-by-project basis and may only be obtained after a licence has been granted. Permits generally outline the area to be affected, the start date, duration, methods, materials/equipment and approximate costs for the intended modification operation.

4. Permit Exemptions. These exemptions are subject to the same criteria as the licence exemptions; those being operations designed for research and development, emergencies and native activities.

5. Modification of Permit. The lead government agency, possibly the Ministry of Natural Resources, will want to be able to exercise control over the permit requirements and components, particularly in emergency situations where the weather itself may become such as to endanger the safety of the public. There are periods in which the weather may necessitate immediate and decisive action, such as excessive rainfall periods. Allowing the Weather Modification Control Board permission to modify the terms of a permit ensures minimal human and property loss as a result (Carswell, 1981).

6. Notice and Publication of Intent and Submission of Records. In today's society, the more the public is consulted and allowed to participate in the decision making, fewer and smaller difficulties and biases against the modifiers will ensue. An intent to modify, progress reports, and a follow-up publication will help to ease the public's fears and hopefully improve relations between the scientists and the public. All records and submissions shall be sent to the lead government agency and made available to the public at the Weather Modification Control Board office.

7. On-Site Inspections. This component allows Board officials to verify the information submitted by operators regarding the equipment used, methods and materials, and to maintain contact between the operators and officials during the weather modification project.

B. Safety Measures

Perhaps one of the areas of purposeful weather modification that should have the greatest emphasis placed upon it is the matter of safety; specifically that of the public and the environment. Components included in this section are: provisions for public hearings, proof of financial

responsibility and an environmental impact assessment. Through the application of safety measures, the model act shall "attempt to inform the community before the weather modification activity starts and safeguard the community after the program begins" (Carswell and McBoyle, 1983).

8. Public Hearings. When planning weather modification activities, the procedure should include provisions for giving public and private interests a voice in the process. It would seem logical that the persons to be affected by the results of the weather modification be able to contribute suggestions, voice concerns or lend support. The purpose of a public hearing, therefore, would be to disseminate information between government officials, modifiers and members of the affected public (Carswell, 1981).

9. Proof of Financial Responsibility. Exhibiting sufficient financial responsibility for their actions assures the public and the government that the modifying company is legitimate and has the ability to cover damages that may occur by accident or mistake during an operation. The amount of liability insurance required would be up to individual provinces and set out in their own regulations.

10. The Environmental Impact Assessment. Within available weather modification legislation, there is no provision for conducting any form of Environmental Impact Assessment (EIA). Today, where environmental conservation and protection is an integral part of any major undertaking, any act of purposeful weather modification should be subjected to some form of assessment. A complete, comprehensive EIA would include evaluation of possible social, economic and biophysical impacts that a weather modification operation might have. Although this form of assessment is all-inclusive and would ensure better environmental stewardship, it is also time-consuming and can become extremely expensive for the proponent. The alternative would be to carry out a Class EIA. These generic assessments are used for routine projects "where the activity in question occurs frequently, has a predictable range of effects, and is likely to have only minor impacts on the environment" (Estrin and Swaigen, 1993). Such projects might include road and sewage construction and possibly in this case, weather modification. Class assessments must comply with all the requirements of the Environmental Assessment Act; however, they make planning and approval more streamlined. It will be up to the individual provinces to designate which assessment is to be used; however, if sufficient opposition exists, or the authority deems necessary, a Class EIA may be 'bumped up' to a full Environmental Impact Assessment.

Whichever assessment is conducted, be it a full assessment or a Class assessment, it must be completed before any public meetings or hearings take place. This then gives the proponents and the opposition substance upon which to base their view.

11. Use of Weather Modification by the Military. Unquestionably, a nation's military initiates huge progressions in research and development, and weather modification could provide a perfect forum in which to demonstrate their capabilities. The United Nations, however, has enacted a policy that "calls upon all States to refrain from military or any other hostile use of any environmental modification techniques" (United Nations, 1992). Fleagle (1968), also believes that it is in the best interest of nations and humanity, in general, to have weather modification discussed openly amongst nations and in a spirit of mutual cooperation. The Model act will not have an explicit clause that prohibits the military's use, but the section will draw the modifier's attention to the United Nations' policy on the subject.

C. Penalties

Penalties are the means of incentive for operators to abide by the Act's requirements and regulations. Depending upon the severity of the infraction, the authority has a number of options for penalization from permit revocation to jail sentences. The provision for appeals has been deliberately omitted. It is felt that the rules outlined in the policy are clear and fair, and violators, if found guilty of an offence, should not be granted permission to appeal the decision handed to them.

12. Revocation of Permit and/or Licence. At the discretion of the Board, either the project permit or the licence, or both, may be revoked according to the severity of the infraction. This is carried out separately from the provincial judicial system.

13. Conviction of Misdemeanour, Fines and/or Jail. If the violation warrants, a higher authority may be called upon to pass judgement in terms of fines and/or jail sentences to be imposed on an operator. A conviction may only be applied if the violator has had his/her permit and licence revoked.

D. Related Matters

Components included in this section are those that relate to weather modification in a more general sense. Such components are the cooperation of agencies and governments and the establishment of a weather modification board. "These components are auxiliaries which complete the picture of how the (provinces) regulate and control the (activities)" (Carswell, 1981). One particular criterion that was not included in the previous list of criteria by Carswell and McBoyle (1983) is the granting of governmental immunity from liability. With such stringent application procedures and requirements, the government and its various agencies responsible for weather modification should be held accountable for their actions. If a problem occurs and the modifier is deemed unfit to conduct or continue operations, it is the government-based Weather Modification Control Board that granted the

licence and permit and by all means should be held responsible, along with the guilty operator.

14. Province Claims Sovereignty Over Atmosphere. The issue of sovereignty and jurisdiction of the atmospheric resources has been a long and hotly debated one. Hunt, (1968), believes "no one owns the clouds...they cannot be reduced to possession and thus become the private property of an individual". In lieu of this, one might argue that someone must exercise control over the atmosphere in order to eliminate any further debate. In the case of purposeful weather modification, and for governing purposes, the provinces should become the responsible body in Canada. Both Hunt and G. MacDonald (1968), are firm supporters that atmospheric resources and the policies pertaining to them should fall under federal jurisdiction. This author feels that the federalist attitude erodes and undermines the provinces' rights and strengths that they strived for so long to gain. The federal government is often seen as too far removed from the people, and in issues that are sensitive to only select populations, better public relations may be achieved if a provincial government were in control.

15. Government Financial Support. Since the provincial government is taking such an active role in regulating and promoting weather modification, it is within reason to allow for an appropriation of the provinces' funds to such practices. These funds may be used in any aspect of purposeful weather modification from administrative duties through to the purchasing of equipment and actual field experiments.

16. International and Interprovincial Cooperation. Fostering a unity between nations and especially among the provinces will instil a sense of faith in the industry of weather modification as well as work to reduce the number of extra-jurisdictional conflicts. What is needed is a simple statement encouraging inter-provincial agreements. As for international collaboration, which is more of a federal issue, Canada and the United States should work to revise and possibly extend the regulations of the Agreement Between Canada and the United States Relating to the Exchange of Weather Modification Information (1975) to encompass trans-boundary projects themselves and not just their relevant information.

17. Intergovemmental Cooperation. This component allows the federal government to work with the provinces in weather modification activities. With firm federal support and the provinces' endorsement, weather modification gains a positive image and the public's trust; both of which are needed for operations to run effectively.

18. Prohibition of Activities Affecting Outside Provinces. Admittedly, not every province will wish to conduct modification operations and they should not be subjected to the effects of an operation done outside of their political boundaries. This particular component will state that unless both provinces are in agreement, an operation shall not be carried out that may affect areas outside of the modifying province. As for provinces conducting operations that have effects on the United States, they are still governed by the information exchange agreement signed by Canada and the United States in 1975.

19. Establishing a Weather Modification Control Board. The creation of a Weather Modification Control Board is essential Such an organization will have numerous responsibilities including the collection of reports, records and monies. It will also assume a regulatory role in addition to being an advisory body.

20. Intervenor Fund. As a follow-up to the Environmental Impact Assessment that will be conducted, there should be a fund created solely for the purpose of aiding those opposed to the projects. This is the intervenor fund. Modifiers have such deep financial resources compared to the public that it is necessary to 'level the playing field' via the intervenor fund. Monies shall come in part from the Weather Modification Control Board, with the majority coming from the prospective modifier.

The general aim of this Act is two-fold. Safety of both the public and the environment is the first consideration. This is accomplished through the application procedures for licences and permits, the mandatory submission of records before, during and after the operation, the Environmental Impact Assessment, and the overall information to which the public has access. Each of these requirements benefits public relations between modifiers and the affected people, ensuring safety and promoting awareness of this progressive technology. The second aim is to establish a legislation that does not hinder the development and research of weather modification (Taubenfeld, 1968), but rather regulates those who conduct the operations while encouraging the advancement of the industry.

Summary

As purposeful weather modification is expected to become more prevalent in Canada, there will be a need to unify the provinces under a common body of legislation that is both modem and comprehensive. Current legislation in Canada is far from comprehensive and deals primarily with the collection of information by the federal government, yet as projects become more complicated and intricate, the governing legislation needs to be more forceful and proactive. Included in such an Act would be clauses for screening prospective modifiers via licence and permit application procedures, public hearings, environmental considerations taken into account by requiring Environmental Impact Assessments, and fostering extra-jurisdictional cooperation. The model provincial Weather Modification Act incorporates political, social, economic and environmental aspects into it, without hindering the scientific progressions that could be realized through research and experimentation. At the same time, through the implementation of such a comprehensive piece of

weather modification legislation, Canada may become the bench mark by which the United States and other countries can measure and compare their own respective weather modification policies, statutes and acts.

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Food for Thought

"Whoever wishes to pursue the science of medicine must first investigate the seasons in the year and what occurs in them."

Hippocrates, 4th Century BC.

Do some Secrets of Soaring Still Lie in the Dark? Shadow Soaring[1]

by Tillmann Steckner[2]

Note from the Editor

The author of the following article is literally a "hands on" user of the weather. Through careful observation, he has developed the concept of cloud shadows as a trigger mechanism for organizing and maintaining itinerant thermals, or fair weather cumuli. We believe this is a novel idea. By reprinting this article, originally published in a soaring magazine, we hope to stimulate discussion in the cloud physics and modelling communities of CMOS.

Note du Rédacteur

L'auteur de l'article qui suit utilise la météorologie à pleine main. Par l'observation méthodique, il a développé le concept que les ombrages de nuages servent de mécanisme déclencheur pour organiser et maintenir les courants thermiques, ou les cumuli de beau temps. Nous croyons que c'est un concept nouveau. En reproduisant cet article, initialement publié dans un magazine de vol plané, nous espérons stimuler la discussion au sein de la communautés de la physique des nuages et du modelage de la SCMO.

As conventional wisdom among glider pilots has it, if you are low, look below, and if your are high, search the sky. While this is sound advice, I discovered during the soaring season of 1996 that, given certain conditions, there may be an alternative way of finding lift and sticking with it.

One day when I was frustrated by my inability to stay with any thermal for long, something occurred to me which I had never given any thought to before. While the clouds were badly tattered, fairly shallow, and for the most part, rather large or even interconnected, their shadows on the ground were, in contrast, extremely well defined. Where the sky was clear, the sun was intense and the constant looking up to the clouds was not only hard on my eyes, but on the neck as well. As I was thermaling, I could never quite see the whole cloud all at once, whereas its full shadow was in plain view every time I came around to face it. The clouds were in constant turmoil and any attempts at memorizing their shape and features in order to better centre on the core of the thermals proved futile. Yet their sharply drawn shadows on the ground maintained more or less the same general outline. Together they formed a tapestry of dark blotches sliding slowly across the sunny countryside. On that day it suddenly came to me literally out of the blue sky that I was looking at nothing less than a huge cloud projection produced by the sun marking for me all the thermals near and far.

When I got into the next thermal, I immediately made a mental note as to my exact position in reference to the nearest cloud shadow below me.

