



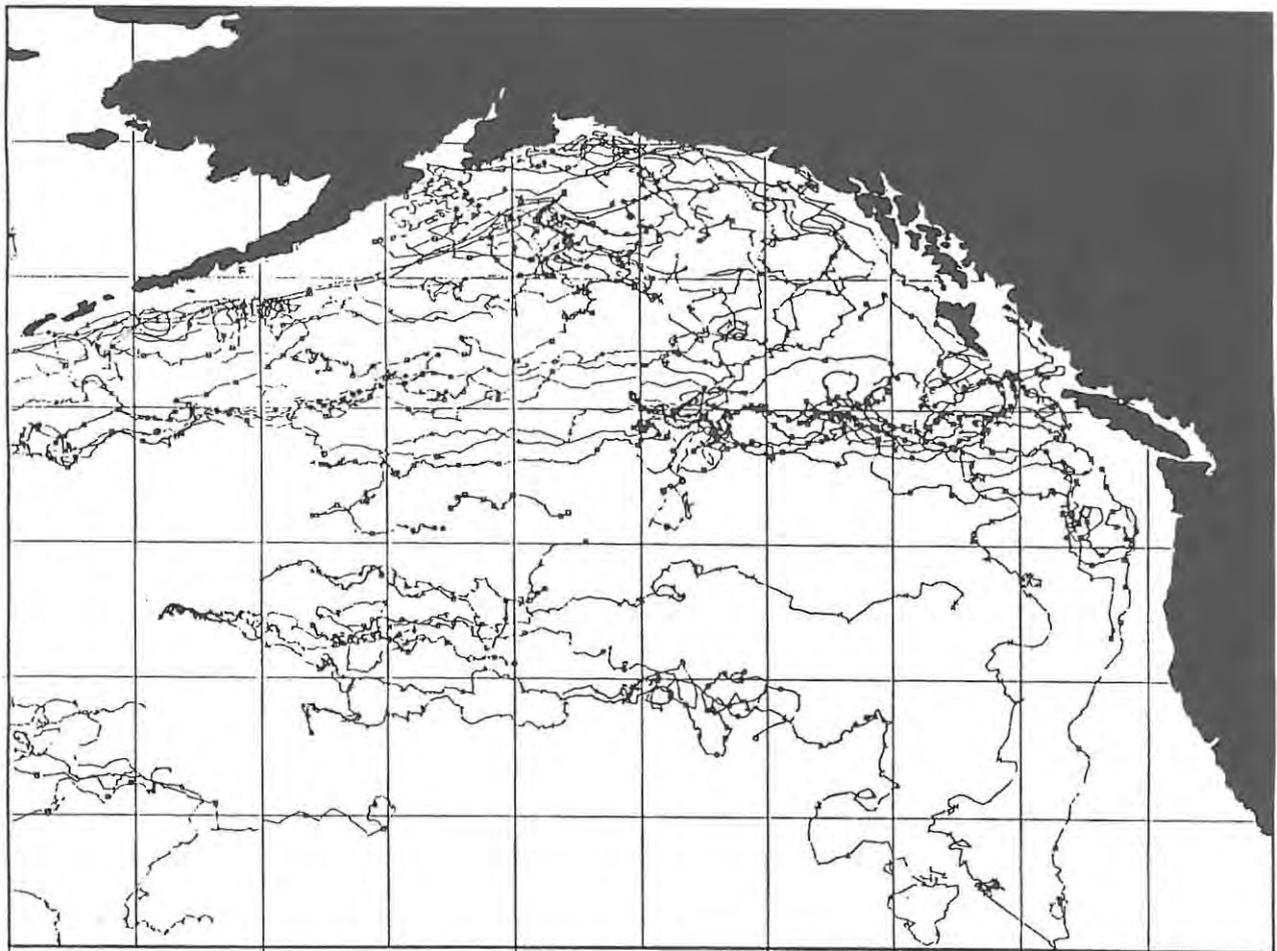
Canadian Meteorological  
and Oceanographic  
Society

La Société canadienne  
de météorologie et  
d'océanographie

# C.M.O.S. NEWSLETTER/NOUVELLES S.C.M.O.

JUNE/JUIN 1993 VOL. 21 NO. 3

## *WOCE Surface Drifters*



Trajectories of surface drifters deployed by the Canadian WOCE Surface Velocity Program in the northeast Pacific: August 1990 to February 1993. See article by Paul LeBlond, Rick Thomson and David Krauel in WOCE News section, page 7.

