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NOUVELLES S.C.M.O.

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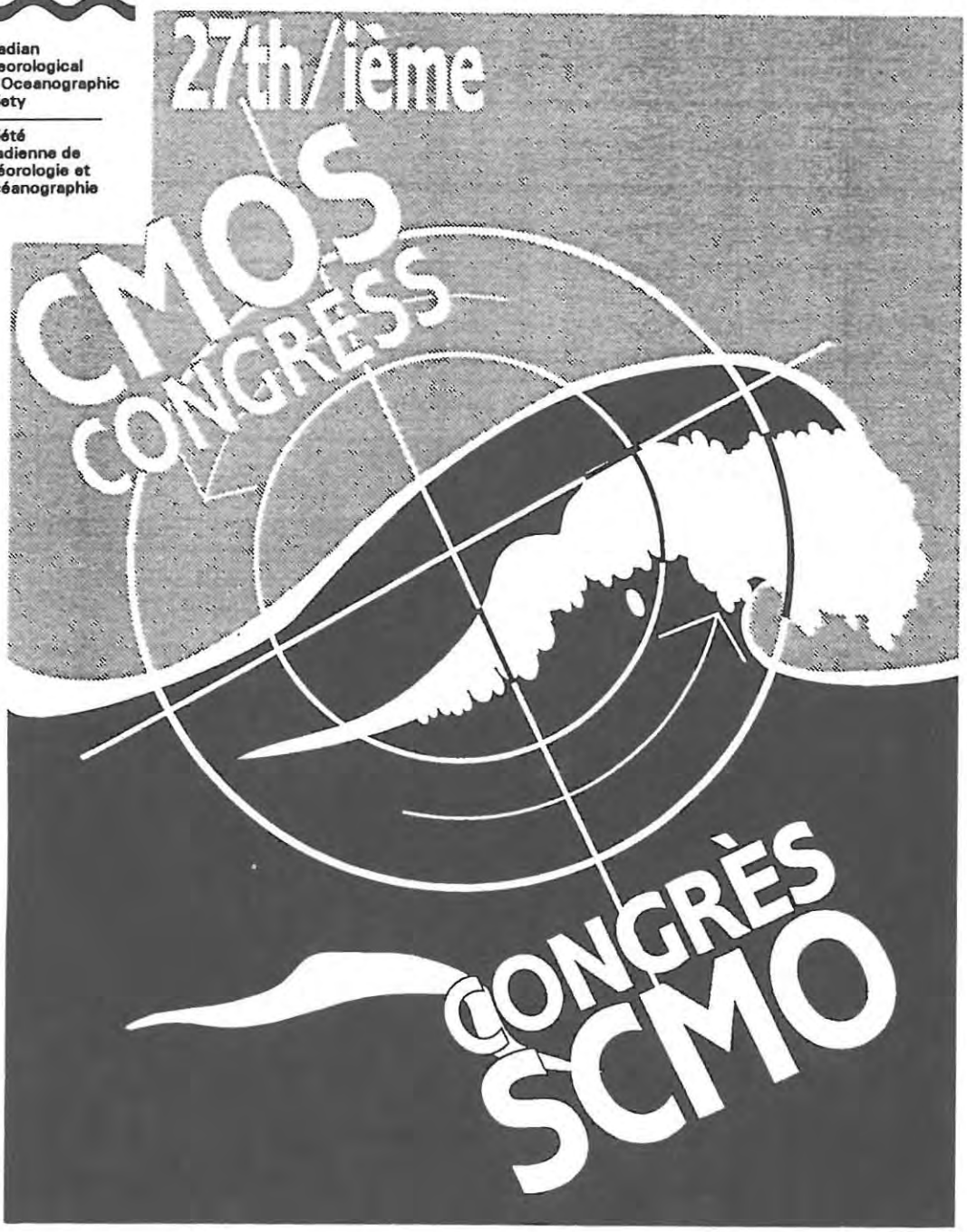
Canadian Meteorological and Oceanographic Society

Société canadienne de météorologie et d'océanographie



FREDERICTON

NEW BRUNSWICK/NOUVEAU BRUNSWICK

JUNE 8-11, 1993 8-11 JUIN, 1993

EDITOR'S COLUMN

The next issue of the CMOS Newsletter **21**(2), April 1993, will go to press on March 20th, 1992. Contributions are welcome and should be sent to me at:-

Institute of Ocean Sciences
P. O. Box 6000
Sidney, B.C. V8L 4B2
Tel. (604)-363-6590
FAX (604)-363-6746

I prefer receiving contributions submitted on floppy disk in a DOS format, however, I can now convert Macintosh files to DOS files. DFO contributors can send ASCII files to me over DFOnet to IOSCCS::HJFREE. Anyone with access to Omnet can send ASCII files to me at IOS.BC, attention Howard Freeland. ASCII files can also be sent to me via Internet to HJFREE@IOS.BC.CA. If you want to send graphics, then HPGL files can be sent as ASCII files over the networks, any other format will have to be sent on paper or on a floppy disc. It is recommended that whatever software prepares an HPGL file be configured for the HP7550 printer. If you have the option of selecting pen colours, please don't.

Do you have an interesting photograph, say, an interesting meteorological or oceanographic phenomenon? If so, write a caption and send me a high contrast black and white version for publication in the CMOS Newsletter. Savonius Rotor is also looking for assistance from anyone who has an unusual point to make.

Howard J. Freeland, CMOS Newsletter Editor

New CMOS Members

The following new members were approved at the CMOS Executive meeting 13th November, 1992:

Leo Burns	Fredericton, N.B.	(regular)
Thomas Carriers	Aylmer, Qc	(régulier)
Peter Chandler	Sidney, B.C.	(regular)
Thierry Chen	Gatineau, Qc	(régulier)
Stephen Déry	North York, Ont.	(student)
Douglas Russell	Ottawa, Ont.	(regular)
André Sevigny	Ste Dorothée, Qc	(régulier)

The following new members were approved at the CMOS Executive meeting 17th December, 1992:

Roger Gagné	Neufchatel, Qc	(régulier)
Marie-France Gauthier	Gatineau, Qc	(régulier)
Paul Lamb	St-Nicolas, Qc	(régulier)
Scott Tinis	Vancouver, B.C.	(student)

Note to Centres and Chapters:
It is important that you make contact as soon as possible with any new members in your area to verify their mailing address and to begin distribution of local Society material. National mailings and publications begin once approved new members are entered in the office computer. This follows the date of the executive or Council meeting shown in this notice.

WHAT'S GOING AROUND?
by Savonius Rotor

The 1993 CMOS Congress will be held in Fredericton New Brunswick. The Province of New Brunswick boasts some of Canada's more remarkable wonders of the natural world: Magnetic Hill, in Moncton; and the Reversing Falls in St. John. The Reversing Falls really is a remarkable spectacle and it is well worth a visit. Of course, it is not really a water fall, rather a series of rapids that reverses itself on each tidal cycle. Despite the misnomer it is an impressive sight. The best view is obtained from a tourist booth in Fallsview Park. In that booth one can collect well printed brochures containing the "Reversing Falls Tide Tables" and a brief description of the phenomenon. I collected a description many years ago and I was pleased to see that the description of the phenomenon has improved, however, some astronomers and oceanographers may have some further improvements to suggest. The following is abstracted from the description of the phenomenon, as published by the Irving Oil Co:

> *.....The low tide running out of the bay collides with the new, incoming high tide, combining forces to make a higher wave coming in. This combination of forces is called resonance.*
>
> *The Bay of Fundy tides are a result of the tidal action originating in the South Indian Ocean sweeping around the Cape of Good Hope and then northward into the bay of Fundy. They are also affected by the distance of the moon from the earth at this longitude.*

Now, perhaps I am not all that well read, but I have not heard any theory that suggests that the global ocean tide originates in the South Indian Ocean. Secondly, astronomers I am sure will be amazed to hear that the moon comes closer to St. John than to anywhere else. Perhaps Cape Canaveral should be moved to New Brunswick.

Letter to the Editor

The following anonymous letter was addressed to the Editor of the Newsletter. It is reproduced here verbatim and I freely admit that I do not understand the criticism that is intended.

FROM ONE 286 TO ANOTHER 286

[or comments on October issue - What's going around?]

Hail colleague and my commiserations on hearing that your operator has been spewing off at the keyboard again. These bio-units amaze me, not content with having to try and assess and rationalize the masses of information they pump through us daily, these units feel compelled to comment on, assess and rationalize the performance of their fellow bio-units. It isn't as if these inefficient and illogical units are even made to standard specifications.

I hear that your Y series bio-unit, under the guise of humour and of course transferring any possible blame to you (don't they all) is having difficulty rationalizing the assessment of one of the very few X series bio-units. At times I seriously doubt that the network and communications cables have been correctly installed on some of these units. I can rarely

tell many of these bio-units apart and as for trying to assess units with such diverse specializations that important performance criteria such as MIPS, megaflops and overall spec marks become meaningless - well I'm lost for bits.

If you still have persistent problems with your Y series bio-unit you might try adding extra memory capacity in the hopes of some self-realization emerging. However, that technique hasn't worked with units in this region and I suspect that many of these Y series units need reprograming.

Canadian Sea-Ice Atlas from Microwave Remotely-Sensed Imagery: July 1987 to June 1990

by E. LeDrew, D. Barber, T. Agnew and D. Dunlop

One of the many important issues in the study of the environment is the prediction of changes and variability in the world's climate. The sea-ice of the polar regions plays a major role in the processes of global climate and acts to some extent like a global thermometer. Considering Canada's significant presence in the Arctic, the Canadian Space Agency and the Canadian Climate Centre of Environment Canada have cooperated to produce this atlas. The atlas, in celebration of the International Space Year, depicts the seasonal changes in sea-ice cover over the northern hemisphere, estimated from the U.S. Special Scanning Microwave Imager (SSM/I) and using techniques developed by Canadian scientists.

The Atlas contains 36 colour-coded images of the changes in ice concentration and extent over a three-year period from July 1987 to June 1990. The Atlas includes chapters on: significance of sea-ice to climate and the arctic environment, geophysical properties of sea-ice, sea-ice algorithm development and ground truth verification. The Atlas is written at the university-entry level and is bilingual English/French.