For this purpose, I divided the dark area on the ground into four imaginary sectors as illustrated in Figure 1, namely sectors N-W, S-W, S-E, and N-E. I also noted any distinct features of the shadow, such as indentations, projections, holes and, of course, the direction and speed the shadow was travelling, as well as the position of the sun. From then on, I used the shadow outline as the primary visual reference for my turns, rather than the cloud above me. I shifted from this reference point only to the extent that my two variometers (analog and audio) indicated the need to do so. For well over 1000 feet, I only occasionally glanced at the cloud itself, which was ill-defined and apparently made up by several smaller clouds fused together. There were some blue openings in it and the shape of the cloud mass varied constantly. In fact, after completing a full turn, I was hard-pressed to recognize any similarity between what I was seeing and what I remembered it to have been only 25 seconds earlier. It was therefore difficult to determine by direct viewing, whether or not I was still in the same spot under the cloud. I had no such problem when looking at the shadow of the same cloud. Its general outline had changed little, it was two-dimensional, rather than three-dimensional as its projective source above. Moreover, when coming around I could see it in its entirety. After making the height gain already mentioned and thermaling in the manner described, my rate of climb suddenly began to accelerate. When I looked up, I could no longer miss the spot of the cloud under which the strongest lift was generated. As I was no longer blinded by the sun, I naturally shifted my reference point from the ground to the new one in the cloud. I was amazed at the ease with which I had reached the most active area under the cloud without barely giving any attention to its location in the sky by looking at it directly. I had remained in the core of the

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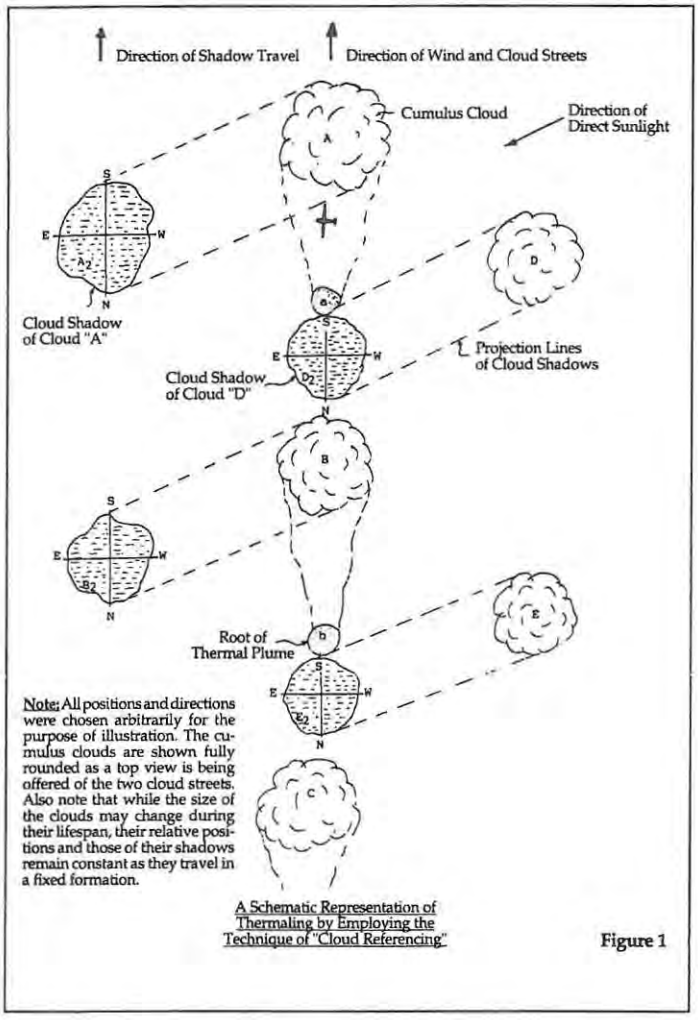
1 Reprint from Soaring: Vol.61, No.6, June 1997. Authorization to reprint received June 1, 1998 from Publications Manager, Soaring Society of America.

2 Tillmann's New Product Research, 103 Hampton Crescent, London, Ontario, Canada N6H 2P2, Steckner@netcom.ca

thermal almost entirely by means of the cloud's shadow and my varios. It is really not as complicated as it would at first appear. The basic technique of thermaling by "shadow-referencing" is essentially the same as thermaling by "cloud-referencing".



A Schematic Representation of Thermaling by Employing the Technique of "Cloud Referencing"

Figure 1

Since my first experience with "shadow-soaring", I have had further opportunities to experiment with this technique and found the results quite encouraging. Interestingly I was less successful with the technique when flying in the Alleghenies than I was over the flatlands of southwestern Ontario, my regular soaring turf in the summer. This should not be surprising as ridge lift augmented by convective air currents coming off the mountain slopes is bound to affect itinerant cumulus clouds, which are arriving from further upwind, in unpredictable ways. In fact some of the cumuli at this soaring site may be formed near, or even directly above the ridge. On the other hand, when flying over the flat terrain already referred to, I was sometimes surprised by the unexpected angles I had to fly in relation to the cloud above me to get the most lift. I certainly would not have sought lift in these areas if I had flown by normal cloud orientation alone. It should be emphasized, though, that the shadow markers selected on the ground served me only as a reference point. I constantly shifted my position as I used my varios to centre on the core of the thermal. Occasionally I still managed to lose the thermal, except I now had usually little trouble to relocate the thermal by reference to the shadows of the cap clouds. Because of the drift angle of the thermal, my position in relation to the ground marker would typically shift significantly as altitude was gained.

In some cases, I discovered that the shadow, which served me as a reference, was not even produced by the cloud which was capping the thermal I was in (see Figure 1). This brings up an interesting point: since all the clouds travel in the same direction and their relative position to one another does not change appreciably even over fairly long periods of time, it does not really matter too much which shadow one uses as a reference. This is very helpful when flying on windy days in thermals of extreme drift angles and when the sun stands low above the horizon. In fact, on more than one occasion I finally "topped out" in a blue hole. At times, I even found myself climbing in "blue thermals" by using for orientation the bright areas which lay between the shadows of surrounding clouds.

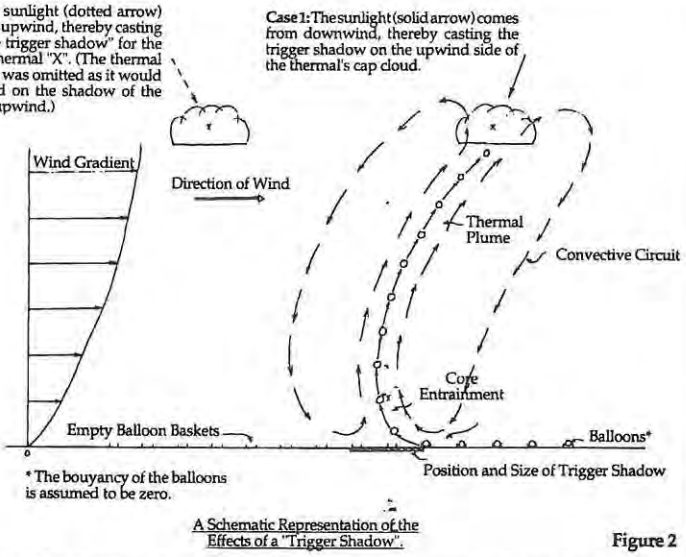
More recently I decided to take the whole concept one step further when the shadow I used for reference disappeared, as, of course, did the respective cloud which produced it. What to do next? I reasoned that if I obtained good results by "referencing" a certain corner of the last shadow, then I could perhaps expect the other cloud shadows to give me good lift in corresponding locations. I therefore headed for the nearest cloud shadow which looked promising to me. As it turned out, for over one hour I was able to jump from one shadow to another, skipping the ones in between which failed to register on my varios in straight flight, but without ever being let down by those which did and where I started to circle in the very sector location I suspected to be "hot".

On days when conditions make it difficult to determine the location of convective activity under the clouds, we should perhaps pay more attention to the thermal map which the sun so conveniently draws for us on the terrain below. Just as we often get a better overall picture of the location of potentially strong thermals by looking at their respective cap clouds from the ground, than when we fly right under them, the converse is equally true about the shadows projected by the very same clouds as we view them from well above, rather than at or near the ground level. The diagram already referred to serves to illustrate the basic principles of "shadow-soaring" as outlined in this article. It is not to be taken as a ready blueprint, because such factors as the angle of the sun, the direction and the speed of the wind, the shape and drift angle of the thermal plume, as well as the relative distance between the glider, the cloud and its respective shadow, vary from case to case. In the situation depicted, the direct sunlight comes from the right, thereby creating the row of shadows to the left of the corresponding cloud street. The wind causes the thermals to be tilted as indicated by dotted lines which join the root of the thermals with the clouds capping the latter. Given the conditions illustrated, the pilot flying under the thermal of cloud "A" has two choices in selecting a shadow

reference:

1. He may use a certain feature of shadow A2, say the rounded protusion of the S-W sector.

2. He can choose the shadow of cloud "D" which happens to be near the root "a" of the thermal capped by cloud "A". Because, as already noted, cloud shadows all move in a fixed formation, the pilot can in the present case pretend for a while that location "S" of shadow "D2" is the root of the thermal Plume a-A. In other words, if during his turn, at the instant here shown, his lower wing tip points at said location "S" and the upper one at cloud "A", he can get a pretty good idea of his alignment with the thermal plume as a whole, because the extension of the banked wings in that position during the turn momentarily forms more or less a straight line between the root of the thermal and the cloud above.



A Schematic Representation of the Effects of a "Trigger Shadow". **Figure 2**

Note: If a glider were to fly circles around a hot-air balloon, the following two scenarios are likely to take place: In a situation where warm air rises from the ground, the glider will outclimb the hot-air balloon, because the latter's ascend depends on the air inside its fabric canopy to be warmer (lighter) than the air surrounding it. On the other hand, in the presence of cool, stable air, the hot-air balloon will climb rapidly, whereas the glider is forced down as a result of "sink". This being the case, the glider pilot should, under the conditions depicted above, use his ability to move in any direction to search for lift near the leading edge of the cloud shadow, while the pilot of the balloon would probably rise more quickly by simply drifting along near the trailing edge of the shadow or behind it.

While it would be true to say that the clouds and their shadows are rarely arranged quite as neatly amongst each other, it is surprising how often they come close to the ideal case depicted in this illustration. Perhaps there is more at work here than mere chance. In the next section of this article, under the subheading titled "Cloud Shadows as a Trigger Mechanism in the Sustainment of Itinerant Thermals", we shall examine if the relationship of cap clouds and their shadows could be more than just an optical one.

Cloud Shadows as a Trigger Mechanism in the Sustainment of Itinerant Thermals

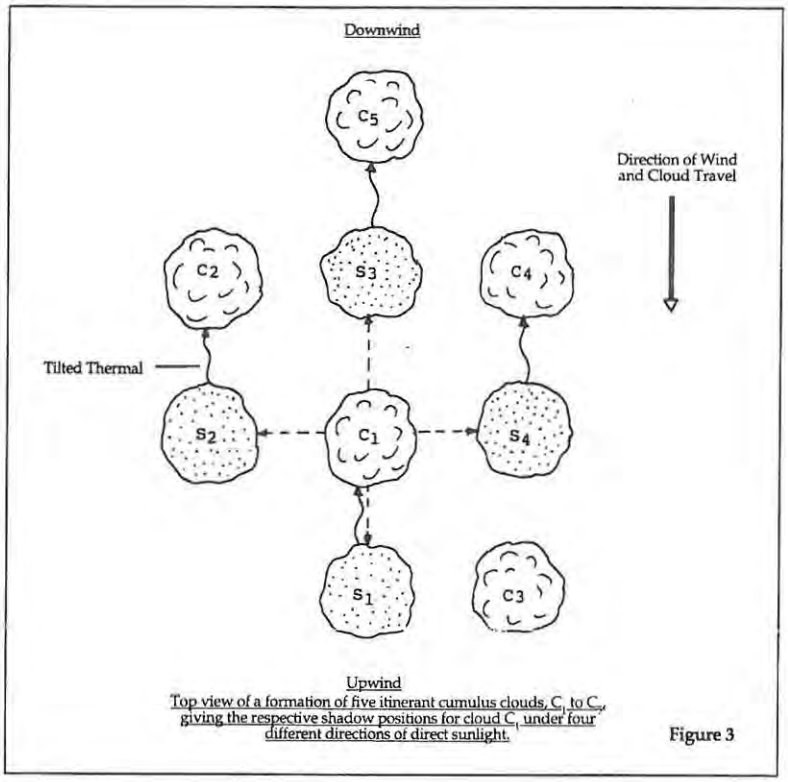
Let us begin our study of itinerant thermals by first looking at a stationary thermal rooted to its source of energy when there is very little wind. For this purpose we choose a small fire burning in an open field, as the smoke plume which rises from it gives us a fairly good picture of the shape and behaviour of stationary thermals in general. Yet even here something lies hidden from our eyes, for often both the width and the strength of the thermals emanating from such fires are very much out of proportion to the relatively small amount of heat generated by their visible source. Since sailplanes can do with barely less of an air space than measuring 140 feet across to turn inside it, it is difficult to see how the narrow smoke plume of our small field fire can be sufficient to do the trick. This suggests that localized "hot spots" of this size merely provide the trigger mechanism by which warm layers of air, adjacent to them, somewhat like a table cloth picked up at the centre, are drawn up into the sky. As we shall see, this could hold important implications for the topic at hand, because similar considerations apply to most solar thermals as well, as for instance those "kicked up" by the roofs of barns, asphalt surfaces and heat absorbent crops.

The question which arises from above observations is what happens if the wind gets strong enough for such a thermal to be uprooted from its original source of heat energy? Quite obviously, without any further and continuous input of energy the thermal would be truncated, contract into a bubble, and then cease to exist entirely in a matter of minutes. As the towering gaggles of sailplanes sometimes seen during major competitions attest, itinerant thermals can under favourable conditions, quite easily maintain their energy levels as the drift downwind, sometimes over considerable distances. It is not uncommon for them to even gain in strength.

To the knowledge of this writer - and those he consulted on the subject - no scientific explanation has ever been offered for this remarkable phenomenon. That being the case, I wish to propose the following concepts for further investigation.

In Figure 2, the wind comes from the left and the direct sunlight, at a steep angle, from the right. This causes a shadow of cumulus cloud "X" to be cast on the ground some distance upwind of the latter. For illustrative purposes let us assume that a long string of light, but non buoyant balloons is laid out on the ground in evenly spaced wire baskets. As the cool cloud shadow advances, it undercuts the warm layer of air still clinging to the suntrenched ground ahead of it like a wedge, thereby dislodging it. The warm air is then drawn into the core of the thermal as traced by the rising balloons. Further energy is added to the thermal by direct heat transfer between the ground and the cool air of the downdraft converging on the root of the former, as well as by the entrainment of warm

ground flux drawn in from all sides. Thus the shadow, best described as a "trigger shadow", acts like a convective catalyst, which ensures that the thermal, although it is moving steadily downwind, is provided with a precisely timed, continuous supply of energy.