## EDITOR'S COLUMN

The next issue of the CMOS Newsletter 21(4), August 1993, will go to press on July 20th, 1993. 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 any DOS format (i.e. Word Perfect, flat ASCII, MS Word etc), 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. If you send a file over the network, send a copy to yourself and examine the transmitted copy to check that it is all there.

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

### WHAT'S GOING AROUND? by Savonius Rotor

Savonius Rotor was unable to contribute this month, however, a colleague has contributed some comments on the 1992/93 CMOS/AES/DFO Tour Speaker which are reproduced here.

Dear Jim:

I hope that you survived the rigours of the twice-cross-Canada CMOS speaking tour, and that your many hours aloft have not left you with a strange urge to eat all your meals from tiny plastic trays with your elbows pressed firmly to your ribs.

During your talk here in St. John's you mentioned a storm this past winter off the coast of B.C. which produced a 26 m wave... "nearly a world record", I believe you said. This assertion tweaked my memory at the time, but it swiftly was lost amidst a plethora of possibilities which were raised by your talk on satellite remote sensing. For instance, will I soon be able to learn, in near-real time, if my friends are having a barbecue, whether or not they want to invite me?

Today I opened the April 1993 issue of the CMOS Newsletter, and there, in bold (some would say brazen), type was my reminder: "BC Wave is nearly a world record". Phah. You crowd are so **excitable** out there.

Anyway, it sent me scurrying off to consult the proceedings of the Third International Workshop on Wave Hindcasting and

Forecasting, held last May in Montréal. A supplement to those proceedings described the so-called "Hallowe'en Storm" of 1991 off the east coast of North America. I have attached a copy of Figure 9 from a paper by Donald Cameron and George Parkes of the Maritimes Weather centre which describes conditions at buoy #44137, located some 230 nm southeast of Nova Scotia, during that event. You should notice two things immediately:

- The maximum wave height recorded was slightly over 30 m (30.7 m, or 100.7 feet, to be exact)
- The anemometer survived the event.

As a newfoundlander it pains me to put in a plug for the Nova Scotians, but this Lotus Land effrontery is a bit too much. I now recognize the whole sorry tale for what it is - a transparent attempt to finagle an invitation to the Guinness Brewery in Dublin. I'll wager if it were the "Mazola Corn Oil Book of Records" you never would have bothered.

We'll have a pint for you

Best regards,

Bottom Circulation

### AES/DFO/CMOS Lecture Tour 1992/93 Tour Report

The jointly sponsored AES/DFO/CMOS Lecture Tour has been carried out since 1969. It consists of a presentation on a leading research topic, or recent advances in meteorology or oceanography. The tour, given in all 13 CMOS Chapters and Centres across Canada in either official language, serves as a valuable vehicle for increasing awareness of meteorology or oceanography issues, advances and opportunities. It also permits the fruitful exchange of ideas between government, academic and private sectors involved in these fields. Last, but not least, the lecture tour speaker is often a major social event at the centre visited.

Our 1993 lecture tour speaker was Jim Gower, of the DFO Institute of Ocean Sciences. His topic of "Satellite Images; after thirty years of satellites: time for wider participation?" was most successful for a wide range of audiences. The talk surveyed present and future applications of satellites in oceanography and meteorology; and highlighted the opportunities for various groups to become more involved in this field. Almost 500 persons attended his talks; a broad cross section ranging from scientists to interested lay people. The presentation was well organized, impressively delivered, and accompanied by a large array of "gee-whiz" visuals.

Chapter/Centre hosts of future tour speakers please note: Jim kept an accurate head count, and noted a high correlation between numbers and food. He concluded that maximum attendance occurs at the lunch or dinner talks, but wine and cheese is almost as effective.

The tour speaker for 1993/94 is planned to provide a lead for the 1994 Annual CMOS Congress in Ottawa. The latter's theme is "Science: Addressing the Issues". Suggested relevant topics for the speaker include UV/Ozone issue, and climate variability and/or change. Nominations can be phoned to the corresponding secretary, Doug Bancroft, at (604)-363-2958, faxed to (604)-363-2132, or Emailed to bancroftd@ios.bc.ca.

## NEWS FROM CMOS EXECUTIVE AND COUNCIL

By the time this issue of the Newsletter appears, the Fredericton Congress either will be just about to take place or will just have taken place. The Executive has co-operated with Dave Daugharty of the University of New Brunswick, the Chair of the Local Arrangements Committee, who, with his committee, has worked hard to ensure the success of the Congress, including arrangements for the attendance of a number of students to be sponsored by the Society. Similar co-operation is taking place with Sheila Bourque, the Chair of the 3rd International Conference on School and Popular Education in Meteorology and Oceanography, which is a CMOS meeting and will be held at the Ontario Science Centre in Toronto on July 14-18 this year. CMOS will sponsor the attendance of a number of teachers for whom this conference is mainly intended.