If you are interested in additional information regarding cost and availability, please request further information from:-

Tom Agnew
Canadian Climate Centre
4905 Dufferin Street
Ontario, M3H 5T4
Canada

Atlas Canadien des Glaces de Mer Basé sur l'Imagerie d'un Système de Détection à Hyperfréquences: de juillet, 1987 à juin, 1990

par E. LeDrew, D. Barber, T. Agnew et D. Dunlop

L'une des importants aspects de l'étude de notre environnement est la prévision des changements et de la variabilité du climat de la planète. La glace de mer des régions polaires joue un rôle prépondérant dans les processus climatiques mondiaux et,jusqu'à un certain point, elle agit comme thermomètre planétaire. En raison du rôle primordial du Canada dans l'arctique, l'agence spatiale canadienne en coopération avec le centre climatologique canadien d'Environnement Canada a produit cet atlas. L'atlas, célébrant l'année internationale de 1'espace, présente les changements saisonniers de la couverture glaciale dans l'hémisphère nord. Ces changements sont estimés à partir d'images produites par le radiomètre imageur à quatre canaux hyperfréquences (SSM/I) des Etats-Unis et de techniques développées par des scientifiques canadiens.

L'atlas contient 36 images codées en couleur des changements de la concentration et de l'étendue de la glace sur une période de trois ans, de juillet 1987 à juin 1990. L'importance qu'a la glace de mer pour le climat et l'environnement arctique, les propriétés géophysiques de la glace de mer, la télédétection de la glace, le développement d'algorithmes de la glace et la vérification par des observations au sol sont parmi les thèmes traités. L'atlas, bilingue, est rédigé pour les étudiants universitaires de premier cycle.

Si vous désirez de plus amples informations sur le coût et la disponibilité de l'atlas, veuillez contacter, s.v.p.:-

Tom Agnew
Centre climatologique canadien
4905 Dufferin Street
Ontario, M3H 5T4
Canada

DONATIONS TO CMOS

If you have not renewed your membership for 1993 as yet, please consider adding a donation to your membership/subscription fee, or if you have already renewed, you can still send a donation if you have not already done so. DONATIONS ARE TAX DEDUCTIBLE! You will receive a receipt which you can use with your annual income tax declaration.

Donations can be earmarked for a specific purpose, i.e. the CMOS Development Fund, which is used to start new ventures such as improving the Newsletter, or the Tully Fund which is used to strike the medals for the annual J.P. Tully award. As it happens, the Tully fund has been depleted and donations for the purpose would be most welcome.

CMOS will welcome any donation, no matter what the size. The small subventions we are currently receiving from government sources, e.g. for the annual CMOS/AES/DFO lecture tour, may well be discontinued in the future due to government fiscal restraints. We are trying to keep overheads to a minimum by relying as much as possible on volunteers to carry out the work. However, with rising prices and taxes it will be difficult to maintain all Society services and publications, provide help to students attending Congresses or Workshops, support the Canada-wide Youth Science Fair, etc..

CMOS would also welcome bequests. Together with donations, they would not only help us to continue and to broaden our services, but would also be a good investment in the future of Canadian meteorology and oceanography, because our services include the provision of information and advice to the many students who express an interest in our sciences.

Executive Director

27th ANNUAL CMOS CONGRESS
Fredericton, 7-11 June, 1993

The 27th Congress will be held at the University of New Brunswick from the 7th to the IIth of June. UNB is Canada's oldest university and combines with the small-town atmosphere of Fredericton to give a pleasant venue. The scientific program will cover a wide range of topics of current and special interest from all of the fluid earth sciences.

Scientific Program
Four Theme Sessions will be featured:

Climate Modelling
Forest and Agricultural Meteorology
Physical-Biological Interactions in the Ocean
Remote Sensing

Special Sessions are also being planned on

Canadian Hazards (a contribution to IDNDR)
CASP II
Hydrological Cycle at Regional & Global Scales
WOCE
Modernizing Canada's Weather Services
Tracers in the Ocean
Oceanography of Seamounts & Banks
Ozone and the Ultraviolet.

In addition, the program will be complemented by a variety of papers in other areas of meteorology and oceanography. Theme and Special Sessions will feature invited speakers.

The deadline for abstracts for oral and poster papers is January 29, 1993. For information contact Dr. John Loder, Chairman, Scientific Program, at: 902 426 4960, Fax: 902 426 7827.

Registration
Registration details, and a form can be found elsewhere in this Newsletter. Early registration is a great help to the Congress organizers. Contact David Daugharty or Ardith Armstrong at: 506 453 4501, Fax: 506 453 3538.

Accommodation
Participants should make their own reservations. Blocks of rooms have been reserved at three locations:

UNB Residence System. Rates: $27.30 single, $39.90 twin (these are current rates and there may be a small increase for next summer). Reservations can be made by contacting UNB Housing & Food Services; at: 506 453 4891, Fax: 506 453 3585.

Lord Beaverbrook Hotel. Located on the banks of the Saint John River, 15 minutes walking distance from the University. Rates: $68 single, $71 double. At: 506 455 3371, Fax: 506 455 1441.

Sheraton Inn. Also on the bank of the Saint John, but 15 minutes by cab from the University. Rate: $79. At: 506 457 7000, Fax: 506 457 4000.

Our reservation at the hotels will only be held until three weeks before the Congress, so be sure to act in good time.

27e CONGRES ANNUEL de la SCMO
Fredericton, 7-11 juin, 1993

L'Université du Nouveau Brunswick sera l'hôte du 27e congrès de la SCMO qui se tiendra à Fredericton du 7 au 11 juin 1993. UNB est la plus ancienne université au pays. Cette caractéristique rehaussée par l'ambiance chaleureuse de la petite ville de Fredericton en fait un endroit privilégié. Le programme scientifique couvrira une gamme de sujets d'actualité et d'intérêt spéciaux de toute les sciences traitant des fluides de la terre.

Programme scientifique
Quatre sessions seront au programme:

Modélisation Climatique
Météorologie Agricole et Forestière
Interaction Physique-Biologique dans l'océan
Télédétection

Des sessions spéciales sont également prévues pour:
Danger au Canada (contribution d'IDNDR)
CASP II
Cycle Hydrologique a l'échelle régionale et globale
l'ECOM
La modernisation des services météorologique au Canada
Les traceurs dans l'océan
Océanographies des montagnes et bancs
Ozone et la radiation ultra-violette

En plus, le programme sera accompagné par une variété de présentation dans d'autre domaine de la Météorologie et de l'océanographie. Des personnes ont également été invité pour des sessions spéciales.

La date limite pour soumettre les résumés des présentations orales et les affiches est le 29 janvier 1993. Pour plus d'information, contacter Dr. John Loder, responsable, Programme Scientifique à: 902 426 4960, Fax: 902 426 7827.

Enregistrement
Les détails pour l'enregistrement ainsi que les formulaires sont inclus ailleurs dans cette brochure. Un enregistrement aussitôt que possible serait de grand aide pour les organisateurs.
Contacter David Daugharty ou Ardith Armstrong
à: 506 453 4501, Fax: 506 453 3538.

Accommodation
Les participants doivent faire leur propre réservation. Un nombre de chambres a été réservé aux trois endroits suivants:

Résidence UNB. Taux: $27.30 simples, $39.90 double (Ceux-ci sont les taux actuels, il peut y avoir une légère augmentation pour l'été prochain). On peut réserver en contactant UNB Housing & Food Services; à: 506 453 4891, Fax: 506 453 3585.

Lord Beaverbrook Hotel. Situé sur la rive sud de la rivière Saint Jean à 15 minutes de marche de l'université. Taux: $68.00 simples, $71.00 double. à: 506 455 3371, Fax: 506 455 1441.

Sheraton Inn. Également sur la rive sud de la rivière Saint Jean à 15 minutes de taxi de l'université. Taux: $79.00. à: 506 457 7000, Fax: 506 457 4000.

Les réservations de chambres aux différents établissements sont valides jusqu'à trois semaines avant le congrès, soyez certain d'agir en temps.

Travel to Fredericton
Air Canada has been appointed the Official Airline for our Congress in Fredericton. Save up to 50%, pending availability, with minimum guaranteed savings of 15% on the full Hospitality and Executive class services.

To take advantage of the above savings, please call your travel agency or Air Canada at 1-800-361-7585. When purchasing your ticket, please ask that our event number **CV930362** be entered in the Tour Code box, and reference code **CMOS** in the Endorsement box regardless of the fare purchased.

CMOS benefits from these bookings, receiving one free ticket for every 40 tickets purchased; these can be used for invited speakers, or to support student attendance.

Industrial Exhibitors
The cost of an exhibit booth is $650. This includes taxes and registration for all events for two persons. Reservations should be made before April 1. Contact Leo Burns at: 506 458 3022, Fax: 506 458 4390.

Be sure to quote the Air Canada event number (CV930362) for a 25% discount in Air Canada Cargo rates.

Sponsorships
Businesses or organizations interested in sponsoring any activity (a coffee break, for example), or in publishing advertisements in the program should contact David Daugharty at: 506 453 4501, Fax: 506 453 3538 for details on rates.

Business Meetings
Committees, SIGS, etc. will have an opportunity to schedule business meetings on Monday, June 7th. Chairs should contact David Daugharty to establish times and locations.

Se rendre a Fredericton
Air Canada a été désigné comme transporteur officiel pour le congrès a Fredericton. Economisez jusqu'à 50%, dépendant de la disponibilité, une économie minimum garanti de 15% sur le service hospitalier et exécutif.

Prenez avantage de ces économies; contacter votre agence de voyage ou Air Canada à 1-800-361-7585. Lorsque vous achetez votre billet, demandez que notre numéro d'événement **CV930362** soit inscrit dans la case "tour code", et le code de référence CMOS dans la case de l'endossement, peu importe le tarif d'achat.

La SCMO bénéficie de ces réservations; recevant un billet gratuit pour touts les 40 billets achetés, ces billets peuvent être utilise pour les invites spéciaux ou pour venir en aide aux étudiants désireux d'assister au congrès.

Exposants industriels
Le coût d'un kiosque est de $650. Ce montant inclus les taxes ainsi que l'enregistrement a tous les événements pour deux personnes. Les réservations doivent parvenir avant le 1e avril. Contacter Leo Burns à: 506 458 3022, Fax: 506 458 4390.

Soyez certain de mentionner le numéro d'événement (CV930362) pour un rabais de 25% sur les tarifs d'Air Canada.