Top view of a formation of five itinerant cumulus clouds, C_1 to C_5, giving the respective shadow positions for cloud C_1 under four different directions of direct sunlight.

Figure 3

In discussions the writer has had with knowledgeable persons whose reaction he sought regarding his concepts, he was challenged by some of four related issues. Since some readers are likely to raise the same points, we should deal with them here.

1. The chilling effect of the trigger shadow is neither fast nor strong enough to accomplish the feat ascribed to it by this observer.

2. The trigger shadow, which travels at the same speed as the cap cloud of the thermal, moves too quickly for the root of the thermal to keep up with it as the latter is subject to the wind gradient.

3. The trigger shadow would be out of position in relation to its respective thermal for any direction of the sunlight other than the one shown in Case 1 of Figure 2.

4. As the cumulus clouds spread out and fill the gaps between them in the direction of the wind to the point of complete closure in the form of a solid cloud street, the trigger effect of the shadows ceases.

The writer wishes to respond to these points in the same order below. As this response allows for a welcome opportunity to elaborate on the subject of trigger shadows, it will take up more space than the above presentation of the basic concept.

1. When we stand in the sun on a hot day, the relief of a passing cloud shadow is felt on our skin almost instantly. Conversely, so is the sensation of sudden warmth with the shadow gone. Just as rain drops can produce a flood, the small quantities of heat energy, which our senses register on a subjective scale from "cold" to "hot", could when scooped up en masse by advancing cloud shadows over large areas, create a thermodynamic torrent. Lest this be taken as an exaggeration, we should reflect on the fact that itinerant thermals may hoist entire gaggles of sailplanes thousands of feet into the sky at very high rates of climb.

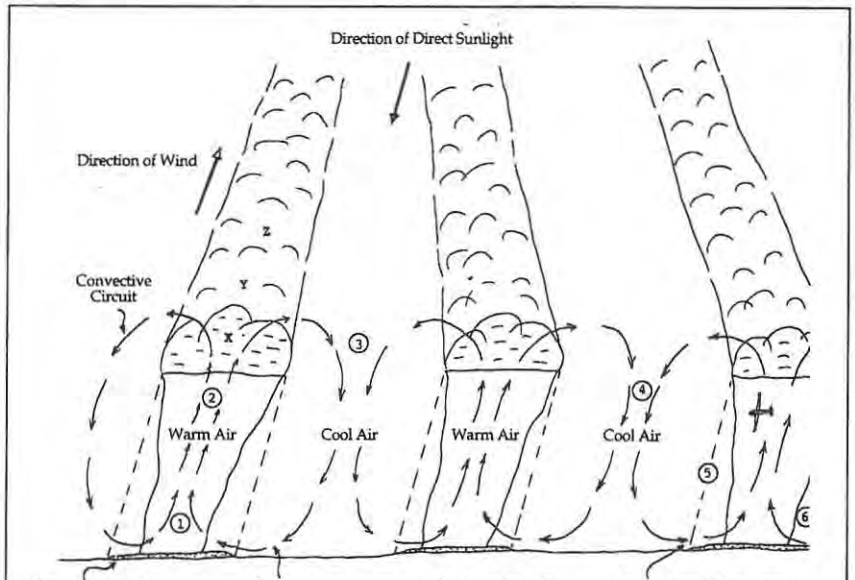
The trigger effect of cloud shadows can be observed on a sunny day when we stand inside a barn or a hangar covered by a metal roof. We hear the roof crackle almost as soon as a shadow blots out the sun and the metal cools off and contracts. In the process the air layer above the roof, which was heated up by direct contact with the sheet metal while it was still exposed to the sun, is dislodged by the sudden cooling effect of the shadow. As the shadow moves across the roof it raises said layer off the metal surface like a carpet lifted up at one of its ends and feeds it into the thermal associated with the advancement of that shadow.

2. It may be argued that the thermal shown in Figure 2 would be ruptured by horizontal wind shear, because the balloons near the ground are held back by the wind gradient, and therefore travel too slowly to keep up with the cap cloud. We know from observing sailplanes with very low wing-loadings, which out climb more highly stressed ships initially well above them, that the structure of itinerant thermal plumes may stay intact in moderate winds over a wide range of altitude. What allows these thermals to resist the horizontal wind gradient shown in Figure 2?

If the thermal plume in this diagram is viewed as a large hose, we can see how this may be accomplished. While the rise of the warm air in the core of the thermal is relatively slow, the ingestion of even one air bubble (as represented by the first balloon being raised aloft) is bound to cause an almost instant displacement of all other air bubbles above it. Consequently, the more bubbles enter at the bottom of the "thermal hose", the faster and more energetic the bubbles will have to move throughout the whole convective system. As the towering gaggles of sailplanes climbing in itinerant thermals so strikingly prove, a vigorous convective system (which includes the massive downdrafts shielding the thermal proper) produces evidently sufficient vertical wind shear to punch through the shifting layers of air surrounding that system. (Unless the breeze is so strong that it tears the thermal apart, which accounts for the fact that on such days we fail to find organized lift).

3. Figure 2 shows that in the event the direct sunlight comes from the upwind side of the cloud (cumulus "Y" in Case 2), it may cast a shadow in the same place as cloud "X" did in the previous case. We shall henceforth refer to such a shadow as a "surrogate trigger shadow", because it is instrumental in sustaining a thermal in place of the shadow cast by its own cap cloud. The arrangement illustrated may at first appear to be the contrivance of a sleight of hand, until it is realized that cumulus "X", whose continued existence depends on its surrogate trigger shadow, has no choice but to shift further downwind as the solar zenith angle is gradually reduced. Simply put, it is a question of "follow the leader". The above relationship naturally raises the question as to what happens when the direction of the sunlight is not aligned with that of the wind? Figure 3 illustrates the relationships which exist between five itinerant cumulus clouds and their trigger shadows. The clouds labelled C1 to C5, which move in formation downwind, are seen from the top. The dotted arrows represent four directions of sunlight at right angles to one another, causing the shadow of C1 to be cast in as many different locations. If, for example, the sun comes from downwind (as it does in Case 1 of the previous diagram), C1 produces its own trigger cloud (see wavy solid arrow). In the case that the sun comes from the right, C1 casts the shadow S2, which in turn becomes the surrogate trigger shadow for cumulus C2. However, this change in the direction of the sun also leaves the thermal associated with C1 without its own trigger shadow. Therefore, C3 must provide a surrogate shadow in roughly the same space presently occupied by shadow S1.

The other combinations, which work in an identical manner, can easily be derived from the arrows shown. As the position of the sun gradually changes its positions from those given in Figure 3, the configuration of the cloud formation will respond to it. For instance, if the solar zenith angle changes in such a way that the shadow S2 of cumulus C1 shifts further towards the left, cumulus C2 would be forced to do likewise since it is being fed by the warm air masses of air dislodged by its surrogate trigger shadow. A further combination is illustrated in Figure 1, where the sunlight comes from a direction roughly 45 degrees to that of the prevailing wind. The relationships developed above may help to explain why on strong soaring days itinerant cumulus clouds often arrange themselves in such "disciplined" formation patterns. Because all shadows, whatever their origin, usually appear to us merely as the image of their source, we may overlook that in the case of cumuli forming cloud streets, the relationship could be more than just an optical one. We do know that when the ground areas covered by shadows become too large, convective activity is curtailed. What happens, though, at the various stages before this critical point is reached? The possibility that growing cloud shadows may do more than just mimic cloud development was raised by one reviewer of this article, who speculates that if the solar zenith angle in the late afternoon causes the cloud shadows to become larger, it could, in addition to other known factors, be instrumental in inducing the cumuli of a cloud street to spread out as well. At first thought, the argument like the question, if the egg came before the chicken may strike us as circuitous and silly, but is it?



1. Warm air acceierated and compressed in counter-flow, strong lift.
2. Warm air expands and cools.
3. Air currents collide and keep cloud streets apart.
4. Strong sink in convective downburst (all air returning to the ground does so crosswind between the two adjacent, unbroken cloud streets)
5. Cloud shadow projection line.
6. Thermal plume.

Cross-sectional View of an Unbroken Cloud Street and Its Convective Circuit

Figure 4

4. That the trigger effect of the cloud shadows ceases when an unbroken cloud street is formed is obvious, but by itself this fact does not invalidate the concepts here developed. It appears to this observer that in this case the shadows, although they assume a very different role, still perform a very important function which tends to be overlooked.

On a calm day, given the right conditions, more or less stationary cumulus clouds typically pop up without any discernible patterns. Eventually the thermals and their cap clouds begin to compete for the same air space. At this stage the separation between the cumuli is likely to be fairly even all around them. However, when there is a breeze and the cumuli are driven downwind, the spaces between successive clouds aligned with the wind may become closer, while those which run on a course parallel to them are kept at a wider and fairly constant distance. There are several reasons for this. For one thing, as the trigger shadows become larger and their spacing in a windward direction is reduced, the downdrafts between successive clouds become weaker as a result, while the downdrafts on their "sunny" sides facing

crosswind get correspondingly stronger, for what goes up must come down. This encourages the clouds which succeed one another to close ranks. What probably facilitates this contraction is the fact that the thermal plumes are tilted downwind, which allows them to slide up on one another. There may also be a draft effect at work causing a thermal to be drawn into the wake of a preceding thermal. The strong downdrafts on the crosswind sides of the clouds, referred to above, also prevent that their neighbours running on a parallel course intrude on their "breathing space". These powerful, opposing convective air currents, which act like magnetic fields of like polarity, are shown in Figure 4.

In Figure 2, we viewed clouds "X" and "Y" at right angles to their common path downwind. In the present case the same clouds, also marked "X" and "Y", seen here at a further stage of development, move downwind away from the viewer. The spaces between them have been filled out completely so that an uninterrupted cloud street has been formed. The cumuli leading "X" and "Y" downwind have perforce of the dynamics described above, organized themselves in like fashion (as did the clouds trailing upwind, which are not shown in this cross-sectional view). The respective downdrafts and updrafts, colliding between the cloud streets and under them, complement each other in such a way that most lift is encountered above the shadows, rather than above the sunny areas which separate the latter. This is a reversal of what normally takes place with cumulus clouds isolated from one another. As uninterrupted cloud streets, like individual cumulus clouds, produce usually the most lift when the solar zenith angle is steep, we need not concern ourselves here with cloud streets whose shadow is displaced sideways by much larger distances than those shown in the illustration referred to. As all glider pilots will attest who have flown under very active, unbroken cloud streets, the lift produced by them, while it may fluctuate, is usually continuous. This is because once an uninterrupted cloud street is formed, all downdraft under the cloud base in the direction of the cloud street ceases as the cool air masses returning from the cloud to the ground in the convective circuit are forced to do so entirely in the air space between the cloud streets. The reason for this is that air currents, like all fluids, always seek the path of least resistance. Similarly, after these cool air masses are reheated by contact with the warm earth, they have no other path to escape than over the cool and heavier air layer which clings firmly to the ground in the unbroken shadow of the cloud streets. It should be noted in this connection that the heat transfer between two layers of air is much less than what it is between a layer of air and a solid surface. This means that in the case at hand, more heat energy is absorbed by the cool return air of the convective circuit when it contacts the warm ground than is being shed subsequently when it is deflected upwards over the cooler layer of air in the shadow. In addition, as said airstream sweeps across the sunlit areas, it causes the entrainment of warm air which, perforce of its lightness, is on the verge of leaving the ground on its own.

In soaring, as in all magic, the most intriguing secrets may yet lie hidden in the dark.

Acknowledgement: I wish to acknowledge the encouragement and the constructive comments I received from Dr. Julian West, a physicist who flies gliders near Bamburg, Germany, and to express my appreciation to Dr. Robert Sica, who teaches physics and meteorology at the University of Western Ontario, for his advice and support. I also thank Dr. G. Klaassen of York University, Toronto, for providing his valuable input, and my eldest son, Thomas, who offered several constructive suggestions.

Letter to the Editor

Dear Mr. Paul-André Bolduc,

In the *CMOS Bulletin SCMO*, Vol. 26, No. 2, pg. 43, you mention that the Titanic disaster led to the establishment in 1914 of the International Ice Patrol. Another important consequence was the 1913 field study of the planetary boundary layer (PBL) over the Grand Banks, led by Sir G. I. Taylor, the renowned British fluid mechanics specialist. Commissioned by the Royal Society, the field party took soundings of the PBL in an attempt to clarify the reasons for the high fog frequencies in that region. Assuming that the area surveyed was in Canadian waters, this was one of the most significant field studies in the history of Canadian meteorology.

I challenge my colleagues with more time than I to sift through the literature and to write a historical review for the *CMOS Bulletin SCMO*.

Ted Munn,
Institute for Environmental Studies
University of Toronto.

Do not hesitate to write to your *CMOS Bulletin SCMO* Editor. Share your ideas, express your opinions, let us know your concerns. Other people might be interested to read what YOU think!

N'hésitez surtout pas à écrire à votre rédacteur du *CMOS Bulletin SCMO*. Partagez vos idées, donnez votre opinion, exprimez vos craintes. D'autres sont intéressés à lire ce que VOUS pensez!

Numerical Simulations in the Environmental and Earth Sciences Proceedings of the Second UNAM-CRAY Supercomputing Conference

Edited by F. Garcia-Garcia, G. Cisneros, A. Fernandez-Equiarte, R. Alvarez
Cambridge University Press, 1997, 283p.