Comments on the CMOS Strategic Plan, a draft of which was disseminated via the Newsletter, keep coming in, and the Executive studies them with interest. Relevant proposals are being prepared for the forthcoming Council and Annual General Meetings.

The Executive was happy to hear that the lectures given by Jim Gower, this year's AES/DFO/CMOS Tour Speaker, were very well received. Thank you Jim!

Various activities of the Scientific Committee were reviewed, including a draft position statement on natural hazards. The question of to whom such statements are addressed (i.e., the CMOS membership and/or the government, public-at-large, etc.) is under discussion. Comments would be welcomed.

The Scientific and Education Committees have been representing CMOS in an AES review of meteorological training and education. Hopefully this review will lead to a more stable situation and more opportunities for graduates of meteorology programs in Canada.

The final report of Gerard Neault, the Chair of the OPMET SIG, on the Whistler OPMET Workshop (September 1992) was received, and Gerard was thanked for organizing a very successful workshop, the fourth of its kind. The fifth will be held in 1994 and the Council will have to decide soon on its location.

## Nouvelles de l'Exécutif et du Conseil de la SCMO

Lorsque ce numéro de "Nouvelles" paraîtra, le congrès de Frédéricton sera sur le point de débiter ou sera terminé. L'Exécutif a collaboré avec Dave Daugharty de l'Université du Nouveau Brunswick, le président du Comité local d'organisation, qui, avec l'aide de son comité, a travaillé fort pour assurer le succès du congrès tout en s'assurant de la participation d'un grand nombre d'étudiants qui ont été subventionnés par la Société. On assiste présentement à une collaboration similaire avec Sheila Bourque, présidente de la 3ième Conférence internationale portant sur l'enseignement et l'éducation populaire de la météorologie et de l'océanographie, qui est une réunion de la SCMO et qui doit avoir lieu au Centre des sciences de Toronto, du 14 au 18 juillet 1993. La SCMO parraine la participation d'un nombre d'enseignants qui sont directement intéressés par cette conférence.

Les commentaires sur le plan stratégique de la SCMO dont l'ébauche fut distribuée par l'entremise de "Nouvelles" continuent de nous parvenir. L'Exécutif les étudie avec intérêt. Des propositions pertinentes sont présentement préparées pour les réunions du Conseil et la réunion générale annuelle qui doivent avoir lieu sous peu.

L'Exécutif fut très heureux d'apprendre que les conférences données par Jim Gower, le conférencier en tournée de l'année pour le SEA, MPO, SCMO, ont été très appréciées. Merci, Jim!

Les différentes activités du Comité scientifique ont été révisées incluant l'énoncé de principe sur les hasards naturels. La question qui est maintenant débattue est celle de savoir à qui s'adresse cet énoncé de principe, (aux membres de la SCMO et/ou au gouvernement, au public en général). Vos commentaires seront les bienvenus.

Les comités scientifiques et d'éducation ont représenté la SCMO lors d'une révision des programmes d'éducation et de formation en météorologie. Il est à souhaiter que cette révision mène vers une situation plus stable et donnera plus d'opportunités pour les gradués des programmes en météorologie au Canada.

Le rapport final de Gerard Neault, le président du groupe d'intérêt spécial (GIS) OPMET (météorologie opérationnelle), de l'atelier de travail tenu à Whistler sur la météorologie opérationnelle a été reçu. Gerard a été remercié pour l'organisation d'un atelier de travail fructueux, le quatrième du genre. Le cinquième atelier se tiendra en 1994 et le Conseil devra bientôt décider de l'endroit où il se tiendra.

### New CMOS Members

The following new members were approved at the CMOS Executive meeting 26th March, 1993:

Joe Curtis	Anchorage, AK	regular
Ray Garnett	Winnipeg, MB	regular
Doug Hagen	Shaunavon, SK	regular
Ray Keller	Sakatoon, SK	regular
Jack Littlepage	Victoria, BC	regular
Réjean Michaud	Victoria, BC	régulier
Sarah Pryor	Vancouver, BC	regular
Jennifer Shore	Vancouver, BC	student
Catherine White	Winnipeg, MB	regular
Doug Yelland	Victoria, BC	regular

The following new members were approved at the CMOS Executive meeting 26th April, 1993:

Darin Borgel	Halifax, NS	regular
Bridget Dawson	Halifax, NS	regular
Steven Milhaly	Vancouver, BC	student
Greg Unrau	Vancouver, BC	student
Stewart Cober	Scarborough, On	regular

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.