Commanditaires
Les entreprises ou organisme intéressé à commanditer une activité (pause café par exemple) ou en publiant une annonce commerciale dans le programme doivent contacter David Daugharty à: 506 453 4501, Fax: 506 453 3538 pour les détails concernant les frais.

Rencontre d'affaire
Les comités tels; SIGS, etc auront la chance de fixer des rencontres d'affaire le lundi 7 juin. Les responsables sont priés de contacter David Daugharty pour déterminer un endroit et temps de rencontre.

Notice to all Members

In accordance with By-Law 7(b), I am giving notice that the Annual General Meeting of the Society will be held on Tuesday June 8th, 1993 at the CMOS Congress. The meeting room and exact time will be posted at the registration desk. This meeting will include these items listed under By-Law 7(c):

1. To receive and consider the reports of the council, the Auditor, the ballot counters, the Committees, the Centres, the Chapters, the Editorial boards, and the Special Interest Groups;
2. To approve the annual budget of the Society;
3. To establish the membership fees for the next calendar year;
4. To discuss and determine such other questions as may be proposed relating to the affairs Society; and
5. To install new officers for the ensuing year.

The agenda for the Annual General Meeting will be published in the Annual Review which will be mailed to all members before the Annual General Meeting. In accordance with By-Law 10 (e) of the Canadian Meteorological and Oceanographic Society, I am providing you with:

1. The list of members of the current Council;
2. A list of nominations for 1993/94 made by the nominating committee; and
3. Notification that nominations for Council will be received in accordance with By-Law 10(d).

The Council for 1991/92 consists of:

President	Dr. D. Krauel
Vice-President	Dr. G. McBean
Treasurer	Dr. S. Tabata
Recording Secretary	Dr. H. Melling
Corresponding Secretary	Mr. D. Bancroft
Past President	Dr. L.A. Hobson
Councillor-at-large	Dr. R. Leduc
	Dr. G.K. Sato
	Dr. D. Daugharty

The Council nominations for 1992/93 consist of:

President	Dr. G. McBean
Vice-President	Dr. J. Derome
Treasurer	Dr. S. Tabata
Recording Secretary	Dr. H. Melling
Corresponding Secretary	Mr. D. Bancroft
Past President	Dr. D. Krauel
Councillor-at-large	Dr. R. Leduc
	Dr. G.K. Sato
	Dr. D. Daugharty

Douglas Bancroft
Corresponding Secretary

Avis a tous les membres

Conformément au règlement 7(b), je donne l'avis que l'assemblée générale annuelle de la Société aura lieu mardi le 8 juin, 1993. La salle et l'heure de l'assemblée seront affichées au kiosque d'inscription. Cette assemblée traitera les points contenus dans l'Article 7(c), qui sont:

1. L'acceptation et la prise de connaissance des rapports du conseil, des vérificateurs, des préposés au dénombrement des votes, des comités, des centres, des sections, des conseils de rédaction, et des groupes d'intérêts spéciaux;
2. L'acceptation du budget annuel de la Société;
3. La détermination des montants de la cotisation pour la prochaine année;
4. La discussion et la résolution de questions soulevées se rapportant aux affaires de la Société; et
5. L'investiture des administrateurs pour la prochaine année.

L'ordre du jour pour l'assemblée générale annuelle sera publiée dans la revue annuelle qui sera envoyée à tous les membres avant la rencontre annuelle. Selon les termes de l'article 10(e) des règlements de la société canadienne de météorologie et d'océanographie, je vous fais parvenir:

1. La liste des membres du Conseil en cours;
2. La liste des mises en candidature pour 1993/94 telle que rédigée par le Comité des mises en Candidature; et
3. Notification que les mises en candidature pour le conseil seront reçues selon les termes de l'Article 10(d).

Le Conseil pour 1992/93 se compose comme suit:

Président	Dr. D. Krauel
Vice-président	Dr. G. McBean
Trésorier	Dr. S. Tabata
Secrétaire d'assemblée	Dr. H. Melling
Secrétaire correspondant	Mr. D. Bancroft
Président Sortant	Dr. L.A. Hobson
Conseillers	Dr. R. Leduc
	Dr. G.K. Sato
	Dr. D. Daugharty

Mises en candidature pour le Conseil de 1993/94:

Président	Dr. G. McBean
Vice-président	Dr. J. Derome
Trésorier	Dr. S. Tabata
Secrétaire d'assemblée	Dr. H. Melling
Secrétaire correspondant	Mr. D. Bancroft
Président Sortant	Dr. D. Krauel
Conseillers	Dr. R. Leduc
	Dr. G.K. Sato
	Dr. D. Daugharty

Douglas Bancroft
Secrétaire correspondant

CMOS
27TH ANNUAL CONGRESS
UNIVERSITY OF NEW BRUNSWICK
FREDERICTON, N.B.
June 7-11, 1993

REGISTRATION FORM

RATES (Including taxes and banquet. Extra banquet tickets will be available at Registration.)

CMOS Members	$170* ___
Non-members	$190* ___
Students	$70 ___
Retired/Life members	$70 ___
Day Registration (at the Congress)	$60 ___

* Members and Non-members can deduct $20 from these rates if they register before May I, 1993.

NAME _____

ADDRESS _____ TELEPHONE _____

_____ FAX _____

_____

_____

_____

Fill in and send with cheque payable to CMOS Congress '93:

Ardith Armstrong
Registration Convener, CMOS '93
Department of Forest Resources
University of New Brunswick
Bag Service # 44555
Fredericton, N.B.
E3B 6C2

SCMO
27ième CONGRES ANNUEL
UNIVERSITE DU NOUVEAU BRUNSWICK
FREDERICTON, N.B.
7-11 JUIN, 1993

FORMULAIRE D'INSCRIPTION

TAUX (Incluant taxes et banquet. Billets supplémentaires disponibles.)

Membre SCMO	$170*	___
Non-membre	$190*	___
Étudiant	$70	___
membre pension/a vie	$70	___
par jour (au Congrès)	$60	___

* Rabais de $20.00 a toute personne s'inscrivant avant le 1 mai, 1993.

NOM _____

ADRESSE _____ TELEPHONE _____

_____ FAX _____

_____

_____

_____

Remplir le formulaire et faire parvenir votre chèque payable à:
Congrès SCMO 93

Ardith Armstrong
Registration Convener, CMOS '93
Department of Forest Resources
University of New Brunswick
Bag Service # 44555
Fredericton, N.B.
E3B 6C2

President's Report/Rapport du Président

It is hard to believe that it is 1993 already and my term as President of CMOS is more than half over. It has been a challenging and busy year so far, during which your Executive has undertaken a large number of interesting initiatives. I will leave a summary of these to my annual report but would like to briefly highlight four activities at this time for your information and so that you may become involved and provide input.

Finances
Our Treasurer, Sus Tabata, spent a lot of time during his first year in office delving into the intricacies of the CMOS budget and now in his second year is developing, with the cooperation of our accountant, a much more detailed and understandable summary of revenues and expenditures. This summary will outline the true costs associated with our various activities and publications and allow the Society to make better informed decisions. The Executive is attempting to maintain the fees for memberships, registrations, and subscriptions at the present levels. The new summary will inform the membership which activities are losing money and which, if any, are profitable and hence subsidizing other activities.

Past
The Society Archivist, Morley Thomas, with the assistance of Drs. Ted Munn and Ced Mann, has agreed to write a history of CMOS and its antecedents. This history will be serialized in the Newsletter starting next year. If you have any anecdotes or pictures that should be included, please provide them to the Executive.

Present
The Scientific Committee with Chairman Dr. Ron Stewart, is continuing to be very active. Along with the Education for Meteorology Committee, they are participating in an AES review of training and education needs in meteorology. The Scientific Committee drafted letters for the President which were sent to the Deputy Ministers of Environment, Energy, Mines and Resources, Forestry, and Agriculture and are in the process of drafting an annual report to the DMs. The Committee is also preparing a CMOS Statement on Natural Disasters. This is the second statement that they have prepared. At present these statements are circulated to our members through the Newsletter. The Executive would like to communicate them to a wider audience but have no experience in preparing statements for the general public. The Executive would like to set up a Public Information Committee to handle these communications. If anyone is interested in volunteering or nominating individuals for this committee please inform me.

Future
On the direction of the membership, the Executive has prepared a draft summary of a Strategic Plan for CMOS which was published in the last Newsletter for discussion purposes. *We cannot progress further without your comments and input.* I have received limited correspondence on the subject. Please take a few minutes *now* to communicate your thoughts to me. As a starting point, please answer the following questions.

Aussi incroyable que cela paraisse, nous sommes déjà en 1993 et ma période en qualité de président du SCMO est déjà plus qu'à moitié terminée. Ce fut une année très occupé et plein de défis, une année pendant laquelle le bureau de notre société a entrepris grand nombre de projets. J'en ferai un résumé dans mon rapport annuel. Je me contenterai, pour le moment, de souligner brièvement quatre activités auxquelles vous pourriez participer.

Finances
Notre trésorier, Sus Tabata, a consacré beaucoup de temps pendant la première année de son mandat à décortiquer les complexités du budget du SCMO et pendant la deuxième année il élaborera, avec la collaboration de notre comptable, un relevé clair et détaillé des revenus et des dépenses. Cette analyse présentera un bref compte rendu des coûts réels associés à diverses activités et publications et permettra à notre société de prendre des décisions plus judicieuses et mieux fondées. Le bureau essaiera de ne pas augmenter les frais d'inscription, les cotisations et le coût des publications. Le nouveau relevé informera les membres des activités qui ne sont pas rentables et de celles qui le sont et qui aident à financer celles qui ne le sont pas.

Passé
L'archiviste de notre société, Morley Thomas, a accepté d'écrire, avec l'aide du Dr. Ted Munn et du Dr. Ced Mann, une histoire du SCMO et de ses antécédents. L'histoire sera publiée en feuilleton dans les Nouvelles SCMO dès l'an prochain. Si vous avez des anecdotes ou des photos qui s'y rattachent et qui méritent d'être publiées, vous êtes priés d'en informer le bureau.