Livre présenté par André April[1]

Ce compendium fait suite à la seconde conférence UNAM-CRAY au National Autonomous University of Mexico. Un total de 59 participants, dont les adresses électroniques sont mentionnées au début de l'ouvrage, provenant de 10 pays différents sont venus discuter de leurs plus récents travaux dans le domaine de la simulation numérique en environnement et en sciences de la Terre.

Ce compendium est organisé en quatre parties. Premièrement on présente les études de modèles de circulation générale atmosphérique couplé avec des modèles océaniques appliqués à différents problèmes environnementaux. On s'intéresse aux problèmes tel que l'augmentation du CO_2 et l'effet sur le climat, les assymétries climatiques, l'interaction de la circulation atmosphérique et la température de surface de la mer. La zone océanique étudiée comprend principalement le Pacifique Est (NINO3) et le golfe du Mexique avoisinant la région du Mexique et de l'Amérique latine.

La deuxième partie présente des applications de modèle à mésoéchelle et la dispersion de polluants. On s'intéresse particulièrement au transport de polluants dans les bassins urbains de Los Angeles et Mexico. Des études à plus petite échelle telle que le modèle de nuage 3D semi-lagrangien et semi-implicite originant des travaux de A.J. Robert et une étude de la modélisation de nuage stratocumulus viennent compléter cette section.

La troisième section couvre des méthodes appliquées à l'assimilation de données tel que le filtre de Kalman et méthode variationnelle, utilisé dans le cadre de données géophysiques. Enfin la quatrième et dernière partie couvre des méthodes algorythmiques et mathématiques applicables aux problèmes de nature géophysique.

Cet ouvrage présente une excellente introduction et une revue de la modélisation dans le domaine des sciences de l'atmosphère, de l'océan et de la géophyisque. Des études intéressantes dont les résultats préliminaires sont présentés permettent d'avoir un impact sur le développement des recherches à venir.

[1] Sciences de l'atmosphère
Département des Sciences de la Terre
Université du Québec à Montréal.

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Cambridge University Press, 1997, 283p.
Book presented by André April[1]

This book contains the proceedings of the Second UNAM-CRAY Supercomputing Conference, held at the National Autonomous University of Mexico. A total of 59 participants -- whose e-mail addresses are posted at the beginning of the book -- came from 10 different countries to discuss their most recent findings in numerical simulation in the environmental and Earth sciences.

This book is organized in four parts. The first part presents studies made with coupled ocean-atmosphere models applied to various environmental problems. Problems such as the effect of increasing concentrations of CO_2 on the climate, climate asymmetries, and ocean-atmosphere interactions are presented. The main areas under study include the Eastern Pacific (NINO3) and the Gulf of Mexico near Mexico and South America.

The second part focuses on mesoscale modeling applications, regarding particularly the dispersion of pollution around the Los Angeles and Mexico City urban centres. Additional studies are also presented in which finer scales of motion are considered, such as in a 3D cloud model using a semi-implicit semi-Lagrangian technique (based on the seminal work of A.J. Robert), and a stratocumulus cloud modeling study.

In the third section various data assimilation techniques are covered, such as the Kalman filter and the variational method, and applied to geophysical problems. Finally, the fourth section deals with the numerical algorithms available for solving geophysical problems.

This book represents an excellent introduction and a comprehensive review of the modeling work in the atmospheric, oceanic and geophysical sciences. This important work is expected to have a real and lasting impact on future research developments.

10 things you can do to Save the World Ocean
10 choses à faire pour sauver l'océan mondial

1 Keep it clean! - Gardez-le propre!

Don't pollute - when you go to the beach or boating trips, bring your garbage back.

Ne polluez pas. Lorsque vous allez à la plage ou que vous faites une excursion en bateau, rapportez vos déchets.

2 Recycle - Recyclez

This is the first step to make a change. Recycle anything and everything. Dispose of toxic wastes in the municipal sites provided for the purpose. If your community doesn't have a program, get one started.

C'est la première chose à faire pour changer les choses. Recyclez tout, tout, tout. Débarrassez-vous des déchets toxiques dans les sites municipaux prévus à cette fin. S'il n'y a pas de programme dans votre municipalité, lancez-en un.

3 Adopt-a-beach! - Adoptez une plage!

Volunteer for beach clean-up activities. If you do not live near a coast, get involved in your local "save the river" or similar clean environment programs. If there isn't one, start it!

Portez-vous volontaire pour une corvée de nettoyage d'une plage. Si vous habitez loin de la mer, participez à un programme de nettoyage des rivières ou à un programme similaire. S'il n'existe aucun programme du genre dans votre collectivité, pourquoi ne pas en mettre un sur pied?

4 Support - Appuyez

ocean educational activities in schools and youth groups. Come up with your own community-level ocean activities.

les activités d'éducation sur les océans dans les écoles et dans les groupes de jeunes. Organisez vos propres activités communautaires sur les océans.

5 Encourage - Encouragez

your friends to get involved with projects to protect special sensitive areas. Support the creation and maintenance of marine protected areas, marine parks and reserves.

vos amis à participer à des projets de protection des zones vulnérables. Appuyez l'établissement et l'entretien de zones de protection marine, de parcs marins et de réserves marines.

6 Make an effort - Renseignez-vous

to learn more! Find out about existing and proposed laws, programs and projects that could affect the world's oceans.

sur les lois, programmes et projets existants ou proposés qui peuvent avoir un effet sur les océans du monde.

7 Be aware - Prônez le respect

that the ocean was the cradle for life on the planet and is still needed for our survival. Talk to people about respect for the oceans.

des océans. Soyez sensible au fait que les océans sont la Source de vie et que nous avons encore besoin d'eux pour assurer notre survie.

8 Sign - Signez

My Ocean Charter at www.oceanscanada.com/IYO and let the world know you care about oceans. While you're at it, check out the web site links.

Ma Charte des Océans sur le site Web www.oceanscanada.com/IYO et dites ainsi au monde entier que les océans vous tiennent à coeur. Pendant que vou y êtes, pourquoi ne pas visiter les liens avec d'autres sites?

9 Contribute - Contribuez

Find ways to contribute to the *Youth for the Oceans Foundation* (c/o The Canadian Association of Principals, 2835 Country Woods Drive, Surrey, B.C. V4P 9P9).

à la *Fondation jeunesse pour les océans* (a/s de l'Association canadienne des directeurs d'école, 2835 Country Woods Drive, Surrey, Colombie-Britannique V4P 9P9).

10 Plan - Organisez

a fun event to celebrate Canada's OCEANS DAY on June 8 - this year and every year after.

une activité amusante pour souligner la journée des océans, le 8 juin de chaque année au Canada.

1998 - International Year of the Ocean - 1998

Facts for May (Extracts only)

In May 1915 the Canadian Fisheries Expedition, the first oceanographic study of the Gulf of St. Lawrence and the Scotian Shelf, began under the leadership of Johan Hjort, a Norwegian fisheries scientist invited to Canada to investigate herring stocks and their environment.

Until recent improvements in electronic thermometers, the most reliable way of measuring deep ocean temperatures was to lower special mercury thermometers into the ocean attached to a wire. A weight is slid down the wire, causing the thermometer to flip over, and thus locking the temperature reading by isolating the column of mercury from the mercury reservoir. When the thermometer is returned to the ship the temperature can be read to an accuracy of 0.01°C.

The effect of water pressure will cause false temperature readings in mercury thermometers. Oceanographers determine the pressure, and hence the depth, at which a temperature reading was taken by measuring the difference between the temperature from a thermometer protected from water pressure and the apparent temperature from an unprotected thermometer.

In 1751, Henry Ellis, captain of the British slavetrader 'Earl of Halifax' made the first recorded measurements of the temperature profile of the open ocean. He used a thermometer in a bucket fitted with flaps which trapped water when it was being raised, which he lowered to depths as great as 1,650 m.

50% of the water in the oceans is colder than 3.0°C, and has between 34.5 and 35.0 grams of salt per kilogram of water. Only 1.6% of the water in the world's ocean is warmer than 19°C.

The deep water in the world's ocean is all cold, and must come from polar regions. The cold water under the warm surface layers in temperate and tropical latitudes is brought there by subsurface currents. This was recognized as early as 1797 by British scientist Count Rumford.

Sound travels approximately 1,500 m/sec in seawater, compared to 334 m/sec in air. Low frequency sounds can travel much farther. Sound at frequencies below 1 kHz has very low losses, sound at 5 kHz loses about 3% per km and sound at 30 kHz loses about 70% per km.

Echo sounders measure the depth of the water by the length of time for a sound signal from a source at the surface to travel to the bottom, be reflected, and travel back to a receiver at the surface. The first large-scale use of an echo sounder on a deep-sea oceanographic cruise was in 1925, by the German research vessel *Meteor*.

Modern surveys of the ocean floor use multibeam echo sounders with many sound sources and receivers mounted on a single vessel to provide complete coverage of the bottom over a swath about twice as wide as the water is deep. In water 10 m deep a person using a lead weight and line can make about 20 depth measurements per hour, while a multibeam sounder can make about 293,000 measurements in the same period.

Sound travels faster as seawater becomes warmer or saltier. It also travels faster as the pressure in seawater increases, which means that sound travels faster as it gets deeper in the ocean. The slowest sound speeds are often found below the surface. In many parts of the ocean sound travels slowest at depths of around 1 km. Sounds travelling horizontally from sources near this depth are refracted by the higher sound speeds near the surface and at greater depth, forming a 'sound channel'. This effect is used by whales and humans to send signals long distances in the ocean.

Since 1995, a number of stations around the Pacific have been monitoring signals from an experimental 75Hz sound source on Pioneer Seamount, off California. The results show that changes of 0.001°C in the average water temperature along a 5,000 km path can be detected.

The British ship Challenger returned to England on May 24, 1876 after a three-and-a-half year round-the-world scientific expedition which took water samples and measured temperatures at all depths. The Challenger expedition's thousands of biological and sea-bottom samples showed convincingly that the ocean teemed with life at all depths.

The first scientifically compiled chart of open ocean currents was published in 1769 and covered the western North Atlantic. Constructed by Benjamin Franklin and Timothy Folger, it was intended to encourage ships to sail within the Gulf Stream when going from North America to Europe and to avoid the Gulf Stream when going the other way.

In 1847, US oceanographer Matthew Fontaine Maury began to produce atlases of sea conditions and sailing directions. As a result of his work, the average time for a ship to sail from Britain to California was reduced by an estimated 30 days, and from Britain to Australia, by 20 days.

The Canadian Pacific passenger liner SS EMPRESS OF IRELAND sank in the Gulf of St Lawrence after a collision off Rimouski 29 May 1914. Of the 1,477 passengers and crew, 1,014 perished, a death toll exceeded to that point only by the *Titanic*.

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Capsules pour le mois de mai (quelques extraits seulement)

En mai 1915, l'Expédition canadienne des pêcheries, première étude océanographique du golfe du Saint-Laurent et de la plate-forme néo-écossaise, débuta sous le commandement de Johan Hjort, halieute norvégien invité au Canada pour étudier les stocks de hareng et leur milieu.

Avant le perfectionnement récent des thermomètres électroniques, le moyen le plus fiable de mesurer la température des eaux océaniques profondes était de faire descendre dans l'eau un thermomètre à mercure spécial attaché à un filin. On laissait alors glisser un poids le long du filin pour renverser le thermomètre, ce qui provoquait la séparation temporaire en deux parties de la colonne de mercure. Lorsque le thermomètre était remonté à la surface, la température pouvait être lue à une précision de 0,01 °C.

L'effet de la pression de l'eau cause de fausses lectures de la température prise avec un thermomètre à mercure. Les océanographes déterminent la pression, et donc la profondeur d'immersion, à laquelle la température a été relevée en mesurant la différence entre la température prise avec un thermomètre protégé, indéformable à la pression, et la température apparente relevée avec un thermomètre non protégé.

En 1751, Henry Ellis, capitaine du navire britannique *Earl of Halifax*, utilisé pour la traite des esclaves, effectua le premier profil enregistré de la température de la grande mer. Il utilisa un thermomètre installé dans un seau muni de volets, qui se remplissait d'eau lorsqu'il était remonté à la surface. Il a ainsi pu mesurer la température de l'eau jusqu'à une profondeur de 1 650 m.

La température de 50 % de l'eau océanique, qui contient de 34,5 à 35,0 g de sels par kg, est inférieure à 3 °C. Seul 1,6 % de l'eau océanique est de température supérieure à 19 °C.

Comme toutes les eaux profondes des océans sont froides, elles doivent donc venir des régions polaires. L'eau froide s'étendant sous les couches de surface chaudes aux latitudes tempérées et tropicales y est transportée par des courants sous-marins. Ce fait a été reconnu dès 1797 par le scientifique anglais Count Rumford.

Le son voyage à une vitesse d'environ 1 500 m/s dans l'eau de mer, par rapport à 334 m/s dans l'air. Les sons de basse fréquence peuvent couvrir de plus grandes distances. Ainsi, les sons de fréquences inférieures à 1 kHz subissent de très faibles pertes, les sons de 5kHz s'amenuisent d'environ 3 % par km et les sons de 30 kHz, d'environ 70 % par km.

Un écho-sondeur est un appareil de mesure de la profondeur fonctionnant sur le phénomène de réflexion d'ondes acoustiques. La mesure de l'intervalle de temps entre l'émission du signal et son retour après réflexion permet d'apprécier la distance entre le fond et le récepteur en surface. C'est en 1925, lors de l'expédition océanographique en haute mer du navire de recherche allemand *Meteor*, que l'on a utilisé un écho-sondeur à grande échelle.