**28th Annual CMOS Congress  
Ottawa, Ontario  
May 30 to June 3, 1994**

**Theme -- "Science: addressing the issues"**

**Scientific Program  
Committee**

**Local Arrangements  
Committee**

Geoff Holland  
(613)-990-0298  
(613)-990-5510

Chair  
Telephone  
Fax.

Mike Hawkes  
(613)-996-3661  
(613)-995-4197

Please contact the Local Arrangements Committee regarding general enquiries and the Scientific Program Committee for special workshops etc. Exhibitors, please contact John Falkingham at (613)-996-4552 to reserve your prime floor space.

Enter the Ottawa Congress on your agenda, now. Abstracts must be submitted before January 31st, 1994.

---

**28ième Congrès annuel de la SCMO  
Ottawa, Ontario  
Mai 30 à Juin 3, 1994**

**Thème -- "Les sciences: des solutions aux problèmes"**

**Comité du Programme  
scientifique**

**Comité local  
d'organisation**

Geoff Holland  
(613)-990-0298  
(613)-990-5510

Président  
Téléphone  
Télécopieur

Mike Hawkes  
(613)-996-3661  
(613)-995-4197

Prière de contacter le Comité local d'organisation pour les renseignements d'ordre général et le Comité scientifique pour les sessions spéciales et les ateliers de travail, etc. Pour les exhibits, contactez John Falkingham à (613)-996-4552 pour réserver votre place de choix d'exposition.

Inscrivez dès aujourd'hui le congrès d'Ottawa à votre agenda. Les résumés doivent être soumis avant le 31 Janvier, 1994.

## North Pacific Marine Science Organization (PICES)

**Establishment:** The Convention came into force on 24 March 1992. Contracting Parties are Canada, China, Japan, and the United States. Russia has been a party to the negotiations and is expected to join soon. The Convention is open to accession of other countries.

**Scope and purposes:** The Organization is concerned with marine scientific research in the North Pacific ocean and adjacent seas, especially north of 30 degrees North. Its purposes are:

"(a) to promote and coordinate marine scientific research in order to advance scientific knowledge of the area concerned and of its living resources, including but not necessarily limited to research with respect to the ocean environment and its interactions with land and atmosphere, its role in and response to global weather and climate change, its flora, fauna, and ecosystems, its uses and resources, and impacts upon it from human activities, and

(b) to promote the collection and exchange of information and data related to marine scientific research in the area concerned."

**Scientific focus:** What is the nature of the subarctic Pacific ecosystem (or ecosystems), and how is it affected over periods of months to centuries by changes in the physical environment, by interactions among components of the ecosystem, and by human activities?

**Delegates, Officers and Secretariat:** Each Contracting Party designates two delegates. PICES is chaired by Dr. Warren S. Wooster, USA; a Vice-chairman is to be elected. The Executive Secretary is Dr. W. D. McKone of Canada; the Assistant Secretary is Dr. Motoyasu Miyata of Japan. The Secretariat is located at the Institute of Ocean Sciences in Sidney, British Columbia.

**Meetings:** The First Annual Meeting took place in Victoria, B.C. on October 12-17, 1992 (First Annual Report available upon request). The Second Annual Meeting will be in Seattle on October 25-30, 1993. It will include sessions on ocean circulation and climate variability in the subarctic Pacific, high resolution paleoecological studies, priority chemical and biological contaminants in the North Pacific ecosystem, shifts in fish abundance and species dominance in coastal seas, and long-term monitoring from platforms of opportunity.

**Science Board and Committees:** The principal scientific body is the Science Board, chaired by Dr. D. Ware of Canada. There are four scientific committees, as follows (with chair):

1. Biological Oceanography (M.Mullin, USA)
2. Fishery Science (Q.Tang, China)
3. Marine Environmental Quality (J.Zhou, China)
4. Physical Oceanography and Climate (Y.Nagata, Japan)

**Working Groups:** The following Working Groups (with chair) were established at the First Annual Meeting:

1. Okhotsk Sea and Oyashio Region (L.Talley, USA)
2. Development of common assessment methodology for marine pollution (R.Addison, Canada; M.Zhou, China)
3. Dynamics of small pelagics in coastal ecosystems (T.Wada, Japan; J.Hunter, USA)
4. Data collection and quality control (D.Yang, China; S.McKinnell, Canada)
5. Bering Sea (R.Francis, USA)
6. Subarctic gyre (T.Sugimoto, Japan; B.Hargreaves, Canada).