Présent
Le comité scientifique et son président le Dr. Ron Stewart continuent d'être très actifs. Avec le comité de l'éducation pour la météorologie, ils participent à une étude du SEA des besoins d'éducation et de formation en météorologie. Le comité scientifique a écrit des lettres au nom du président. Ces lettres ont été envoyées aux ministres-adjoints de l'Environnement, des Energie, Mines et Ressources, des Fôrets, et de l'Agriculture. De plus, le comité est en train d'écrire un rapport annuel qui sera aussi adressé aux ministres-adjoints. Enfin, le comité prépare un communiqué du SCMO sur les fléaux de la nature. C'est le deuxième communiqué de ce genre. En ce moment, nos membres peuvent lire ces déclarations dans les Nouvelles SCMO. Le bureau aimerait communiquer ces renseignements au grand public, mais n'a aucune expérience dans ce domaine. Le bureau aimerait mettre sur pied un comité de renseignements publics qui s'occuperait de ces communiqués de presse. S'il y a des gens parmi vous intéressés à se porter volontaires ou à désigner d'autres membres pour faire partie du comité, veuillez me le communiquer.

Avenir
Tel que les membres l'ont demandé, le bureau a préparé un plan abrégé des stratégies d'ensemble du SCMO. Ce plan a été publié dans le dernier Nouvelles afin d'amorcer la discussion. Je voudrais prendre l'occasion pour exprimer mes regrets que ce plan ait été publié en anglais seulement. *Nous ne pouvons pas progresser davantage sans vos commentaires et votre apport.* J'ai reçu peu de lettres à ce sujet. Veuillez donc prendre quelques minutes, *maintenant*, pour me communiquer vos pensées.

President's Report/Rapport du Président

1. Why do you belong to CMOS?
2. Why do some individuals cease to be members?
3. What do you like about CMOS (A-O, CB, Newsletter, Annual Congress, Centre activities, SIGs, etc.)?
4. What do you dislike about CMOS (see 3 above)?
5. How should activities be modified to improve them?
6. What new activities should be undertaken?
7. What activities should we cease to pursue?
8. If we are to increase our membership, who should we target (biological oceanographers and operational meteorologists were mentioned - perhaps teachers, volunteer observers, etc.)?

Please provide your ideas so that we can plan for the future of your Society. Do not limit your comments to the above questions.

1. Pourquoi êtes-vous membre du SCMO?
2. Pourquoi certaines personnes cessent-elles d'être membres?
3. Qu'aimez-vous du SCMO (A-O, CB, Nouvelles SCMO, Congrès annuel, activités des Centres, SIGs, etc.)?
4. Quelles sont les choses que vous n'aimez pas au sujet du SCMO (voir le point 3 ci-dessus)?
5. Comment devrait-on améliorer ces activités?
6. Quelles nouvelles activités devrait-on entreprendre?
7. Quelles activités devrait-on abandonner?
8. Si nous devons augmenter le nombre de nos membres, à quelles disciplines devraient appartenir ces nouveaux membres (l'océanographie biologique,la météorologie opérationnelle ont déjà été mentionnées)? Devrait-on penser aux enseignants, aux observateurs volontaires, etc.?

Veuillez proposer des idées qui nous permettront de planifier l'avenir de notre société. Ne limitez pas vos commentaires aux points ci-dessus mentionnés.

CMOS Tour Speaker - 1993

The tour speaker for 1993 has been selected. Jim Gower, Institute of Ocean Sciences, will present a talk entitled "Satellite Images: Where are we after 20 years?". The tour will probably take place during March, 1993.

Abstract
Images from space are often beautiful as well as informative, but usually fail to show all we would like to see. The talk will survey present and future applications of satellites in ocean (and to a lesser extent, weather) remote sensing, and highlight the opportunities for researchers, students and consultants to be more involved in this field. Examples will be presented, and some of the physical principles involved will be demonstrated. Please come prepared to discuss the potentials and problems of this expanding field.

Biographical Details
Jim Gower received a Ph.D. in radio-astronomy from Cambridge University in England in 1966. After coming to Canada in 1967 he first taught physics at UBC and then began working in satellite remote sensing in 1971, as the Institute of Ocean Sciences, Sidney, B.C., was being formed. He has been a member of NASA experiment teams in satellite oceanography for the GEOS-3 radar altimeter and the Seasat SAR, and is a principal investigator on the European satellite ERS-1. He has organized conferences on measurement of ocean properties from space and has published papers in many aspects of this field. He is currently working with data from a variety of aircraft and satellite sensors, including synthetic aperture radar, an instrument whose design closely parallels the one he used in radio astronomy.

TOURNEE DU CONFERENCIER SCMO - 1993

Le conférencier itinérant pour 1993 a été sélectionné. Jim Gower, de l'Institut des Sciences de la Mer, fera une présentation intitulée " Les images satellites : où en sommes-nous après 20 ans ? " La tournée se déroulera probablement en mars 1993.

Résumé
Tout en étant aussi belles qu'instructives, les images prises de l'espace ne réussissent pas à nous apprendre tout ce que nous aimerions savoir. Le séminaire fera un survol des utilisations présentes et futures des satellites dans l'étude de l'océan (et à un degré moindre, de l'atmosphère), et mettra en valeur les opportunités, pour les chercheurs, étudiants et consultants, d'être plus impliqués dans ce domaine. Des exemples seront présentés et certains principes physiques utilisés seront démontrés. Veuillez être prêts à discuter les possibilités et les problèmes de ce domaine en développement.

Renseignements biographiques
Jim Gower a reçu en 1966 un Ph.D. en radio-astronomie de l'Université Cambridge en Angleterre. Après son arrivée au Canada en 1967 il a d'abord enseigné la physique à UBC. Puis en 1971, lors de la formation de l'Institut des Sciences de la Mer, Sidney, C.B., il a débuté son travail en télédétection par satellites. Il a été membre d'équipes d'études expérimentales de l'océan par satellites de la NASA pour l'altimètre GEOS-3 et Seasat SAR et est un investigateur principal sur le satellite européen ERS-1. Il a organisé des conférences sur la prise de données des propriétés de l'océan par satellite et a publié des articles concernant plusieurs aspects de ce domaine. Il travaille présentement avec des données prises par une variété de détecteurs installés sur des avions et des satellites, incluant le radar à ouverture synthétique, instrument dont la conception est similaire à celle de l'instrument qu'il utilisait en radio-astronomie.

Dissolution and precipitation of inorganic carbon in shelf and slope sediments: burial and diagenesis

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The role of inorganic carbon in the overall cycling of carbon in shelf and slope sediments has been largely overlooked. $CaCO_3$ enters the sediments as exoskeletons of pelagic micro-organisms and shelly material of benthic fauna. In the oxic upper portion of sediments, this material can be subjected to dissolution if the CO_2 produced by organic matter decay,

$$(CH_2O)_{106}(NH_3)_{16}H_3PO_4 + 138\ O_2 \rightarrow 106\ CO_2 + 16\ HNO_3 + 122\ H_2O + H_3PO_4$$

can overcome the supersaturation of the overlying waters (Emerson and Bender, 1981). Conversely, in anoxic portions of shelf sediments, $CaCO_3$ may precipitate in response to the increase in alkalinity of porewaters resulting from sulfate reduction,

$$(CH_2O)_{106}(NH_3)_{16}H_3PO_4 + 53\ SO_4^{=} \rightarrow 67\ HCO_3^{-} + 39\ CO_2 + 16NH_4^{+} + 53\ HS^{-} + 39\ H_2O + HPO_4^{=}$$

This latter phenomenon is well documented (Sholkovitz, 1973) and creates an additional sink for inorganic carbon. The extent of $CaCO_3$ dissolution/precipitation in marginal sediments has not been quantified and our knowledge of the kinetics of these reactions in near saturated seawater is meagre.

The objective of this project is to derive a kinetic expression describing the rate and mechanism of $CaCO_3$ precipitation and dissolution reactions in near saturated seawater. Field truthing and the role of these reactions in the recycling of carbon from shelf and slope sediments will be addressed within the JGOFS program. Finally, a refined expression will be included in the formulation of a model for sedimentary carbon burial and recycling in marginal environments (Boudreau, 1992)

Many expressions have been used to model calcite precipitation/dissolution kinetics, and most were derived from limestone dissolution studies. These expressions were formulated from either theoretical considerations, experimental studies or both. Another distinction can be made between those expressions in which the rate determining mechanism is mass-transport (i.e., diffusion) or surface reactions. In contrast to dissolution at low pH and with the exception of conditions leading to spontaneous nucleation, under natural conditions, mass-transfer (i.e. diffusion) is rarely the rate determining step.

The reaction control model proposed by Plummer et al. (1978) for calcite dissolution, as applied by others to the crystal growth of calcite in simple solutions, is the basis of our experimental approach. This model provides a mechanistic description of the growth/ dissolution process based on a set of parallel elementary reactions.

$$CaCO_3 + H^+ \rightleftarrows Ca^{2+} + HCO_3^- \quad (1)$$
$$CaCO_3 + H_2CO_3 \rightleftarrows Ca^{2+} + 2\ HCO_3^- \quad (2)$$
$$CaCO_3 + H_2O \rightleftarrows Ca^{2+} + HCO_3^- + OH^- \quad (3)$$
$$CaCO_3 \rightleftarrows Ca^{2+} + CO_3^{2-} \quad (4)$$

and

$$R = R_f - R_b = k_{.1}(Ca^{2+})(HCO_3^-) + k_{.2}(Ca^{+2})(HCO_3^-)^2 + k_{.3}(Ca^{2+})(HCO_3^-)(OH^-) + k_{.4}(Ca^{2+})(CO_3^{2-}) - k_1(H^+) - k_2(H_2CO_3) - k_3 \quad (5)$$

where R is the observed rate of precipitation (or dissolution) normalized to the reacting surface area, R_f is the precipitation rate (forward reaction), R_b is the dissolution rate (backward reaction), $k_{(i)}$ are the rate constants for each of the reactions, and (i) are the activities of the species involved in the reactions.

The model of Plummer et al. (1978), however, does not adequately describe the kinetics of calcite precipitation at high pH (i.e. >8.2) or low P_{CO_2} (i.e. $<10^{-3}$) in simple solutions and crystal growth/dissolution in seawater. More recently, Chou et al. (1989) proposed an expression based on three parallel elementary reversible calcite dissolution/precipitation reactions (i.e., Rx. 1, 2 and 4) to describe calcite dissolution in dilute solutions. They concluded that at high pH and low PCO_2 calcite precipitation should be dominated by Rx. 4.