Les relevés modernes du fond océanique font appel à des écho-sondeurs multi-faisceaux à nombreux receveurs et sources sonores fixés à un seul navire pour fournir une couverture complète du fond sur une bande d'environ deux fois aussi large que la profondeur de l'eau. À une profondeur de 10 m, une personne utilisant une pesée de plomb au bout d'une corde peut faire environ 20 mesures de profondeur par heure, tandis qu'avec un écho-sondeur multi-faisceaux, elle peut en faire environ 293 000 durant la même période.

Plus l'eau de mer est chaude et salée, plus le son se propage vite. Il en est de même lorsque la pression de l'eau augmente, ce qui signifie que le son voyage plus vite lorsque la profondeur augmente. C'est souvent la surface que le son se propage le plus lentement. Dans plusieurs parties de l'océan, le son voyage plus lentement à des profondeurs d'environ 1 km. Les sons qui se propagent horizontalement de sources proches de cette profondeur sont réfléchis par les vitesses du son plus élevées près de la surface et à de plus grandes profondeurs, formant ainsi un "couloir audio". Les cétacés et l'homme se servent de cet effet pour envoyer des signaux sur de longues distances en mer.

Depuis 1995, des stations à l'échelle du Pacifique enregistrent les signaux d'une source expérimentale de sons de 75 Hz installée sur le mont sous-marin Pioneer, au large de la Californie. Les résultats révèlent que l'on peut identifier un changement de 0,001 °C de la température moyenne de l'eau dans un couloir de 5 000 km.

Le navire britannique *Challenger* revint en Angleterre le 24 mai 1876 après avoir complété une expédition scientifique autour du monde de trois ans et demi. En plus des échantillons d'eau et des mesures de la température à toutes les profondeurs, des milliers d'échantillons de spécimens et du fond marin ont été recueillis. Ces derniers ont révélé de façon probante que les océans fourmillaient d'organismes vivants à toutes les profondeurs.

La première carte des courants océaniques dérivée scientifiquement, couvrant l'Atlantique nord-ouest, a été publiée en 1769. Établie par Benjamin Franklin et Timothy Folger, elle visait à encourager les navires à utiliser le Gulf Stream lorsqu'ils se rendaient en Europe en provenance de l'Amérique du Nord et d'éviter ce courant lorsqu'ils allaient dans le sens inverse.

News Release

NSERC announces $71 million more for students and researchers

(June 9, 1998, Ottawa, Ontario) - NSERC (the Natural Sciences and Engineering Research Council) today announced that 11,000 young researchers across Canada will be the main beneficiaries of the $71 million increase that NSERC received in the 1998 Federal Budget.

"Almost two thirds of our new funds will go to create opportunities for graduate students and postdoctoral fellows to pursue research careers and alleviate some of the economic hardship they face," said NSERC President Dr. Tom Brzustowski". These measures, coupled with major new NSERC investment in university research and university partnership with industry, will help make science and engineering careers more attractive for young Canadians".

NSERC's allocation from the federal government went up from a previously projected $422 million to $493 million. The budget will rise to $495 million next year, and $501 million the year after.

"We are making provision now for the next generation of scientists and engineers - people who will be making a real difference both to the economy and our quality of life in the future," said Dr. Ron Duhamel, Secretary of State (Science, Research and Development)". The case for increased support for university research and students across Canada is very strong. The federal government has listened and is taking action".

Almost 3,600 NSERC scholars and fellows will see immediate increases to their stipends. Undergraduates will also be eligible for some of the new NSERC money: $7.2 million has been set aside for 2,000 new awards next year under the Undergraduate Student Research Awards program. In addition, NSERC will award 700 new postgraduate scholarships and fellowships, some of which will be offered immediately to excellent applicants whom NSERC had been unable to fund in its last competition.

By 2000-01, NSERC will invest an extra $32 million annually in encouraging partnerships between university researchers and the private sector. Affected by funding reductions in recent years, these activities were singled out for renewal in the 1998 Federal Budget.

Research grant holders will be provided with $20.4 million immediately to raise stipends, train more students and fellows, and create a better environment for research training.

Within the next two weeks, NSERC will also announce the results of a major review to redistribute basic research funding. A further $10 million of the new funds will be used to supplement the $20 million originally reserved for this exercise, allowing NSERC to support more of the excellent proposals brought forward by the Canadian research community. This redistribution will assure that the cutting-edge disciplines, those that have the greatest importance for Canada's future, receive the best possible funding and that Canadian science and engineering research remains vigorous and competitive on the global scene.

"Investments in basic and project research have a multiple return for Canada", said Dr. Brzustowski. "They advance Canadian knowledge in science and engineering, enhance Canadian access to the latest international discoveries, put the results of Canadian research to productive use in the economy, and help create stimulating research environments in which young Canadians can receive the best research training in the world".

In addition to the more than 6,000 young researchers who will now receive NSERC awards, a further 5,000 are assisted through the grant and project funds that professors receive from NSERC. To ensure that the increases to grantholders will be shared with these students and postdoctoral fellows, NSERC has revised upwards the maximum annual stipends that professors may pay them. "We are urging supervisors to review the amounts they are paying and to determine, in negotiation with their students, when and by how much stipends will be increased", said Dr. Brzustowski. He added that NSERC will also ask professors to describe how their new funding has contributed to training when they apply for their next research grant or project award.

For more information, please contact:

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Communiqué

Crédits additionnels de 71 millions de $ au CRSNG pour les étudiants et les chercheurs

(Ottawa, Ontario, le 9 juin 1998) - Le CRSNG (Conseil de recherches en sciences naturelles et en génie) a annoncé aujourd'hui que 11 000 jeunes chercheurs canadiens seront les principaux bénéficiaires de la hausse de 71 millions de $ accordée au CRSNG dans le budget fédéral de 1998.

"Près des deux tiers des nouveaux fonds serviront à créer des débouchés de carrière en recherche à l'intention des étudiants de 2e et de 3e cycles et des stagiaires

postdoctoraux et à alléger en partie les difficultés économiques auxquelles les jeunes chercheurs sont confrontés, a déclaré le président du CRSNG, Tom Brzustowski. Ces mesures, combinées à de nouveaux investissements majeurs du CRSNG dans la recherche universitaire et les partenariats universités-industrie, contribueront à rendre une carrière en sciences et en génie plus attrayante pour les jeunes Canadiens".

Ces nouveaux crédits viennent s'ajouter aux 422 millions de $ que le gouvernement fédéral avait prévu allouer à l'origine au CRSNG. Le budget dont disposera le CRSNG s'élèvera donc à 493 millions de $ en 1998, à 495 millions de $ l'an prochain, et à 501 millions de $ en l'an 2000.

"Nous mettons en place les conditions nécessaires à la formation de la prochaine génération de scientifiques et d'ingénieurs, qui jouera un rôle instrumental dans l'essor économique futur du Canada et la qualité de vie des Canadiens, a déclaré Ron Duhamel, Secrétaire d'État (Sciences, Recherche et Développement). Le besoin d'un soutien accru pour la recherche universitaire et les étudiants du Canada ne fait aucun doute. Le gouvernement fédéral a été attentif et prend les moyens pour y répondre".

Près de 3 600 étudiants et stagiaires postdoctoraux présentement titulaires d'une bourse auront droit immédiatement à une hausse de versements. Les étudiants de premier cycle n'ont pas été laissés pour compte et bénéficieront également d'une partie des nouveaux fonds alloués au CRSNG. À cet effet, le CRSNG prévoit réserver 7,2 millions de $ en vue d'accorder 2 000 nouvelles bourses de recherche de 1er cycle. Le CRSNG compte également accorder 700 nouvelles bourses d'études supérieures et postdoctorales, dont un certain nombre immédiatement à des candidats de très grand talent dont la demande n'avait pu être retenue lors du plus récent concours, faute de fonds.

D'ici à l'exercice 2000-2001, le CRNSG consacrera annuellement 32 millions de $ additionnels en vue d'encourager l'établissement de partenariats de recherche entre les universités et le secteur privé. Le gouvernement fédéral a choisi d'inscrire à son budget de 1998 le renouvellement de ces activités, qui avaient été ralenties en raison des compressions budgétaires des dernières années.

De plus, 20,4 millions de $ seront versés immédiatement aux titulaires de subventions de recherche pour leur permettre d'augmenter la rémunération accordée aux étudiants qui collaborent à leurs travaux, de former un plus grand nombre d'étudiants et de stagiaires postdoctoraux et d'offrir un environnement davantage propice à la formation de chercheurs. D'ici à deux semaines, le CRSNG fera connaître les résultats d'un vaste exercice de réaffectation des fonds destinés à la recherche fondamentale. Dix millions de $ seront ajoutés aux 20 millions de $ mis de côté pour cet exercice, ce qui permettra au CRSNG d'appuyer un plus grand nombre d'excellentes propositions de recherche mises de l'avant par la communauté des chercheurs canadiens. Cette redistribution fera en sorte que les disciplines d'avant-garde revêtant une grande importance pour l'avenir du Canada bénéficient du meilleur financement possible et que la recherche canadienne en sciences et
en génie demeure dynamique et concurrentielle sur la scène internationale.

"Les investissements dans la recherche fondamentale et les projets de recherche rapportent gros au Canada sur plusieurs plans, a souligné M. Brzustowski. Ils contribuent à l'avancement des connaissances en sciences et en génie, à rehausser l'accès des Canadiens aux plus récentes découvertes internationales, à mettre à contribution les fruits de la recherche canadienne dans notre économie, et à créer un environnement de recherche stimulant où les jeunes Canadiens reçoivent la meilleure formation en recherche qui soit dans le monde entier".

Si plus de 6 000 jeunes chercheurs bénéficient actuellement d'une bourse du CRSNG, il y en a 5 000 autres qui touchent une rémunération versée à même les subventions que le CRSNG accorde à leur professeurs pour des travaux de recherche fondamentale et des projets de recherche. Pour s'assurer que les augmentations accordées aux titulaires d'une subvention seront partagées avec les étudiants et les stagiaires postdoctoraux, le CRSNG a révisé à la hausse la rémunération annuelle maximale que les professeurs sont autorisés à leur verser. "Nous enjoignons les superviseurs de revoir sans tarder les montants accordés aux étudiants et de déterminer les hausses à y apporter, après entente avec les étudiants, et la date d'entrée en vigueur de ces augmentations", a indiqué M. Brzustowski. Il a également déclaré que le CRSNG compte demander aux professeurs de décrire en quoi les nouveaux fonds ont permis de rehausser la formation dispensée aux jeunes chercheurs quand viendra pour eux le temps de présenter une nouvelle demande de subvention de recherche ou de projet.

Pour toute demande de renseignement, communiquez avec:

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Canada's Best Newspapers for Weather Information

Halifax, Nova Scotia, 1 June 1998: The Canadian Meteorological and Oceanographic Society has rated the weather content and presentation in daily newspapers.

Top-rating, or in meteorological terms — sunny and cool, for the Toronto Star, Calgary Herald and Edmonton Journal. Overcast with rain for the Financial Post — hopefully their financial predictions are better.

"The survey shows what's cool in newspaper weather content today" said CMOS President, John D. Reid. "By shining some sunlight on the top performers we aim to encourage the others to a brighter future."

The evaluation rated sixteen papers based on the issue published on May 1st, 1998. Three criteria were used: placement of weather information, the space devoted to it, and the quality and clarity of the presentation. Further details are given in a backgrounder.

The ratings were done by the Canadian Meteorological and Oceanographic Society (CMOS), a federally registered non-profit society aiming to advance meteorology and oceanography in Canada, and released during the Society Annual Congress taking place in Halifax, Nova Scotia, June 1 to 4.

The ratings are:

A: Sunny and Cool	Toronto Star Calgary Herald Edmonton Journal
B: Mainly Sunny	La Presse Vancouver Sun Winnipeg Free Press The Province - Vancouver
C: Mixture of Sun and Clouds	Hamilton Spectator Windsor Star Journal de Montréal Globe and Mail
D: Mainly Cloudy	Halifax Chronicle Herald The Gazette - Montréal
E: Cloudy with Showers	Ottawa Citizen Toronto Sun
F: Overcast with Rain	Financial Post

For further information, please contact Johd. D. Reid at (819) 997-3832 or by e-mail at cmosnews@hotmail.com

Backgrounder

How were the newspapers rated?

A score was assessed for three factors: placement of weather information, the space devoted to it, and the quality and clarity of the presentation. These three scores were multiplied together, and summed over each page with routine weather content, to give a total for the newspaper. News about weather events and weather-related feature stories were not rated.

Placement of Weather Information

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

Space Devoted to Weather

The area on each page devoted to weather was measured and tabulated in square centimetres. Block areas containing advertising were excluded but information on natural phenomena, such as sunrise and set, moonrise and set, phases of the moon and tidal information was included. The average area in the main weather section over all papers rated was 584 square centimetres.

Quality and Clarity of Presentation

On the front page the judges expected to see summary information on today's weather, the daily high and low temperatures and a pointer to additional information inside the paper. Depiction with a pictograph, and in colour helps the presentation. On the main weather page most newspapers included a continental scale weather map, a regional map, a three to five-day local forecast, statistics on the normal, record and year- ago temperatures for the date, information on sunrise and set, moonrise and set, phases of the moon, the UV index, Canada wide, US and world weather conditions and temperatures. Credit should be given to the source of the information, and a toll-free telephone number or web site address provided for updated information. In many cases additional information specific to the local situation was given, for example, air quality information in areas subject to pollution, tides in coastal areas. The majority of papers used colour maps and pictographs. This presentation factor was rated by a panel of three CMOS members on a scale of 1 (worst) to

5 (best); the average score was 3.7.