## PICES 2nd Annual Meeting 2nd Announcement and Call for Papers

**PROGRAM** The program is being organized by the Science Board and contains the following topics.

### 1. Ocean circulation and climate variability in the subarctic Pacific (POC) Convenor: P. LeBlond, Canada

This session will focus on formation of subarctic intermediate water, absorption of CO<sub>2</sub> and its circulation in the subarctic, status of numerical modelling, long-term variation in the water properties and circulation, and the characteristics of the subarctic gyre and their impact on climate.

### 2. High resolution paleoecological studies in the subarctic Pacific (BIO) Convenor: M. Mullin, USA

This session will consider studies of foraminifera and fish-scales in fish sediments, isotope analysis, tree rings, and other proxy techniques to reconstruct ocean conditions, species dominance, and biological productivity in the North Pacific over the last millennium.

### 3. Priority chemical and biological contaminants in the North Pacific ecosystem (MEQ) Convenor Usha Varanasi, USA.

The session will address national overviews and new approaches for assessing the source and impacts of sewage discharge, nutrient flux and algal blooms, waste dumping, fisheries and agriculture processing wastes, ballast water contaminants, and anthropogenic chemicals in the North Pacific. Impacts of these contaminants on natural biogeochemical processes and cycling will also be considered.

### 4. Shifts in fish abundance and species dominance in coastal seas (FIS) Convenors Q. Tang, China and A. MacCall, USA

This session will emphasize case histories describing shifts in plankton and fish species dominance in marine ecosystems around the Pacific rim in recent centuries. Studies comparing the timing and magnitude of change in different areas and linkage between dominance shifts and concurrent changes in the ocean climate will also be discussed.

### 5. Long-term monitoring from platforms of opportunity (SB)

Convenor C. Miller, USA. This session will address possibilities for long-term monitoring of physical and biological conditions in the subarctic gyre and North Pacific coastal ecosystems, using satellite remote sensing, X-CTD mapping, drifting buoys, pollution monitoring, collection of trans-Pacific continuous plankton recorder data from ships of opportunity, and other potential monitoring sources, along with associated statistical and data management issues.

Scientific sessions will include invited and contributed papers on these topics as well as contributed papers on other subjects of interest to the committees. Contributed papers will be selected for oral or poster presentation.

**ABSTRACTS:** All interested persons are invited to provide summaries of their papers, not to exceed 250 words, to the PICES Secretariat by 1 July, 1993.

**MAILING ADDRESS:** To have your name included in the SAM mailing list and to obtain further information, please notify the PICES Secretariat at the following:

Institute of Ocean Sciences  
P.O. Box 6000  
Sidney, B.C., Canada, V8L 4B2  
Phone 604-363-6366 FAX 604-363-6827  
(Omnet) PICES.SEC

## CNC-WOCE Workshop

CNC WOCE will be sponsoring a one day workshop on September 16 1993 to coincide with the International WOCE Numerical Experimentation Group and Steering Group on Global Climate Modelling meetings to be held at the Institute of Ocean Sciences, Sidney, B.C.

The goals of the CNC WOCE workshop are to:

- (1) Provide a forum for communication of recent research results with both Canadian and international colleagues;
- (2) Allow for a free exchange of ideas and information aimed at accelerating the progress of the overall Canadian WOCE project;
- (3) Foster mutually beneficial national and international collaborations;
- (4) Provide a forum for the discussion of research areas which are deemed to be of importance to WOCE. Particular attention will be focused on areas which are not currently part of the CNC WOCE commitment to WOCE international.

Participants will present research results in a series of approximately half hour talks during the morning session. An informal format will be adopted to encourage extensive discussion where desirable and presentations will continue after lunch if required. There will then be a general discussion of the present and future status of WOCE Canada.

Full travel and living expenses for project participants will be paid by CNC WOCE to successful applicants. The workshop follows the eighth meeting of the Numerical Experimentation Group and attendance of this meeting is strongly encouraged. Funding for this purpose will also be available through CNC WOCE.

Those interested in attending this workshop are encouraged to send a letter of intent/request to the address below. Students, postdoctoral fellows, and research associates are particularly encouraged to apply. Due to limited resources, preference will be given to researchers presently funded by the NSERC WOCE project. However, neither attendance nor support will be limited to individuals receiving funding from this source.