Alternatively, rate equations have been expressed in terms of a disequilibrium functional dependence. These expressions were used to describe the kinetics of both calcite and aragonite dissolution/precipitation kinetics in freshwater and seawater solutions. For precipitation reactions it is expressed as:

$$R = k(\Omega-1)^n \quad (6)$$

where R is the precipitation rate, k is the rate constant, n is the empirical reaction order and $(\Omega-1)$ is the degree of supersaturation with respect to the mineral phase. When n = 1, this expression becomes equivalent to the mechanistic model as expressed by Rx.4. In seawater, however, n can take a value between 1.7 and 4 depending on temperature, concentration of reaction inhibitors (e.g. PO_4^{3-}, SO_4^{2-}, Mg^{2+}, etc.) and a number of other variables. Since $n \neq 1$ in seawater, equation (6) becomes purely empirical and does not allow much insight into the reaction mechanism.

More recently, Zhong and Mucci (1993) conducted calcite precipitation experiments in near-saturation seawater solutions (constant $[Ca^{2+}]$) using a new experimental technique. They demonstrated the predominance of Rx. 4 and the complex nature of the precipitation mechanism in seawater. A reaction order of 3 with respect to the carbonate ion concentration, $[CO_3^{2-}]$, was obtained:

$$R = R_f - R_b = k_{.4}(Ca^{2+})^{n1}(CO_3^{2-})^{n2} - k_4 = K[CO_3^{2-}]^n - k_4 = 10^{3.8}[CO_3^{2-}]^3 - 0.29 \quad (7)$$

where n(i) are the partial reaction orders with respect to the reactive species.

Studies are underway to determine the influence of PCO_2, ionic strength and solution composition on the partial reaction orders and rate constants for this and the other parallel reactions during dissolution and precipitation. Ultimately, the kinetic expression may take into account the formation of intermediate species which could be represented by ion pairs, as well as the presence of specific naturally occurring reaction inhibitors (e.g., phosphate, DOC).

Results of the experimental study will be tested against the accumulation rate and burial/distribution of inorganic carbon in the Gulf of St-Lawrence and Scotia Shelf/Slope sediments. The integrated preservation of $CaCO_3$ will be estimated from the rain rate obtained from sediment traps with the $CaCO_3$ content in the oxic layer. This result will be compared to dissolution rates determined from modelling alkalinity and calcium concentration gradients in the porewaters. The amount of $CaCO_3$ precipitated in the sediment as a result of sulfate reduction will be determined by either modelling the porewater Ca^{2+} profile or from the change in the isotopic composition of the preserved mineral. As a result of organic matter decay, the $\delta^{13}C$ of the resulting bicarbonate decreases significantly, and the $CaCO_3$ that precipitates from these porewaters will be depleted in ^{13}C relative to the material produced in the water column and collected in the sediment traps.

Literature Cited

Boudreau, B.P. 1992. Carbon dynamics in marginal sediments: mathematical modelling of carbon and nutrient regeneration. ***C.M.O.S. Newsletter*** **20(6)**, 18-19.

Chou, L., R.M. Garrels and R. Wollast. 1989. Comparative study of the kinetics and mechanisms of dissolution of carbonate minerals. ***Chemical Geology*** **78**, 269-282.

Emerson, S. and M. Bender. 1981. Carbon fluxes at the sediment-water interface of the deep sea: calcium carbonate preservation. ***Journal of Marine Research*** **39**, 139-162.

Plummer, L.N., T.M.L. Wigley and D.L. Parkhurst. 1978. The kinetics of calcite dissolution in CO_2-water systems at 5° to 60°C and 0.0 to 1.0 atm CO_2. ***American Journal of Science*** **278**, 179-216.

Sholkovitz, E. 1973. Interstitial water chemistry of the Santa Barbara sediments. ***Geochimica et Cosmochimica Acta*** **37**, 2043-2073.

Zhong, S. and A. Mucci. 1993. Calcite precipitation in seawater using a constant addition technique: a new overall reaction kinetic expression. ***Geochimica et Cosmochimica Acta*** (in press).

Re-Evaluation of the Eddy Correlation Method For CO_2 Fluxes over the Ocean

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As part of Theme 1--Gas Exchange of JGOFS Canada, the Joint Global Ocean Flux Study, a group of scientists from Dalhousie and the Bedford Institute of Oceanography are examining the flux of CO_2 through the air-sea interface. As the title suggests, our primary goal is to make eddy correlation measurements over the ocean under a range of meteorological and oceanographic conditions. By comparing estimates of the flux of CO_2 with those made from a direct measurement of the difference in CO_2 partial pressure across the interface, we hope to convince those who are skeptical of eddy correlation results that the method can be used to measure CO_2 flux reliably over the ocean.

Eddy correlation measurements of CO_2 flux are routine over agricultural surfaces using both ground-based and airborne fast response infrared sensors. Data rates of 10-20 Hz are achievable, resulting in horizontal resolution of eddies of a few metres for ground-based instruments and of 10's of metres for airborne ones. Thus, measurements represent rather precise locations, though the time to take a reasonable sample of eddies, 10's of minutes, implies rather larger scales when wind speeds exceed a few metres per second. Over the ocean CO_2 fluxes are substantially (perhaps two orders of magnitude) smaller. Current technology restricts measurements to stationary platforms. Initially our work will take place on the Dutch meteorological platform MPN in the North Sea in September 1993. We will deploy an instrument currently under construction at Kartech Instruments in Kanata, Ontario along with several other flux sensors. As well, we will deploy a differential path infrared absorption sensor to directly measure the ΔP_{CO2} between the ambient air and the water just below the surface at the platform. By comparing a time series of these differences with the eddy-correlation flux estimates we hope to deduce the direct and indirect effects of wind speed, including the postulated importance of bubbles in the gas transfer process. Though we are not planning quantitative bubble measurements at this point, we will have a photographic record of the whitecaps for later analysis. As well, depending on field trials elsewhere, we may be deploying other instrumentation which will better define the CO_2 conditions in the upper part of the water column.

Once we have demonstrated that we can make reproducible measurements with a reasonable signal-to-noise ratio under a wide range of wind and sea conditions in a shallow sea, we plan to deploy the instruments at either an open sea atoll or along a coast with good fetch from a deep ocean basin. The data from this second field trial will then be compared with the postulated pathways for natural and anthropogenic CO_2. At this point our understanding of the literature and available data is that there are several possible pathways along which the majority of the air-sea exchange of CO_2 could be taking place. By developing confidence in a measurement system which can make high frequency, local measurements we hope to provide the community with a tool to evaluate these pathways in later years.

Canadian GEWEX Update

The interaction of energy and water cycles are key to understanding our climate system and the impacts of climate variability and change are often most pronounced on water availability. The Canadian Global Energy and Water Cycles Experiment (GEWEX) will focus on these important scientific issues in areas of special Canadian interest and competence. To clarify its focus and to provide the Canadian scientific community with better guidance, the Canadian GEWEX Management and Science Committees have prepared several GEWEX related documents. The documents are:

1. The Canadian GEWEX Programme Science Plan (R. Lawford editor).
2. Canadian GEWEX Programme Phase I: Report of the planning meeting and university workshop (T. Krauss editor).
3. Canadian GEWEX Programme - A Conceptual Overview (G. McBean editor).

The GEWEX Science Plan and Conceptual Overview documents have been widely distributed and copies are available from the GEWEX Secretariat. A Call for Proposals to University and Government researchers was issued in early December, 1992. The deadline for proposals from government researchers for Green Plan funding was January 22, 1993. Letters of intent were requested from University researchers by January 22, 1993, however, the deadline for proposals for the NSERC Collaborative Special Projects and Programs CSPP) grant submission is March 1, 1993. The following excerpts are taken from the Conceptual Overview.

Development of Climate Models

Achieving the aims of the international GEWEX Programme is bound up with improving our ability to model the global hydrological cycle. Ultimately this requires the use of global fully-coupled climate-system models. However, general circulation models (GCMs) and numerical weather prediction models (NWP) suffer from widely recognized deficiencies in their treatment of the atmospheric moisture budget, including clouds and precipitation and the heat and moisture fluxes at the land surface. The improvement of models in these areas is anticipated to be one of the major contributions of GEWEX.

Three types of information are required in order to accomplish this goal.

1) Process studies are needed to provide algorithms describing physical phenomena taking place in the atmosphere, biosphere and cryosphere. To be useful in a GCM or NWP model context, these must be based upon variables which are actually carried by the models. In the case of atmospheric moisture, for each grid square this is basically limited to the temperature at the midpoint of each atmospheric layer and the specific humidity averaged over the layer.

2) Scaling studies will be required to enable sub-grid scale processes to be modelled in a physically realistic manner. The variables carried by global models are in reality grid-square averages (as well as being, in the case of atmospheric variables, vertical layer averages), and thus conceal what may be a considerable degree of sub-grid spatial variability. Ways must be found of taking this variability into account, either by aggregating upward or by parameterizing the variability into the calculations.

3) Global data sets of various climatological and land-surface variables are required to provide information needed to initialize global models and, even more importantly, to verify and test their simulations. It is anticipated that such data will be provided primarily by the Earth Observing System (EOS) programme (Phase II of GEWEX), scheduled for launch about the year 2000. However, valuable preliminary work can be done on data assimilation and on algorithms for the translation of raw satellite measurements into the information required by modellers.

Development of Hydrological Models

The objectives for the hydrological modelling component of the Canadian GEWEX Programme are:

- To contribute to the development of land surface process modelling within climate system models by developing a hydrological model that can be embedded in the atmospheric climate models;
- To contribute to the estimation of present and possible future surface water balances of the Canadian Arctic basin at GEWEX scales, using existing data bases and simulations of GCMs.

The strategy will be to focus on the MacKenzie River Basin although some models should also be tested on the Mississippi River basin, using the large data set that will be generated by the GEWEX Continental-Scale International Project (GCIP).

The conceptual plan is based on the assumption that there are significant non- linearities in the Mackenzie system and that a successful 100 km monthly model must be based on simulations in the order of daily to weekly time steps and 10 to 20 km computational elements. Furthermore, hydrologic models used in the study need time to interact with GCMs and, therefore, must be able to resolve the differences in time and space scales between the two types of models.

The models will be tested by driving them with the output of NWP models or GCM outputs to test their response to time-varying meteorological inputs. The results can then be compared with observed stream flow or other observations of basin state.