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

The judges did not evaluate the accuracy of the forecast or other information. To do so would require a much more extensive study. Neither were the providers of the information and products, primarily The Weather Network and Environment Canada, evaluated.

How did CMOS allow for different readership and formats?

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

Rating national newspapers has to take into account the lack of a local readership on which to focus the weather information. The judges expected to find less detailed coverage for a particular area, but more detailed coverage across the country than for a local paper.

What was the assessment of individual newspapers?

Only the best selling twenty papers in Canada were included in the survey. However, four papers were not readily available in Ottawa, where the assessment was conducted, and so were not evaluated.

Toronto Star

This was the top-rated paper in the survey - a solid A rating. The information was carried on the top half of the back page of the second section, and gained the highest rating for quality of the content. The continental scale map was clear. Data was comprehensive, including local airport and downtown sites. Both air pollution and UV index information were given. A toll-free telephone number, and web site for updates were listed.

Calgary Herald

The Herald devoted the largest area of any Canadian paper surveyed to weather, and displayed it prominently on the back page of section four. The continental map was large, colourful, easy to read, and showed the positions of pressure systems and fronts. The quality was down-rated as it omitted to mention the valid time for the map, didn't indicate whether the national and international weather summaries were observed or predicted, and didn't give any source for updates - all could be easily changed within the current format. Overall, the Herald rated an A.

Edmonton Journal

The Journal gained an overall A- rating largely on the basis of the prominence and quality of the content, especially two-day forecasts for numerous cities and resorts worldwide, useful if you are flying overseas when today's weather will likely be past by the time you get there. The continental scale weather map suffered from being compressed to 79 sq. cm.

La Presse

This was the top Québec paper, and it rated a B overall. Weather information was found on the back page of the sports tabloid insert. A reasonable size continental map and two-day forecasts for national, world and resort centres were clearly presented. On the negative side, the local forecast was limited to three days, and it failed to give any telephone or web source for updates.

Vancouver Sun

At first glance The Sun appeared to devote a large area to weather. This was reinforced because the lower quarter of the page was devoted to a feature article on El Niño. On closer examination, considerable space had to be discounted as it was given over to information on traffic conditions and the ferry schedule. The Sun offers an attractive weather product, including two-day international weather forecasts, and despite its B- rating, could have been the top-rated paper if the information was given more prominence than inside the second section of the paper. This was the only paper that included the name and telephone number of a weather editor.

The Province

The top-rated tabloid in the survey, and also the highest-rated paper that did not feature a continental-scale map. The Province focused on the region with a large colourful B.C. map including mountain detail (important for weather) and the boundaries of Environment Canada forecast regions. Two-day information for Canadian, US and world cities was that actually recorded for yesterday and the forecast for today. The local four-day forecast was presented. The overall rating was B-.

Winnipeg Free Press

Weather information occupied the lower third of the back page of the second section of the Free Press. The continental weather map was enhanced by arrows showing warm and cold airflow. The layout was exceptionally clear. In the national/international temperature section it was not evident that these were forecasts for today, and no weather conditions were given along with the temperatures. Also

there was no source for updated information. The overall rating was B-.

Hamilton Spectator

The weather information was found on the front page of the second section of the paper. However, the area was only 323 sq. cm, of which 59 sq. cm was devoted to a colour continental map. National and international conditions were listed without indicating if they were actual or forecast. The C+ rating was given largely on the basis of the prominence given to an indifferent presentation.

Windsor Star

A lot was crammed in to the small area allowed for weather information in the Star. If the information were on the front, rather than the back page of the section, it would have received a B rather than a C rating. Including both a continental map, only 59 sq. cm, and a regional map, made for a crowded presentation. There was no source for updated forecasts.

Journal de Montréal

The information given on page 66 in this tabloid was dominated by a regional map with sparse information. The Montréal and area forecast was for three days only, national and international information was given without indicating if these were actual or forecast conditions, and there was no source for updates. Given the constraints of the tabloid format this presentation rated a C.

Globe and Mail

It was a challenge for a panel of meteorologists to rate the presentation only C-. This was the sole paper that features a weather map with isobars - technically appealing to the weather professional. It also included a short paragraph to explain how to read the map. As a national paper the demands are different from those of a local paper. The paper met these by giving a summary of the forecast province by province, the UV index for major cities, and a three-day forecast for Canadian, US and world cities. The Globe has yet to embrace colour and gave only a toll telephone number for weather updates. But even if these deficiencies are remedied it will be difficult to improve the rating while the content is consigned to the obscurity of page A17.

Halifax Chronicle Herald

This was the only paper from Atlantic Canada in the top twenty best sellers for Canada as a whole. Weather information was found at the bottom of page 2, considered equivalent to appearing on the back page of a section. The presentation, in black-and- white, included a tiny 17 sq. cm map of the eastern part of the continent. Coverage of conditions outside the region was poor and despite a plethora of telephone numbers for local helplines, none was listed for weather updates. The Chronicle Herald rated a D.

The Gazette

The weather information, presented on page D11, included a full five-day regional forecast, and was the only paper to list heating degree-days. The 50 sq. cm continental map in black-and-white was inadequate, and only a single-day forecast was given for national and international cities. Under the heading UV Index an arrow showed a moderate value. However, no UV index value was given, only a caption that read "25 minutes to burn." Health authorities are now discouraging use of "time to burn" owing to misuse. Only a toll telephone number was given for weather updates. The Gazette rated a D.

Ottawa Citizen

This was the lowest-rated broadsheet for weather information in the survey. On this day the information was presented in black-and-white on an inside page of the paper. We are aware that on some other days the information appears in colour on the front page of a section, which would increase the overall rating from E to C. A five-day local forecast was given and single-day information for other centres - which day isn't obvious. The weather information is one component that has not benefitted from the makeover of the Citizen.

Toronto Sun

The Sun devoted 172 sq. cm to weather information on page 36, of which 42 sq. cm was a weather map of the northern half of the continent. The black-and-white presentation listed high temperatures and weather for only 11 cities, with no indication if they were actual or forecast. The four-day metro forecast was not given the perspective of how temperatures related to the normal. A southern Ontario synopsis and forecasts for the area around Metro, not "Across Ontario" as in the title, was included. On the plus side, there was a reference to a web site with information that it is updated hourly. Rated an E.

Financial Post

At 19 sq. cm the black-and-white continental weather map hidden away on page 51 must deserve some kind of prize for density of information. The only other information presented was a two-day forecast for Canadian, US and world cities and travel advisories for airports. Rated an F.

What about other Canadian papers?

The survey was for sixteen of the twenty best-selling Canadian daily newspapers. However, Atlantic Canada had only one entry in this list and so two other papers in the region were examined. Unfortunately the St. John's Evening Telegram could not be rated as weather

information was listed as "unavailable" for May 1st! The Daily Gleaner (Fredericton) gave prominence to weather on the front page of the fourth section and would have earned a B rating. Even a relatively low circulation paper can do a good job.

How do Canadian papers compare internationally?

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

USA Today

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

The Daily Telegraph

By contrast, The Daily Telegraph, in the UK, is notable for providing two weather maps, with isobars and fronts, one for the UK, the other for the North Atlantic. Weather information is printed on the back page. Nevertheless, the presentation would rate no better than a C in this survey.

Les meilleurs journaux canadiens en matière d'information météorologique

Halifax, Nouvelle-Écosse, 1er juin 1998: Le contenu et la présentation de l'information météorologique de quotidiens canadiens ont été évalués par la Société canadienne de météorologique et d'océanographie.

Classés en premier, ou en termes météorologiques - ensoleillé et frais: le Toronto Star, le Calgary Herald et le Edmonton Journal font un excellent travail. Couvert avec pluie pour le Financial Post - espérons que leurs prévisions financières sont meilleures.

"L'étude indique ce qui rafraîchit le contenu météo des journaux d'aujourd'hui", explique le président de la SCMO, John D. Reid. "En illuminant les meilleurs, nous espérons amener les autres vers un avenir plus ensoleillé."

"L'évaluation a coté seize journaux publiés le 1er mai 1998. Trois critières ont été utilisés: l'endroit où se trouve l'information météorologique, l'espace qui lui est révservé, et la qualité et la clarté de la présentation. De plus amples détails sont fournis dans le document d'information (disponible en anglais seulement).

Le classement a été effectué par la Société canadienne de météorologie et d'océanographie (SCMO), une société sans but lucratif immatriculée au gouvernement fédéral qui promeut l'avancement de la météorologie et de l'océanographie au Canada. Ce classement est publié durant le congrès annuel de la Société qui a lieu cette année à Halifax, du 1er au 4 juin.

Le classement se présente comme suit:

A: Ensoleillé et frais	Toronto Star Calgary Herald Edmonton Journal
B: Généralement ensoleillé	La Presse Vancouver Sun Winnipeg Free Press The Province - Vancouver
C: Mélange de soleil et nuages	Hamilton Spectator Windsor Star Journal de Montréal Globe and Mail
D: Plutôt nuageux	Halifax Chronicle Herald The Gazette - Montréal
E: Nuageux avec averses	Ottawa Citizen Toronto Sun
F: Couvert avec pluie	Financial Post

Pour de plus amples renseignements, veuillez contacter John D. Reid; téléphone: (819) 997-3832; courriel: jedr@intranet.ca

A new Website on Oceans

The Marine Ecosystems Conservation Branch of the Science Sector has developed an interactive website which profiles oceans conservation and protection initiatives in Canada. This site provides access to information on the Department of Fisheries and Oceans' Oceans Act and its many marine conservation initiatives. It also highlights endeavours undertaken by other federal agencies, provincial and territorial goverments and non-governmental organizations in the areas of sustainable development and conservation and protection of marine ecoystems.

http://www.oceansconservation.com

The goals of the above-noted site are:

1) To increase public awareness of the Oceans Act and of its conservation and protection programs, namely Integrated Coastal Zone Management (ICZM), Marine Protected Areas (MPAs), and Marine Environmental Quality (MEQ).

2) To increase public awareness and education on marine issues related to conservation. The Youth education component of the site is designed to provide teachers, students and schoolchildren with fun yet informative material related to the site's main goal.

Un nouveau site Web sur les Océans

La direction de la conservation des écosystèmes marins du secteur des Sciences a conçu un site internet interactif afin de présenter un profil des activités de conservation et de protection des océans au Canada. On y présente des renseignements au sujet de la Loi sur les océans de Pêches et Océans Canada et sur les nombreuses initiatives sur le plan de la conservation et la protection qui en découlent. Les initiatives des organismes fédéraux, provinciaux, et territoriaux, et d'organismes non-gouvernementaux dans le domaine du développement durable, de la conservation et de la protection des écosystèmes marins y sont également mentionnées.

http://www.oceansconservation.com

Les objectifs du site présenté ci-haut sont:

1) de sensibiliser davantage le public à la Loi sur les océans et à ses programmes de conservation et de protection, notamment les programmes de Gestion intégrée des zones côtières (GIZC), de Zones de protection marines (ZPM) et de Qualité du milieu marin (QMM);

2) de sensibiliser le public et de l'instruire sur les questions ayant rapport à la conservation du milieu marin. La composante du site axée sur l'éducation des jeunes présente du matériel amusant et éducationnel pour les professeurs, les étudiants et les écoliers.

Note to our readers

The February and April issues of the *CMOS Bulletin SCMO* have included some fascinating ocean facts as part of its feature on the International Year of the Ocean (p.16 & 48). The present issue (see p.80) and all other issues in 1998 will continue with this practice to celebrate the International Year of the Ocean (IYO). Readers who like the selection proposed might like to know that a new fact is available every day on the IYO website shown below. Readers interested in ocean-related science communication might like to know that the compilation was done by John F. Garrett under contract with the IYO office and that 2WE Associates (Saanichton, B.C.) have enjoyed working on this particular project.

Avis à nos lecteurs

Les éditions de février et d'avril du *CMOS Bulletin SCMO* incluaient des capsules intéressantes (p.17 & 49) sur les océans. Ce présent numéro (voir p.81) et tous les autres numéros de l'année 1998 contiendront également d'autres capsules toutes aussi divertissantes qu'éducatives dans le but de célébrer à notre manière l'Année internationale des océans. Nos lecteurs seront sans aucun doute intéressés de savoir qu'une nouvelle capsule apparaît chaque jour sur le site web indiqué ci-bas et que la compilation de ces capsules a été faite par John F. Garrett sous contrat avec l'IYO et que les associés de la firme 2WE (Saanichton, B.C.) ont eu beaucoup de plaisir à contribuer à ce projet particulier.

http::/www.OceansCanada.com/IYO

The IEEE Sixth Conference on Current Measurement

First Call for Papers!

Sponsored by the Current Measurement Technology Committee of the IEEE Oceanic Engineering Society

March 11-13, 1999 - Bahia Hotel
San Diego, California

Conference theme will be: "Lagrangian and Eulerian current measurement techniques".

Papers are invited from interested authors in the following categories:

1. Development of Techniques;
2. Applications of Techniques;
3. Validation of Techniques.

Topics will include:

* Direct measurements: Eulerian and Lagrangian;
* Indirect methods for measuring currents including hydrography;
* Remote Sensing including acoustic and radar.