Further information may be obtained by contacting:

Andrew Weaver  
School of Earth and Ocean Sciences  
University of Victoria  
PO Box 1700 Victoria, BC, V8W 2Y2  
Tel: (604) 721-8848  
Fax: (604) 721-6200  
Email: [weaver@ocean.seaoar.uvic.ca](mailto:weaver@ocean.seaoar.uvic.ca)

## Sea level rise from enhanced greenhouse warming William W. Hsieh

Dept. of Oceanography, Univ. of British Columbia, Vancouver, B.C., Canada V6T 1Z4

A recent 4-month visit to GFDL, Princeton resulted in a joint paper with Dr. Kirk Bryan (Bryan and Hsieh, 1993, submitted to J. Phys. Oceanogr.), where future sea level rise from the ocean's thermal expansion under global warming was studied using a sophisticated coupled GCM and a simple reduced gravity model. Atmospheric carbon dioxide was increased by 1% per year in the coupled model, which showed that the northern North Atlantic and the Southern Ocean to be regions of largest heat flux from the atmosphere to the ocean, and that there was a weakening of the thermohaline circulation. To explain some features of the observed rising sea level distribution from the coupled model, a simple reduced gravity global model with much higher horizontal resolution ( $1/4$  degree) was used to represent the first baroclinic mode

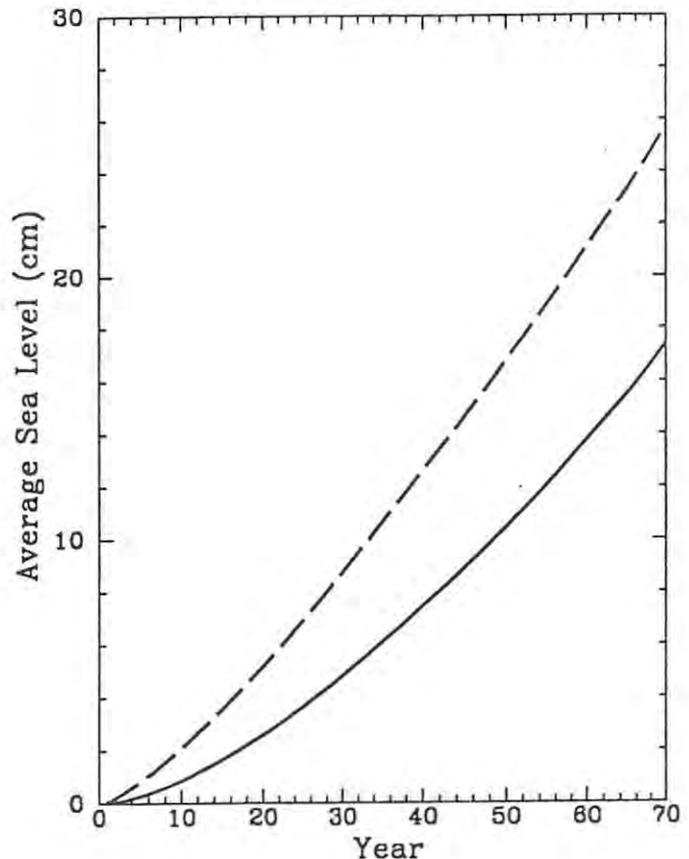


Figure 1 Average global sea level (solid curve) and average global coastal sea level (dashed curve) as a function of time during experiment A (reduced gravity model with heat source in the northern North Atlantic).

# WOCE News (cont.)

response to the source regions in the northern North Atlantic and the Southern Ocean. This modified Rossby adjustment problem with the simple model shed light on the role of coastal and equatorial Kelvin waves and Rossby waves in distributing the excess sea level from the source regions of high heat input.

In experiment A where the source region was in the northern North Atlantic, the excess volume was transferred out of the source region mainly by a coastal current along the east coast of North America, bending eastward at the equator as an equatorial Kelvin wave, which then generated poleward Kelvin waves on the eastern boundary of the Atlantic Ocean. As the Kelvin wave continued around the Cape of Good Hope, the high sea level was transmitted into the Indian Ocean and then into the Pacific. In the Atlantic, westward propagating long Rossby waves originating from the eastern boundary set up poleward interior flow, as well as cross-equatorial western boundary flowing southward along the east coast of South America. In experiment B, where the source region was in the Southern Ocean, the lack of adequate coastal wave guides hindered the transport of excess volume out of the source region.

Coastal sea level was examined as a signature of global sea-level rise. In experiment A, the average coastal sea level was rising much faster than the average global sea level, especially in the early years (Fig.1). In contrast, in experiment B, the average coastal sea level was rising much slower than the average global sea level. These experiments cast doubt on the assumptions that the coastal tide gauges can provide a reasonable estimate of the global sea level rise.