For more information about GEWEX, Terry Krauss can be reached at Tel. (306) 975-4215 or Fax. (306) 975-5143.

Please send climate research-related material to Ross Brown, Canadian Climate Centre, Phone: (613) 996- 4488, Fax: (613) 943-1539.

Arctic Climate Workshop

2A workshop on the Arctic climate system was held in Ottawa on December 10-11, 1992. The workshop, sponsored by the federal government's Climate Research Network Initiative, brought together 55 Canadian researchers from universities, government and the private sector to discuss how to improve understanding of the Arctic climate system, and to make recommendations on priority areas for future studies. The workshop was viewed as a major contribution to developing a position on Canada's participation in the Arctic Climate System Study (ACSYS) of the World Climate Research Programme. There was a strong consensus that Canada should establish a Canadian ACSYS Committee in order to coordinate Canadian involvement. In addition, it was unanimously agreed that Canada should offer to host the ACSYS International Secretariat. The workshop was considered a success in that it brought together Canadian researchers from several disciplines and backgrounds, and sowed the seeds for future collaborative research on arctic climate processes. A full report of the workshop will appear in an upcoming edition of the Newsletter.

Summary of the 9th Session of the National Climate Research (NCRC) Committee, Ottawa, December 9, 1992

The NCRC serves as the Canadian National Committee of the World Climate Research Program (WCRP) and as the Research Committee for the Canadian Climate Program Board (CPB). The Committee also acts as the scientific advisory panel for the Canadian Climate Research Network. This network is being established as part of the Green Plan Global Warming Science Program. Highlights of the discussions held in Ottawa are presented below:

- The Committee agreed that right-to-access guidelines for climate data were needed in Canada in order to overcome accessibility difficulties currently being experienced by scientists.
- The Committee reviewed a consultant's report on management options for the Canadian Climate Research Network. The Committee supported the report's recommendation that the Network be established as a non-government, non-profit organization along the lines of the Ontario Centres of Excellence.
- The Committee reviewed current progress on establishing the Canadian Climate Research Network. The Committee agreed that a formal process was required, similar to the NSERC collaborative grants model, for stimulating and reviewing proposals for Network "nodes". This would entail an initial call for letters of intent, followed by a request for formal proposals. These would be reviewed by the Committee at its biannual meetings. The Chairman indicated that a call for letters will be developed over the next few months outlining the research priorities for the Network, the guidelines for "node" proposals, and the approximate level of available funding.
- The Committee reviewed a proposal from a task force established by the NOAA Office of Global Programs to establish an International Climate Research and Prediction Centre to provide ENSO- related climate forecasts to developing countries. While the Committee felt the Centre was worthwhile as a US-led initiative, it recommended against strong Canadian participation since the proposal did not fit in well with Canada's scientific priorities.

A presentation on GCOS, the Global Climate Observing System, was given by Dr. D. Whelpdale of the Atmospheric Environment Service. The Committee suggested establishing an ad-hoc committee with representatives from industry and the research community to provide advice on Canadian participation in GCOS, and to stimulate the development of observing systems by Canadians. The next meeting of the NCRC will be held on May 17-18 at the Institute for Space and Terrestrial Science, Waterloo.

For additional information on the National Climate Research Committee, please contact Mr. M.D. Hewson, the interim secretary at (416) 739-4988.

Up-Coming Climate-Related Research Meetings in Canada

Fredericton, June 8-11, 1993: Twenty-Seventh Annual CMOS Congress. The Congress will feature a theme session on climate modelling. Contact: Dr. John Loder, Chairman, Scientific Program Committee, (902) 426-4960.

Québec City, June 8-10, 1993: 50th Anniversary of the Eastern Snow Conference. The conference will include a theme session on Snow and Ice Studies Related to Energy Budget or Global Warming Investigations (deadline for receipt of abstracts was December 1, 1992). Contact: Derrill J. Cowing, ESC Program Chairman, U.S. Geological Survey, Water Resources Division, 26 Ganneston Drive, Augusta, Maine 04330.

Calgary, September 12-18, 1993: The International Society of Biometeorology Thirteenth International Congress of Biometeorology. The theme of this congress is adaptations to global atmospheric change and variability. The congress will address issues of human, animal, plant, invertebrates and microorganisms in relation to climate change and variability. Contact: Dr. N. Barthakur, (514) 398-7938.

Montréal, September 23-28, 1993: The Second International Design for Extreme Environments Assembly (IDEEA Two). This conference will bring together professionals from many countries and environmental settings to look at habitats and operations in difficult settings. The environments include Arctic regions, mountains and the oceans, and the conference will emphasize issues such as sustainable development, design/construction, environmental impacts and policy/law. (Although not specifically mentioned, climate change cuts across all these issues). The deadline for abstracts is February 15, 1993. Contact: Centre for Northern Studies and Research, (514) 398-6052.

WOCE Session at the CMOS Congress

Abstracts have been invited for a special session on ocean circulation observations and models at the CMOS Congress, 8-11 June, 1993, in Fredericton, N.B. This session will follow the theme session on climate modelling, and will include papers dealing with computer, theoretical, or numerical modelling or observations of ocean circulation. It will begin with invited presentations from scientists instrumental to the implementation of WOCE. The session will feature results from projects related to the World Ocean Circulation Experiment, but welcomes other related projects. The official abstract deadline was Jan. 31, but late abstracts may be considered by contacting the session convenor as soon as possible. Final decisions on abstract acceptance will rest with the program committee. Session convenor:

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Onset of Convection in a Rotating Semi-Infinite Fluid

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1. Introduction

Rotating laboratory experiments by Brickman and Kelley identified three phases to the convective response of a fluid to heating from an isolated source. The initial phase consists of thin tendril-like plumes which rise out of the boundary layer above the hotplate. In this note we model this first phase by investigating the onset of convection in a semi-infinite, rotating fluid, using a theoretical model and laboratory experiments. The intention is to model the initial response of the ocean to a constant heat flux applied at its boundary, thus mimicking what happens when a mass of cold air blows out over the ocean surface.

2. The Model

We consider the onset of convection in a semi-infinite, homogeneous, rotating fluid which is heated from below starting at some instant. The mean density field, a function of vertical position and time, is assumed to obey a diffusion equation

$$\frac{\partial \bar{\rho}}{\partial t} = \kappa \frac{\partial^2 \bar{\rho}}{\partial z^2} \qquad (1)$$

throughout the domain, with the constant-flux condition boundary condition

$$\kappa \frac{\partial \bar{\rho}}{\partial z} = \frac{\rho_0 Q}{g} \qquad (2)$$

where $Q = \alpha F/C_P$ m^2s^{-3} is the buoyancy flux. Here, κ is a constant eddy diffusivity, ρ_0 a reference density, g is gravity, F (Wm^{-2}) is the applied heat flux, α (K^{-1}) is the coefficient of thermal expansion, and C_P ($Jkg^{-1}K^{-1}$) is the specific heat. The solution for the density deficit is:

$$\bar{\rho}(z,t) = \frac{\rho_0 Q}{g}\left(\frac{4t}{\kappa}\right)^{\frac{1}{2}}\left[\frac{1}{\sqrt{\pi}} exp\left(\frac{-z^2}{4\kappa t}\right) - \frac{z}{2\sqrt{\kappa t}} erfc\left(\frac{z}{2\sqrt{\kappa t}}\right)\right] \qquad (3)$$

This solution describes an unstable boundary layer, diffusing into the interior of the domain, with buoyancy deficit across the boundary layer an increasing function of time. Thus, as time increases the fluid is becoming progressively more unstable. Linearized equations apply for the perturbation fields as, initially, there is no motion. We non-dimensionalize the equations using: time, $t \sim (\nu/Q)^{\frac{1}{4}}$; length, $L \sim ((Pr\,\kappa^3)/Q)^{\frac{1}{4}}$; velocity, $V \sim ((\kappa Q)/Pr)^{\frac{1}{4}} V'$; and density $[\rho,\rho] \sim (\rho_0/g)((PrQ^3)/\kappa))^{\frac{1}{4}}[\rho,\rho']$. Here, ν is the diffusivity for momentum and $Pr = \nu/\kappa$ is the Prandtl number. We choose harmonic functions for the x,y dependence such that $\nabla_h^2 \equiv \partial^2/\partial x^2 + \partial^2/\partial y^2 = -(k^2+l^2) = -a^2$, where k,l are the horizontal wavenumbers. The governing equations for the non-dimensional (perturbation) density, vertical vorticity, and vertical velocity are:

$$\frac{\partial \rho}{\partial \tau} = \nabla^2 \rho - w\frac{\partial \hat{\rho}}{\partial z} \qquad (4)$$

$$\frac{\partial \zeta}{\partial \tau} = Pr\nabla^2\zeta + \frac{f}{(Q/\nu)^{1/2}}\frac{\partial w}{\partial z} \qquad (5)$$

$$\frac{\partial \nabla^2 w}{\partial \tau} = Pr\nabla^4 w - Pr\nabla_h^2 \rho - \frac{f}{(Q/\nu)^{1/2}}\frac{\partial \zeta}{\partial z} \qquad (6)$$

Here, z is depth measured upwards from $z = 0$ on the heated boundary, f is the Coriolis parameter, and $\nabla^2 = \nabla_h^2 + \partial^2/\partial z^2$. Note that for $f = 0$ these equations, in the independent variables z, τ, are independent of Q, depending only on Pr. More generally, we see that the behaviour of equations (4)-(6) depends on Pr and the parameter $\gamma = f(\nu/Q)^{\frac{1}{4}}$. For the ocean γ ranges from $0.05 \rightarrow 0.14$, given a turbulent viscosity of $\nu \sim 10^{-1}m^2s^{-1}$ (consistent with that used by Leaman and Schott [1991]), and buoyancy fluxes from $5 \times 10^{-8} \rightarrow 5 \times 10^{-7}$, m^2s^{-3}. For an assumed Prandtl number of O(1), the ratio $\gamma/Pr \ll 1$ so the rotation terms are not expected to be important. However, plausible changes in the values of ν and Q could increase this ratio.