Abstracts of 200 words should be submitted no later than October 15, 1998. Authors of papers selected for presentation and publication in the Conference Proceedings will be notified by mail no later than November 15, 1998. Detailed instructions for the preparation of final manuscripts will be provided following notification of selection. Final manuscripts must be received by December 15, 1998. Oral presentation contingent on receipt of manuscript.

Abstracts must be submitted not later than October 15, 1998.

Abstracts should be sent to

Dr. Albert J. Williams 3rd
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Woods Hole, MA 02543 USA
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jwhite@whoi.edu (Registrar & Publications)
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The 1998 Ice Storm in Eastern Canada

The 1998 ice storm was the worst to hit Canada in living memory. At the peak of the storm, the area of freezing precipitation extended from Muskoka and Kitchener in Ontario through western Québec and the Eastern Townships to the Bay of Fundy coasts of New Brunswick and Nova Scotia. The duration of the freezing precipitation was exceptional - more than 80 hours or nearly double the normal winter total of all freezing precipitation events.

Without question, the 1998 ice storm in Eastern Canada directly affected more people than any previous weather event in Canada's history causing a number of fatalities, massive disruptions of day-to-day life and extensive damage to electrical distribution systems and other facilities.

Some Ice Storm 1998 Facts:

At least 25 deaths occurred, many from hypothermia and/or carbon monoxide poisoning.

About 900,000 households were without electrical power in Québec; 100,000 in Ontario.

Approximately 16,000 troops, including 2,300 reservists, were deployed to assist with clean-up, evacuation and security.

Millions of residents were forced into mobile living, visiting family members to shower and share a meal, moving in temporarily with friends or staying at a shelter.

The prolonged freezing rain destroyed millions of trees, 120,000 kilometres of power lines and telephone cables, 130 major transmission towers (each worth about $100,000) and about 30,000 utility poles costing $3,000 each.

Dernière heure!

Si vous voulez suivre les péripéties de l'expédition North Water (NOW), consultez le site internet

http://kestrel.fsg.ulaval.ca/giroq/now

en anglais seulement. Vous serez émerveillé!

Stop Press!

If you wish to follow the peripeteia of North Water Expedition (NOW), browse the internet web site

http://kestrel.fsg.ulaval.ca/giroq/now

You will be amazed!

Personal notes from the 1998 CMOS 32nd Congress in Halifax

The devastating Ice Storm of 1998; the Floods in Manitoba and the Saguenay; abnormal sea temperatures and the Atlantic cod crisis; the potentially harmful impacts of climate on Atlantic Canada's offshore development. Increasingly, Canadians are feeling the effects of erratic climate systems along with the social and economic fallout from a string of unusual weather events.

From June 1-4, more than 300 members of CMOS gathered together to address the crucial links between climate and our oceans. "*Atmosphere-Ocean Climate Variability*" was the focus of the CMOS 32nd Annual Congress at the Holiday Inn Convention Centre in Dartmouth, N.S., placing great emphasis on improving our understanding of the climate system and of the linkages between the oceans and the atmosphere.

The Congress opening address was delivered on June 1 by Federal Environment Minister, Christine Stewart. After stating that sound science was the cornerstone of environmental progress, she said to the assembly: "Without your work, we would not have had the evidence we needed to make acid rain and ozone depletion national priorities. We would not have had the evidence we needed to provide the momentum to reduce levels of sulphur in gasoline. And we would not have had the evidence we needed to reduce levels of lead in our air to almost zero." Moving to the subject of climate change, the Minister said that she was committed to making the science of climate change and its implications better known to Canadians. She also claimed that our capacity to predict changes in climate must be improved so that we all can prepare and protect ourselves. She also recognized that the Oceans play a huge role in determining our climate, "and any models that are going to assess climate change and variability have to include an adequate description of ocean processes if they are to produce realistic projections". She concluded her speech by thanking the meteorologists who played such a significant role in January's Ice Storm, one of the most dramatic weather events witnessed by many Canadians. "As meteorologists, you tracked the storm through its various stages, as it traveled across northeast North America, and you kept all of us informed about what we could expect. You helped emergency organizations, and all affected people, take the necessary steps to reduce hardship. For that, we remain deeply grateful - and we hope that we never have to share such an event again!"

This very well received opening address by Ms. Stewart was followed by a keynote presentation from Geoffrey Holland, President of UNESCO's Inter-Governmental Oceanographic Commission (IOC). You can read Mr. Holland's speech on page 83 in this issue of the *CMOS Bulletein SCMO*.

Tuesday June 2 was designated as "*Industry Day*" to draw attention to the importance of meteorology and oceanography to the safe, efficient conduct of vulnerable industrial activities. With Susan Woodbury serving as chair of the session, the Industry Day started with the opening address delivered by Cal Ross, Senior Environmental Advisor, Sable Offshore Energy Inc who has a long experience with offshore oil and gas activities on Canada's East Coast. Cal's talk, entitled "*What the offshore industry requires from meteorologists and oceanographers*" focused on the offshore oil industry's requirements during the various stages of the life of an offshore project. He drew the attention of the audience to the specific vulnerabilities to wind, waves, weather and other aspects of the offhore environment from the concept stage through the design of the rig selection process to the operational or production stage.

In recognition of the devasting impact of the 1998 ice storm, the Scientific Program included a special session on "*Ice storm '98*". Two consecutive sessions chaired by Jim Abraham were held Tuesday afternoon with the presentation of no less than 10 papers describing the ice storm itself, the performance of the various numerical models in forecasting it, the measurement of the various physical parameters during the storm and debating whether the storm was the effect of El Niño or climate change, or both. Needless to say they were attended by a large and captive audience. The Scientific Committee should be very proud for having organized such a very informative session within so little time after the event. One interesting point mentioned by several authors was the failure of the automatic weather stations to perform adequately during the full length of the storm.

Under the leadership of Steve Miller, Education Day took place on Wednesday, June 3. Local high school and university educators attended this session. Education Day represents a new initiative by CMOS to encourage improvements in meteorological and oceanographic education in the Canadian school system. David Phillips (*What's up with the weather?*) and Nathalie Gauthier (*The InterMET project: using the Internet to improve the teaching of meteorology in Québec high schools* were among the speakers of this well- attended session where some people had to sit on the floor due to the shortage of chairs. The program included a teacher's luncheon followed by an afternoon panel discussion on meteorology and oceanography in the school curriculum.

The 1998 Patterson Medals were presented at the Halifax Congress during its regular luncheon on Wednesday to Nancy Cutler, Director General,National Weather Services of AES and to Dr. Lawrence A. Mysak, Director of the Centre for Climate and Global Change Research of McGill University. Nancy has been a long-time employee of AES and played a key role on operational weather forecasting. In addition, she is the first woman to receive the Patterson Medal. Nancy served as President of CMOS in 1990. Lawrence is a mathematician, oceanographer and meteorologist and has gained an international reputation in geophysical modelling. He recently completed a three-year term as President of the Academy of Sciences of the Royal Society of Canada. Congratulations to Nancy and Lawrence, both of whom are active CMOS members.

The 1998 Tully luncheon was attended by more than 22 oceanographers with the pleasant company of Eleanor Campbell and Jean Stoddart. For the first time, two meteorologists, Val Swail and Tom Agnew, joined the oceanographers in the Lower Deck in Halifax to celebrate with us the recipient of the 1998 J.P. Tully Medal.

Of noted interest, the first-ever award of the Rube Hornstein Medal for Operational Meteorology was presented at the Society's formal banquet on Wednesday night, June 3. This new CMOS Medal honours the contribution made to the Society's affairs by well-known Maritime TV and radio personality, Rube Hornstein. The first medal was awarded to Rube who was delighted to receive such an honour. This is quite a change in the Society's procedure as, in the past, this prize was called the Rube Homstein Prize and consisted of a framed certificate. A framed photograph of the medal was presented to Rube's wife, Helen, who graced the company with her presence at the banquet.

You will find the list of the various recipients of the 1998 CMOS Prizes and Awards on page 94 of this issue of the *CMOS Bulletin SCMO*.

Overall, a very well organized Congress. Both teams, the Scientific and the Local Arrangements Committees, must be congratulated for their successful achievement.

Paul-André Bolduc, Editor,
CMOS Bulletin SCMO

Halifax CMOS 1998 Congress Opening Address

by Geoffrey Holland[1]

Minister Stewart, CMOS President, Colleagues,

I am both honoured and delighted to have been asked to open the CMOS annual Congress here in Halifax. You all know that 1998 has been declared by the United Nations as the International Year of the Ocean and as I was present at the Assembly of the Intergovernmental Oceanographic Commission that initiatied this event, I feel doubly fortunate in being here today.

The theme of this year's meeting is climate, a subject equally important to both oceanographic and meteorological communities. I will come back to that theme, but first I hope that you will forgive me if I commence my remarks with a look at the future importance of the ocean; after all, it is the year of the ocean and it is Halifax and I do come from the ocean science side. Although, I would hasten to add, I also have strong connections with the meteorological community. My postgraduate degree was in fluid dynamics, which covered both hydrodynamics and aerodynamics; my research topic was storm surges and, in fact, the University of London Library has my thesis filed in the meteorology section.

Let me outline my own reasons for believing additional attention should be paid by governments to the three-quarters of the planet's surface that is covered with salt water. I believe that having the International Year of the Ocean on the eve of the next millennium is very appropriate. I think it inevitable that this overcrowded world will turn increasingly towards the ocean, for food, for resources, even for habitation, and that a concurrent growth in marine activities will occur, in turn spawning a need to service those activities with knowledge, data and information products.

Consider the prospects of food from the oceans. Today eighty per cent of the world's commercial fisheries are overfished or approaching their limit, so does this mean we have reached the wall in terms of protein available from the sea. I personally do not think so. At the moment we are hunting marine living resources. We are pursuing a course similar to that of the buffalo hunters in the early

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[1] Chairman, Inter-governmental Oceanographic Commission

days of settling North America, though I hope that we don't pursue that analogy to the same result. We are harvesting, but not farming, and that has to change. In the future I would expect fish farming to develop in a similar way to that of terrestrial agriculture, where cultivation and technology have increased yields many fold. In the coastal areas, the aquaculture industry will overcome problems of conflict, of fish health and environmental impact. The lessons learned will lead to increased production and more diversity of species. Genetic improvements will increase growth rates and resistance to disease, leading to improved economics for the industry and I would expect more of the higher value products to be produced in shore facilities under controlled conditions.

Farther in the future will be the development of fish farming techniques offshore, finding ways to increase the productivity of the ocean surface waters, making better use of a multispecies ecosystem approach and reducing wasteful practices. Instead of the world's fisheries coming to a grinding halt, I foresee ocean fisheries as an area of innovation and growth. Of course, many problems have to be surmounted; jurisdiction, regulation and control, technological and management issues must be overcome but I believe a new fishing industry will eventually emerge. Only last month I read about a Spanish fishing company that deploys about 600 drifting rafts in the open sea. While only about two metres square and cheaply made from bamboo, they attract fish schools, and indeed are termed Fish Attraction Devices (FADs). Each raft carries an Inmarsat device for location by the fishing fleet. Vessels report that, although many will be barren, others can yield up to 100 tonnes of fish congregated under a single raft. Is this part of the overfishing technology? Or a step towards the future farming of the deeper ocean?

What about the non-living resources in the ocean? Here again the potential for growth is already evident, but the evolution of mineral exploitation has not followed the path originally predicted. When the Law of the Sea was being drafted in the early seventies, sea bed mining for polymetalic nodules was the centre of attention. That industry is still awaiting its economic window. It will arrive eventually, but in the meantime, placer mining, gravel and sand are more important minerals for many countries. More commonplace is the extraction of hydrocarbons from offshore, which is producing an increasing proportion of the world's energy needs. In contrast to the relatively slow progress in pursuing manganese nodules, the search for pharmaceuticals and genetic materials from the sea is attracting a great deal of attention, particularly in the deep benthic and vent ecosystems. It is estimated that the major portion of the world's species live in the oceans, but the majority are still unclassified. The biological richness of the ocean is likely to generate billions of dollars and yet these resources were not even on the table for the original Law of the Sea negotiations.

There are other ocean developments. The ocean as a source of freshwater is of increasing importance in countries lacking natural supplies. The capacity of the ocean to provide renewable energy will continue to exercise engineering minds for decades, although I expect that such uses will be directed towards satisfying local multiple needs rather than global requirements. For example, wave power can be combined with harbour protection facilities and be used for electricity or directly to generate freshwater from seawater. Ocean thermal energy sites create electricity and also generate a source of nutrient-rich ocean bottom water for aquaculture.

The final ocean resource I wish to touch on is ocean space. Coastal populations are increasing even faster than the overall growth of population because of migration towards the ocean. We are already infringing on the ocean edges, filling in salt marshes, building over mangrove swamps and reclaiming coastal lands. Governments must take collective action to preserve important marine habitats. Consider the economics of the use of ocean space for marine transportation, for recreation and tourism and, of course, for sewage and waste disposal. Two thousand five hundred years ago, in the fifth century BC, a poet, Euripides, wrote "The sea washes all man's ills away". Unfortunately, today those words are no longer valid; the ocean's capacity to cleanse anthropogenic wastes is reaching its limit in many coastal areas and it is important to direct attention to the health of the marine environment. The intrinsic value of ocean space is too often ignored when considering the economics of those industries that make use of the common ocean property.