## WOCE Surface Velocity Program

by Paul LeBlond, Rick Thomson and David Krauel

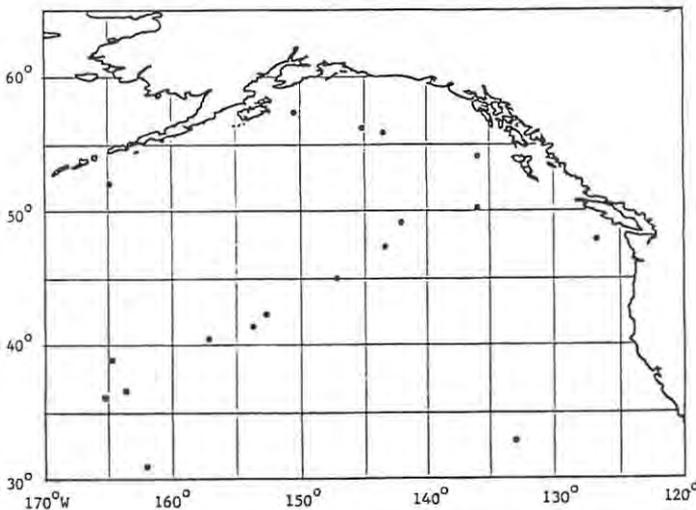


Figure 2: Positions of surface drifters at the end of February 1993.

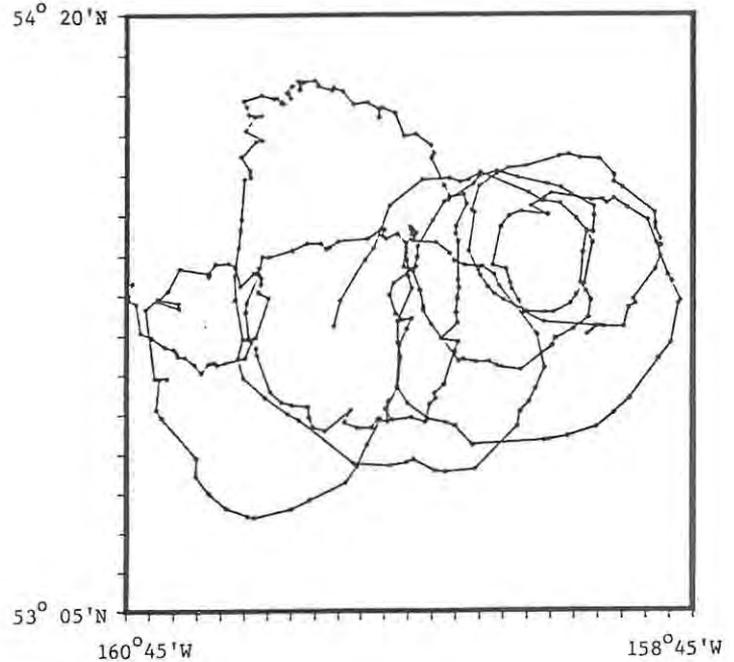


Figure 3: Trajectory of drifter 15362 from 6 Sept. 1992 to 31 Oct. 1992.

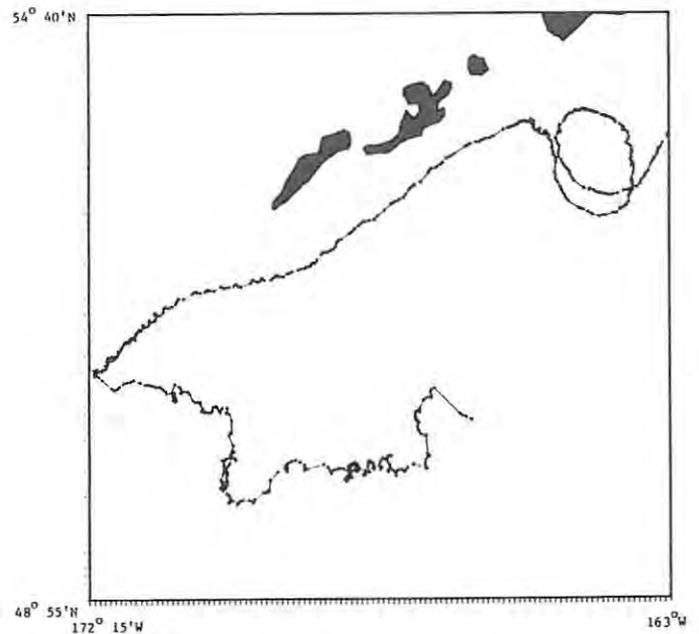


Figure 4: Trajectory of drifter 15366 from 7 Sept. 1992 to 23 Nov. 1992.