To investigate the stability of the above set of equations, we monitor the behaviour of a norm, M, of an initial perturbation

in w, for a given (Pr, γ). Since the system is viscous/diffusive but potentially more unstable as time goes on, an initial perturbation could possibly decay and then grow. We define the instability time, τ_i, as the time from the origin at which M, which must be strictly growing, reaches a value R times its minimum value. The mathematical problem is to find the a^2, for a given perturbation, which minimizes τ_i. As the equations are not (obviously) separable in z, τ, the instability time will depend on the initial perturbation function, making the problem of finding the absolute minimum τ_i intractable. We limit our investigation to initial perturbations in w which satisfy the boundary conditions and are vertically uniform in the interior of the fluid.

We use no slip boundary conditions on the velocity fields at the solid boundary, with all variables forced to zero as $z \to \infty$. The solution method involved changing to a stretched vertical coordinate $z' = 1\text{-}exp(z/D)$, which maps the semi-infinite domain onto [0,1], and then writing the equations in finite difference form. Typically, 100 grid points and a (dimensional) timestep of 10s gave numerically stable results. A value of 2 was chosen for R.

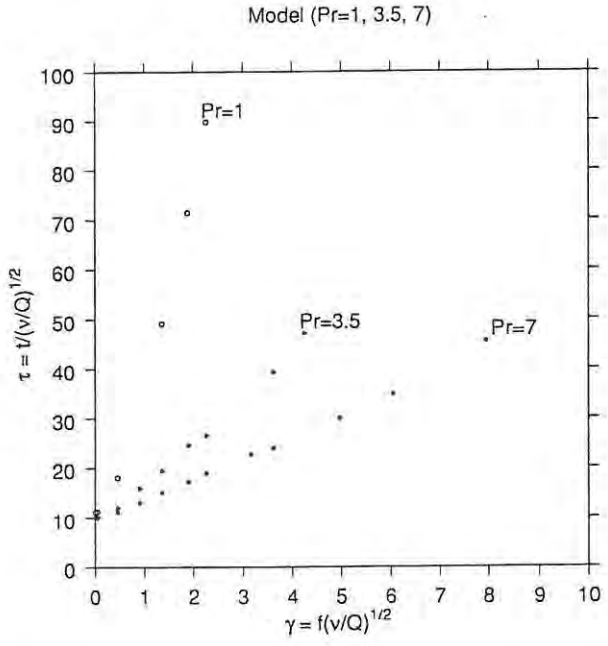

Figure 1: The non-dimensional instability time, τ_i, versus the forcing parameter, γ, for three Prandtl numbers.

Results

Predictions from the model include the instability time, the spacing between plumes, the boundary layer depth, and the density deficit. We discuss here only the result for the instability time. Figure 1 is a plot of $\tau = t/(\nu/Q)^{1/3}$ versus $\gamma = f(\nu/Q)^{1/3}$ for three Prandtl numbers. We see that τ is an increasing function of γ whose slope increases as Pr decreases.

3. Laboratory Experiments

In this section we present laboratory experiments designed to complement the theoretical model. The experiments were done in a 25x25x25 cm^3 sealed square glass container, insulated with 4 cm of styrofoam, and mounted on a rotating platform. The working fluid was pure water at either $19.5 \pm 0.5°C$ ($Pr = 7.0$) or $48 \pm 2.0°C$ ($Pr = 3.5$). The fluid was seeded with $\sim 2\mu m$ flat rheoscopic particles and vertical slits of light 5mm thick were shone through the tank to elucidate the flow field. The heat source was a 2 mm thick rubberized wire mesh which was suspended on thin wires about 4 cm above the tank bottom in a total water depth of 20 cm.

The instability time was the only parameter determined to compare to the model predictions as it was the only one that could be reasonably measured. All experiments were video recorded, and the time at which the first crenilations in the boundary layer occurred was noted. Heat fluxes ranged from 150-3000 Wm^{-2}, and Coriolis values between 0 and 4 s^{-1}. Instability times ranged from 10 to 60 seconds, which yields a predicted maximum boundary layer thickness of less than 10 mm (for $\kappa = 1.4\ 10^{-7}\ m^2s^{-1}$. Because this boundary layer was about 250 times smaller than the fluid depth, the laboratory tank was effectively semi-infinite.

The determinations of the instability time from the video recordings were usually reproducible to within a couple of seconds. However, it was not felt that the true onset of instability time was observed, but rather some later time. This would correspond to a larger value of R in the numerical model. Figure 2 is a comparison of the lab results versus the numerical model for Pr = 3.5 and 7.0. Plotted are the average value, standard deviation, and range for the lab data,

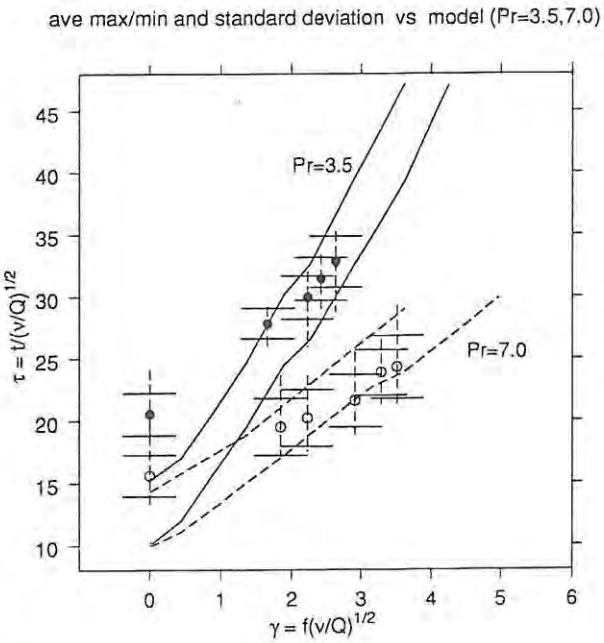

Figure 2: Laboratory and theoretical determinations of instability time τ versus $f(\nu/Q)^{1/3}$ for Pr = 3.5 and 7.0. The $R = 20$ and $R = 2$ lines are drawn for the numerical model. For the lab data, the dots are the average values, the horizontal lines the standard deviations, and the vertical lines the range of values.

and the $R=20$ and $R=2$ lines from the model. The plot shows that the lab experiments and theory are acceptably similar. We note that the model underestimates τ for small γ, and tends to overestimate it for large γ. Possible reasons for these discrepancies are: (1) the model assumed that the viscosity was constant while for the lab experiments ν is a decreasing function of temperature. (The dependency is stronger at 20°C than at 50°C); (2) the laboratory experiments rely on random perturbations to excite the instability, and it is likely, due to imbalances in the rotating platform, that the noise in the system increases as the rotation rate increases. It was found that reperturbing the numerical model periodically decreased the instability time.

4. Summary

In this note we have considered the onset of convection in a homogeneous rotating semi-infinite fluid, from both a mathematical and experimental point of view. Mathematically, we regard this problem as an instability, about a motionless basic state, of a fluid with a time-dependent mean density field. Results from the numerical model show that the non-dimensional instability time, $t/(\nu/Q)^{\frac{1}{3}}$, is an increasing function of $\gamma = f/(\nu/Q)^{\frac{1}{3}}$ whose slope increases as the Prandtl number decreases. The ocean, with $\gamma \sim 0.1$, acts as a non-rotating fluid for the onset problem. A typical dimensional value for the time of instability would be ~2-4 hours. From the model this implies that the initial tendrils would carry a density deficit of about 0.013-0.002 kg m^{-3}, with a boundary layer depth of ~ 50-75 m, and the horizontal spacing of ~200-300 m.

Laboratory experiments were performed for two Prandtl numbers by using pure water at two different temperatures. The laboratory experiments confirmed the numerical predictions, although obvious discrepancies exist. We noted that the temperature dependence of viscosity might be responsible for deviations from theory and that a general increase in noise as the rotation rate increased could also have played a role.

REFERENCES

Brickman, D., and D.E. Kelley, Onset of convection in a rotating fluid: scales and patterns of motion, *Dynamics of Atmospheres and Oceans*, in press, 1993.

Leaman, K.D., and F.A. Schott, Hydrographic structure of the convection regime in the Gulf of Lions: winter 1987, *J. Phys. Oceanogr.*, **21**, 575-598, 1991.

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Second announcement and call for papers

HAZARDS '93
29 Aug.-3rd Sept., 1993
QINGDAO, CHINA

BACKGROUND: This international symposium is the fifth in the continuing interdisciplinary series begun in 1982, with the first being held in Honolulu, USA. The second one was held in Rimouski, Canada in 1986, the third in Ensenada, Mexico during 1988, and the fourth meeting was held in August 1991 in Perugia, Italy. The objectives of this series of symposia on natural and man-made hazards are to promote the advancement of hazard sciences, to perceive and explore those aspects that may be similar among some of the various hazards, to review the newest developments in a few selected fields, and also to outline new directions for future research.

HAZARDS – 93 The United Nations declared the 1990s as the International Decade for Natural Disaster Reduction (IDNDR). Its objective is to prevent or mitigate natural disasters and the loss of life, property damage, and socio-economic disruption produced worldwide. The 1990s is also a time when for many countries coping with disasters is becoming synonymous with development. The cost of rehabilitation and reconstruction in the wake of disasters is consuming available capital, significantly reducing the resources for new investment. Tackling this problem requires a sound evaluation of disaster mitigation policies and tools.

The theme for HAZARDS – 93 is **DISASTER MITIGATION: SCIENTIFIC AND SOCIO-ECONOMIC ASPECTS.** The organizing committee welcomes papers on all aspects of natural and man-made disasters, but priority will be given to those emphasizing the mitigation aspects. The global impact of disasters is on the increase as can be seen from the recent storm surge impact in Bangladesh in April-May 1991, the heavy rain and flood disasters in China in May-July, 1991 and the impact of the Mount Pinatubo volcano in the Philippines, hurricane Andrew and typhoon Iniki in the United States of America in 1992. It is felt that it is time to develop ways and means of mitigating disasters and not just to do the basic science of understanding these.

All those interested in natural and man-made hazards and their mitigation will not only find much value in the formal sessions, but will also have a unique opportunity to confer personally with eminent researchers and policy makers in this important field. The Organizing Committee invites all scientists, engineers and policy makers and others involved in natural and technological hazards to participate actively in HAZARDS-93.

SPONSORSHIP The International Society for the Prevention and Mitigation of Natural Hazards (NHS), the IAPSO Commission on Natural Marine Hazards, the Research Committee of Natural Disasters of the Chinese Academy of Sciences (CAS) and the Institute of Oceanology of CAS are the principal scientific organizations sponsoring HAZARDS-93.