Finally, in the next century I foresee a different and perhaps more extensive use of ocean space. Nearshore engineering structures such as artificial harbours, oil development platforms and airport extensions are now commonplace; in fact most current uses of ocean space impact on the fragile coastal habitat. However, it does not take much of a stretch of the imagination to project progressive developments into deeper water. As the search for resources takes us farther offshore, and even now oil and gas platforms are being positioned in ever-deeper waters, the economics for self-sufficient habitations on the ocean will improve. It is not a question of waiting for technology; we have the technology. I have commented on the possibilities of habitation on the oocean surface for many years and thought I may be alone in this prediction. This week, however, in Paris a group of lawyers are meeting with the theme "The Legal Issues of Ocean Cities".

Will all this activity, if it comes to pass, mean an end to the ocean environment? One could argue that the ocean is already stressed and more pressure may exceed its capacity to cope. However, I am an optimist. I believe that having more people dependent on the ocean for their life and livelihood will foster a greater ocean awareness and thence promote greater action on ocean issues rather than the reverse.

As oceans become more directly important to our lives we must learn to manage our global environmental affairs better and to do that we shall need many more ocean observations, greater knowledge of physical, chemical and biological ocean processes and better interpretation of information into useful and timely operational services. Greater knowledge of the ocean will lead to better coupled ocean-atmosphere models and improved long-term and seasonal forecasts of weather. Climate prediction will also become an increasingly important part of decision-making in an overpopulated and environmentally-stressed world.

This leads me into the final part of my talk. In decision-making, scientific knowledge and information are a valuable and critical resource, giving credibility to arguments and establishing the acceptability or vulnerability of policies and strategies. When scientific uncertainty exists, as is inevitably the case in the complex issues facing us today, science should continue to present the best available interpretations together with an assessment of the risk attributed to action or inaction on the problem under consideration. When subjected to careful peer review and reasoned opinion, even scientific uncertainty can be handled in a manner useful to decision-making.

Unfortunately, this doesn't always occur. Scientific opinion can degenerate into a mere negotiating tool with "made-to-measure" interpretations that are predicated on political or profit motive positions rather than reasoned arguments. Thanks to the communication age, preliminary or biased research opinions can be immediately delivered through the press and television to an already sensitized public. This misuse of science and scientific information has been doubly unfortunate. Today, biased representation of scientific results for political and/or financial gain, by governments, by lobby groups, by industry and even by environmentalists only serve to bewilder the electorate with conflicting opinions. It is no wonder science has lost some of the esteem in which it was once held.

An example of a major international initiative to deal with scientific uncertainty is the Intergovernmental Panel on Climate Change. The history of the Panel has aptly demonstrated both the best and worst of the problems. I will not elaborate on this subject except to note that the work done by the Panel has been of great assistance in achieving a negotiated govemmental response to the issue of greenhouse gas emissions. We all know that the Kyoto agreement was not perfect but some governmental action is an improvement over inaction.

The point I wish to emphasize is that the scientific community must work collectively to ensure that data and information are accurate and that scientific interpretations are subject to peer review. In this, professional societies such as CMOS have a critical role to play. CMOS should be prepared to speak out as an independent scientific voice on matters relating to ocean and atmospheric research and the interpretation and application of scientific results. It is not a question of becoming politically involved; indeed it is the apolitical nature of science that needs to be fostered and protected. Our Society should not be afraid to direct its advice and criticism, when necessary, to the highest level of decision-making in Canada.

As for this week, I wish you well in your deliberations, which I know, despite the hard times that we have experienced, will demonstrate that ocean and meteorological science is still alive and well in Canada.

Thank you. I now declare the 32nd CMOS Congress officially open.

New Medal awarded for the first time by CMOS in Halifax!

Reuben A. Hornstein Medal

Rube, as he is known to many, grew up on a farm west of London, Ontario, where he learned the importance of weather to agriculture. He entered the University of Western Ontario on scholarship and graduated as a gold medalist in physics with an honours B.Sc. He was awarded an M.A in physics from Western in 1936 and an M.A. in meteorology from U of T in 1938.

He first served as a meteorologist at the St. Hubert airport and later, from 1940-1945, as the Officer-in-Charge of the meteorological services for the Eastern Air Command, which served all three military services, in particular the coastal command and naval convoy operations off the East coast. He was recognized for his wartime services with an M.B.E.

After the war he was appointed O.I.C. of the Halifax Atlantic Weather Centre where he authored numerous technical papers and became a feature broadcaster on the Maritime and Newfoundland networks as *"Meet Your Weatherman"* and on the CBC as *"Ask The Weatherman"*. Rube also wrote a number of fascinating booklets *"Weather Facts and Fancies"*, *"Weather and Why"*, *"The Weather Book"*, *"Après la pluie, le beau temps"*. If that was not enough, he also wrote and presented school broadcast scripts for radio and TV.

For 27 years between 1954 and 1981 he served as host weatherman on a nightly TV supper-hour program, and after he retired in 1972 he became active in producing talking books or tapes for the blind and disabled. He read several hundred text books that filled 7,500 90-minute tapes for students from elementary to graduate school.

Rube has offered his time and talents to many worthy causes: the Halifax Theatre Arts Guild, the Nova Scotia Institute of Sciences where he is a life member, the

Canadian Association of Physicists, CMOS, the John Howard Society and the Vanier Institute of the Family, to name only a few.

It should come as no surprise that a man with such broad interests and talents has been honoured before: the Patterson Medal, Honorary Big Brother of Big Brothers of Halifax-Dartmouth, an Honorary Doctor of Letters from St. Mary's University, a Special Merit Award of the Federal Institute of Management, the Commemorative Medal for the 125th Anniversary of Canadian Confederation, and the Order of Canada, once again naming only a few.

Rube's name is well-known in CMOS circles since it is through his thoughtfulness and generosity that we have had a Prize in Applied Meteorology. With a name so synonymous with Canadian meteorology and CMOS, we thought it was time to do something for Rube by creating his very own medal which will be awarded annually to an individual who has made an outstanding contribution to Applied Meteorology - and naturally, the first such recipient is the man himself - Rube Hornstein.

1997 Prizes and Awards
Prix et récompenses pour 1997

The Prizes and awards for 1997 were distributed by the Committee and presented during the CMOS Annual Congress Banquet as follows:

Les prix et récompenses pour 1997 ont été octroyés par le comité et présentés durant le banquet du Congrès annuel de la SCMO de la façon suivante:

Tully Medal

The Tully Medal is awarded this year to Professor Lawrence Mysak, for his impact and leadership in oceanographic research and education in Canada.

Dr. Mysak has made substantial and wide-ranging research contributions to the field of oceanography. He also co-authored the magnum opus "Waves in the Ocean" with Paul LeBlond and is renowned in the oceanographic community for his infectious enthusiasm and dynamism as a teacher and supervisor of graduate students and postdoctoral fellows. Many of these have gone on to occupy leading positions in oceanographic research both within and outside Canada. It is a pleasure to recognize this triple legacy to the development of Canadian oceanography with the award of the 1997 J.P. Tully Medal in Oceanography.

La médaille Tully

La médaille Tully a été attribuée cette année au Professeur Lawrence Mysak pour son impact et son leadership en recherche océanographique ainsi que sa contribution à l'éducation au Canada.

Le Dr.Mysak a apporté une contribution substantielle et vaste à la recherche dans le domaine de l'océanographie. Il a également été co-auteur avec Paul LeBlond du magnum opus "Waves in the Ocean" et est reconnu dans la communauté océanographique pour son enthousiasme et son dynamisme contagieux comme professeur et superviseur d'étudiants gradués et stagiaires post-doctoraux. En fait, plusieurs de ces derniers occupent maintenant des postes de premier plan au sein de la recherche océanographique, et ce, tant au Canada qu'à l'étranger. C'est un plaisir que de souligner ce triple apport au développement de l'océanographie au Canada avec la remise de la médaille J.P.Tully 1997 en océanographie.

Prix à l'étudiant diplômé

Le prix à l'étudiant diplômé est remis cette année au Dr. Bruno Tremblay pour sa thèse intitulée "Modélisation des glaces de mer comme matière granulaire, avec applications à la variabilité climatique".

La thèse du Dr. Tremblay contribue de manière originale et hautement significative au domain de la modélisation des glaces de mer par l'introduction innovatrice de rhéologies de la matière granulaire. Le modèle de Bruno Tremblay incorpore une description quasi-complète de la dynamique sans coûts computationnels importants, et ainsi ouvre la voie à un grand champ de nouvelles recherches sur les effets des glaces de mer sur le climat.

Graduate Student Prize

The Graduate Student Prize is awarded this year to Dr. Bruno Tremblay, for his doctoral thesis entitled "Modeling Sea Ice as a Granular Material, with Applications to Climate Variability".

Dr. Tremblay's thesis is an original and highly significant contribution to the field of sea ice modeling through the novel introduction of granular material rheologies. Bruno Tremblay's model incorporates a nearly-complete description of the dynamics without major computational costs, and thus opens the door to a wide range of new studies of the effects of sea ice on climate.

Rube Hornstein Medal

The second award of the Rube Hornstein Medal is being made to David Patrick in recognition of his contribution to operational meteorology and his dedication in developing, implementing, maintaining and enhancing mission critical software which is in large part due to his personal commitment. The nomination was strongly supported from every part of the country reflecting a broad level of respect and in the spirit of the Rube Hornstein prize which is now being replaced with a medal in his honour.

Dave's efforts in developing a very specialized program, *BullPrep*, used in the production of forecasts, warnings and other weather products across the country, has greatly facilitated the forecast production process by minimizing the time required to produce bulletins, thus allowing the forecaster to focus more attention on the weather problem of the day. It has been instrumental in allowing weather centres to maintain operations with far fewer resources. Simply put, the forecast operations could not live without *BullPrep*.

Over the years, Dave has maintained a commitment to respond quickly to suggestions and problems brought forward by forecasters, managers and end-users, often delivering a fix within 24 hours. His determination has always been to make the forecasters' job easier and to be sensitive to their needs. It is this tireless commitment that has earned Dave the respect of his fellow forecasters and made his programs so successful.

La médaille Rube Hornstein

La seconde remise de la médaille Rube Hornstein a été accordée à David Patrick en reconnaissance de sa contribution à la météorologie opérationnelle et de son dévouement personnel dans le développement, l'implantation, l'entretien et l'amélioration de logiciels importants dans ce domaine. Sa nomination a reçu un fort appui à travers tout le pays, reflétant ainsi l'étendue du respect qui lui est voué, ce qui est tout à l'image du prix Rube Hornstein, qui a d'ailleurs été remplacé par une médaille en son honneur.

Les efforts de Dave en vue de développer un logiciel très spécialisé, *BullPrep*, utilisé dans la production de prévisions et d'alertes météorologiques ainsi que d'autres produits à travers le pays, ont grandement facilité le processus de production de prévisions en écourtant la période de temps requise pour produire des bulletins de prévisions, permettant ainsi au prévisionniste de se concentrer d'avantage sur le problème météorologique de la journée. De plus, le logiciel a permis aux centres météorologiques de maintenir la viabilité de leurs opérations tout en utilisant beaucoup moins de ressources qu'auparavant. En fait, les opérations de prévisions ne pourraient tout simplement plus se passer de *BullPrep*.

Au fil des ans, Dave s'est continuellement engagé à répondre rapidement aux suggestions et problèmes rapportés par les prévisionnistes, gestionnaires et utilisateurs, résolvant fréquemment le problème en un seul jour. Sa détermination a toujours été de rendre la tâche plus facile aux prévisionnistes et d'être à l'écoute de leurs besoins. C'est cet engagement sans relâche qui a valu à Dave le respect de ses pairs prévisionnistes et le succès de ses logiciels.

The President's Prize

Dr. Richard Greatbatch is awarded the President's Prize for his contributions to the field of oceanography.

Dr. Greatbatch is internationally recognized as a leader in the field of ocean modelling. Perhaps the most outstanding problem in this field is the representation or parameterization of the effects of mesoscale eddies in coarse resolution ocean models. In recent work, Dr. Greatbatch has been able to identify the relationships between the eddy-induced tracer transports, vertical mixing of momentum and the isopycnal flux of potential vorticity. Dr. Greatbatch uses these relationships to determine a general form for the parameterization of eddy-induced tracer transports, and to determine important constraints on the subtle details of all such parameterizations. For this important contribution to our knowledge of the relationship between mesoscale eddies and the ocean's general circulation, Dr. Greatbatch is awarded the President's Prize of the Canadian Meteorological and Oceanographic Society.

Le prix du Président

Le Dr. Richard Greatbatch a reçu le prix du Président pour ses contributions dans le domaine de l'océanographie.

Le Dr. Greatbatch est reconnu internationalement comme chef de file dans le domaine de l'océanographie. Le problème le plus criant dans ce domaine est sans doute la représentation - la paramétrisation - des effets des tourbillons méso-échelle dans les modèles océaniques à faible résolution. Dans ses récents travaux, le Dr. Greatbatch a réussi à identifier les relations entre le transport des traceurs induit par les tourbillons, le mélange vertical de quantité de mouvement, et le fux isopycnal de tourbillon potentiel. Le Dr. Greatbatch utilise ces relations pour déterminer la forme générale de la parmétrisation du transport de traceurs induit par les tourbillons, et pour déterminer des contraintes importantes sur les détails subtils caractérisant de telles paramétrisations. Pour cette importante contribution à notre connaissance des relations entre les tourbillons méso-échelle et la circulation océanique générale, le Dr. Greatbatch est le récipiendaire du prix du Président de la Société canadienne de météorologie et d'océanographie.

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