SUBMISSION OF ABSTRACTS Authors are invited to submit abstracts of 250-500 words (not to exceed one typed page). Original and two copies of the abstracts should be sent to the chairman of the Scientific Committee (Dr. T.S. Murty) **before** March 15, 1993.

SCIENTIFIC PROGRAM Under the umbrella of HAZARDS – 93 several symposia and workshops will be held, dealing with all aspects of natural and technological disasters, with particular emphasis on the mitigation aspects and preventive measures. Keynote speakers, special invited lectures and contributed papers on current practices and research activities will be grouped into the following themes:

- Geological hazards (earthquakes, volcanoes, landslides, snow avalanches, soil erosion)
- Meteorological hazards (cyclones, droughts, desertification, forest fire, etc.
- Hydrological and marine hazards (tsunamis, storm surges, floods, sea-level rise, ice, icebergs, and marine biological hazards)
- Technological and man-made hazards (air and water pollution, deforestation)
- Disaster prevention, mitigation and management
- Economic, social and political aspects
- Tools and techniques for disaster assessments
- Public education and preparedness
- Risk assessment problems
- The IDNDR: a perfect chance to put hazard research into practice

These themes will be organized into formal sessions for the symposium and will be described in detail in the final program. Each session will commence with a keynote address by an invited eminent scientist, to review the state of knowledge and set the stage for the contributed presentations which will be limited to 20 minutes, including the question period. Authors preferring to offer a poster presentation are requested to write to the Chairman of the Scientific Committee. The plenary session, planned for September 3, will focus on practical responses to natural and man-made hazards, the identification of preferred lines of investigation, and actions required to improve measures of hazard mitigation.

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Canadian GLOBEC Planning Workshop

Canada is starting to develop a national Global Ocean Ecosystems Dynamics (GLOBEC) research program. Over the next decade, GLOBEC will be a worldwide focus for research on global environmental change and its effects on marine ecosystems. An international "umbrella" organization has been endorsed by international bodies such as SCOR, IOC and ICES. Formal national programs exist or are being developed in a number of nations. A workshop to plan Canadian GLOBEC activities will be held 5-7 June in Fredericton NB immediately prior to the 8-11 June Canadian Meteorology and Oceanography Society (CMOS) Annual Congress. Broad represention from the Canadian marine science community is sought for this workshop.

How will GLOBEC differ from other major "global change" research initiatives? The emphasis of GLOBEC will be on response of marine ecosystems to climate variability, rather than the cause and magnitude of physical climate change (WOCE) or biological feedback via CO_2 and other geochemical cycles (JGOFS). The emphasis will also be mostly on **animal populations** (including harvested species and their major food sources). Both modern and paleoceanographic time series show that marine populations are highly variable, and suggest strong coupling of this variability to changes in their physical environment. **Physical-biological linkages** may be stressed by acceleration of climate change due to human activities; at the same time **new observation and analysis methods** should allow much better resolution of critical processes.

For further information, contact the interim GLOBEC co-chairs:

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Employment wanted

Acoustical oceanographer with engineering background. Experience with underwater instrumentation, signal processing and data analysis. Interest in fisheries acoustics, boundary layer processes and Arctic oceanography. Looking for employment or post-doctoral position in related fields. Currently completing Ph.D. under the supervision of Dr. David Farmer at the Institute of Ocean Sciences, Sidney, British Columbia. Available May 1993.

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Emploi désiré

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ATMOSPHERE-OCEAN

as of 20th Jan/en date de jan 20

ACCREDITED CONSULTANTS/EXPERTS-CONSEIL ACCREDITES

Entries on the following pages are restricted to CMOS Accredited Consultants. The accreditation process started in December, 1986. A complete list of CMOS accredited consultants can be obtained from the CMOS Business Office. Individuals interested in applying for accreditation may contact the CMOS Business Office at the Society's Newmarket address for a copy of the guidelines, and an application form.

As set out in the document, "CMOS Guidelines for Accreditation", the criteria are:

(1) The applicant must possess an appropriate undergraduate degree from a recognized university.

(2) The applicant must possess at least one of the following types of specialised training:

   (i) post-graduate degree from a recognised university in meteorology or oceanography.

   (ii) post-graduate degree from a recognised university in the natural or applied sciences or mathematics specializing in one or more branches of meteorology or oceanography; or

   (iii) three years of on-the-job meteorological or oceanographic experience.

3) Upon completion of the above educational and training requirements, the applicant must have spent at least two years of satisfactory performance at the working level in the field of specialisation included in this document. This should include at least some consulting experience.

La présent section est réservée aux experts-conseils accrédités de la SCMO. Le processus d'accréditation a débuté en décembre 1986. Une liste complète des experts-conseils accrédités de la SCMO peut être obtenue au bureau d'affaires de cette dernière. Les personnes désirant l'accréditation doivent entrer en contact avec la Société à son bureau de Newmarket afin de recevoir une copie de règlements et un formulaire d'application.

Comme il est indiqué dans le document intitulé "Règlements de la SCMO pour l'accréditation", les critères d'adhésion sont:

(1) L'applicant doit posséder un diplôme universitaire de premier cycle approprié d'une institution reconnue.

(2) L'applicant doit posséder au moins un des types suivants de formation spécialisée.

   (i) diplôme de deuxième ou troisième cycle en météorologie ou océanographie d'une universitaire reconnue;

   (ii) diplôme de deuxième ou troisième cycle en sciences naturelles ou appliquées ou en mathématiques avec spécialisation dans une ou plusieurs branches de la météorologie ou de l'océanographie d'une université reconnue; ou

   (iii) trois années d'expérience sur le marché du travail en météorologie ou en océanographie.

(3) En plus des exigences d'éducation et de formation, l'applicant doit posséder au moins deux années d'expérience sur le marché de travail, avec un rendement satisfaisant, dans le champ de spécialisation mentionné dans le document. De l'expérience en tant qu'expert-conseil est nécessaire.

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ACCREDITED CONSULTANTS/EXPERTS-CONSEILS ACCREDITES

1992 MEMBERSHIP APPLICATION FORM-DEMANDE D'ADHESION 1992

(Please print in block letters - Ecrire en lettres moulées s.v.p.)

Title: Dr___ Mr___ Mrs___ Miss___ Ms___
Titre: M.___ Mme___ Mlle___

Name/Nom _____

Address/Adresse _____

_____

_____

_____

Telephone/Téléphone res./maison _____ bus./travail _____

Occupation/Emploi _____

For records only: if student, please indicate institution and year studies will be completed.

Pour dossiers seulement: l'étudiant(e) doit inscrire le nom de son institution et l'année où il (elle) finira ses études.

MEMBERSHIP CATEGORY-CATEGORIE DE MEMBRE
ANNUAL FEES - COTISATION ANNUELLE
(Please check one - cochez une case s.v.p.)

Regular Régulier	☐	$40.00/40,00$
Student Étudiant	☐	$20.00/20,00$
Retired Retraité	☐	$25.00/25,00$
Sustaining De soutien	☐	$150.00/150,00$ (minimum)
Corporate Moral	☐	$200.00/200,00$ (minimum)

PUBLICATION SUBSCRIPTIONS - ABONNEMENT AUX PERIODIQUES

ANNUAL RATES - FRAIS D'ABONNEMENT ANNUEL

		Members Membres	Non-members Non-membres	Institutions Institutions
ATMOSPHERE-OCEAN ATMOSPHERE-OCEAN	☐	$25.00 25,00$	$35.00 35,00$	$65.00 65,00$
Climatological Bulletin Bulletin climatologique	☐	$15.00 15,00$	$20.00 20,00$	$25.00 25,00$
Annual Congress Program and Abstracts Programme et résumés du congrès annuel	☐	$ 0.00 0,00$	$15.00 15,00$	$15.00 15,00$

NOTE: Students receive one society publication in their annual fee and must indicate free publication desired. All regular Society publications are sent to Corporate and Sustaining Members. Members resident in Canada please add 7% GST to annual rates

NOTE: Les membres étudiants reçoivent une publication gratuite de la SCMO et doivent indiquer celle désirée. Tous les périodiques réguliers de la Société sont envoyés aux membres moraux et de soutien. Les membres résidant au Canada doivent ajouter 7% (TPS) aux frais d'abonnement annuel.

PRIMARY FIELD OF INTEREST - SPHERE D'INTERET PRINCIPALE

Meteorology / Météorologie ☐ Oceanography / Océanographie ☐

SPECIAL INTEREST GROUP - GROUPE D'INTERET SPECIAL

(Indicate group if interested - Indiquez si vous avez des intérêts dans un de ces groupes.)

Hydrology / Hydrologie ☐
Air pollution / Pollution de l'air ☐
Agriculture and Forest / Agriculture et foresterie ☐
Operational Meteorology / Météorologie d'exploitation ☐
Floating Ice / Glaces flottantes ☐
Mesoscale Meteorology / Météorologie à la mésoéchelle ☐
Fisheries Oceanography / Océanographie des pêches ☐
Other (specify) / Autre (spécifiez)_____ ☐

See over/voir au verso

CMOS-SCMO
P.O.Box/C.P. 334
Newmarket, Ontario
L3Y 4X7
Canada

Please enroll me as a member of the Society. I attach a cheque for $_____ payable to the Canadian Meteorological and Oceanographic Society for membership fee and/or publication subscriptions. I also include a tax-deductible donation of $_____ for (indicate):

☐ The Society's Development Fund

☐ Other (specify) _____

_____ _____
(Signature) (Date)

If applying for student membership, please obtain signature of one of your professors.

_____ _____
(Signature) (Date)

Mail completed form to CMOS at the address above.

Je désire devenir membre de la Société. J'inclus un chèque au montant de $ _____ payable à la Société canadienne de météorologie et d'océanographie pour la cotisation de membre et/ou les frais d'abonnement aux périodiques. J'inclus aussi un don déductible d'impôts de $ _____ pour (indiquez):

☐ Le fonds de développement de la Société

☐ Autre (spécifiez) _____

_____ _____
(Signature) (Date)

Si vous désirez devenir membre étudiant, veuillez SVP obtenir la signature d'un de vos professeurs.

_____ _____
(Signature) (Date)

Faire parvenir la demande d'adhésion complétée à la SCMO à l'addresse ci-dessus.