During the last year, the Canadian WOCE Surface Velocity Program has arranged for the deployment of two sets of drifters. Thanks to the help of Steve Riser, of the University of Washington, 15 shallow-drogued (at 15m) WOCE-standard

## WOCE News (cont.)

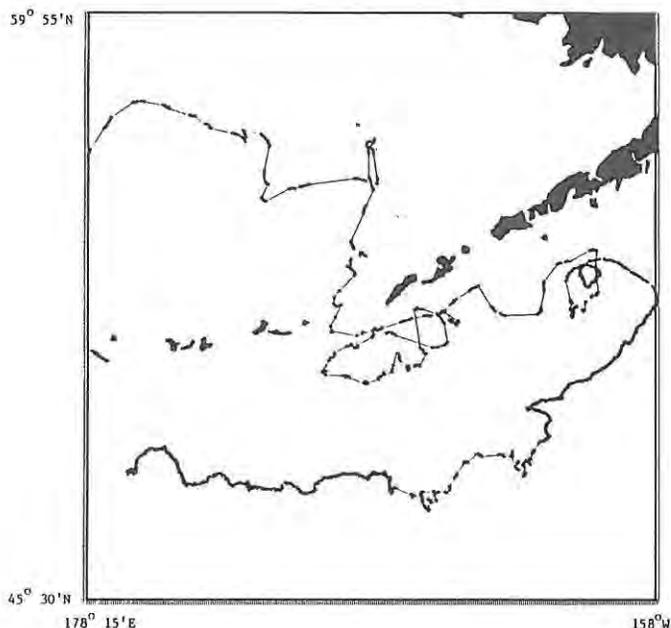


Figure 5: Trajectory of drifter 1471 from 13 Nov. 1991 to 27 Feb. 1993.

drifters, and 8 deep-drogued (at 100m) drifters were deployed in the central North Pacific (40° to 52°N and 137.5°W to 175°E) in June 1992. Six shallow-drogued drifters were deployed from the Miller Freeman in September 1992, thanks to the assistance of Ron Reed of NOAA/PMEL also in Seattle. These latter drifters were deployed along a great circle route from Cape Spencer, Alaska, to Unimak Pass.

Figure 1 (front cover of this issue of the *CMOS Newsletter*) shows trajectories of all shallow drifters to date (since August 1990) in the northeast Pacific. Figure 2 shows coverage at the end of February 1993. Interesting trajectories in the area of the Alaskan Stream include that of shallow drifter 15362 (Figure 3), caught in an energetic eddy (speeds up to 50 cm/s); also that of drifter 15366 (Figure 4), passing twenty days after release from an eddy to the Alaska Stream, which it exits again abruptly at day 47; and finally, that of drifter 1471, launched on 13th Nov. 1991, near the date line (Figure 5), and which joined the Alaska Stream after about 250 days to return westward.

## Agricultural and Forest Meteorology SIG

The Agricultural and Forest Meteorology SIG has been inactive since the 10th Conference on Fire and Forest Meteorology and has not submitted an Annual Report for the past three years. The Council would like to encourage a rejuvenation of this Special Interest Group. Anyone who is willing to assist with the planning and organization of activities for this SIG should make themselves known to the President. Or if you can suggest someone who may be interested, please communicate the name to the President.

If no interest is expressed before September, Council will dissolve the Agricultural and Forest Meteorology SIG in accordance with By-Law 6 a).

## Air Pollution SIG

The Air Pollution SIG has been inactive for a number of years and has not submitted an Annual Report for the past four years. The Council would like to see a rejuvenation of this Special Interest Group if there is interest amongst the membership. Anyone willing to participate in organizing a revival of activities in the Air Pollution SIG, should make themselves known to the President. Or if you can suggest someone who may be interested, please communicate the name to the President.

If no interest is expressed before September, Council will dissolve the Air Pollution SIG in accordance with By-Law 6 a).

## Weather and Health Workshop

The Proceedings of The Weather and Health Workshop held in Ottawa 19-20 November 1992 have been published. The workshop was sponsored by Environment Canada's Atmospheric Environment Service (AES) in collaboration with Health and Welfare Canada (HWC) and the Canadian Meteorological and Oceanographic Society (CMOS). The Workshop objectives were:

- to better understand the health-atmosphere relationship;
- to establish what interests and opportunities exist for health-related weather services in Canada; and
- to develop recommendations for Canadian courses of action.

The workshop included presentations by invited speakers from Canada, the United States and Germany who shed light on the known, suspected and predicted relationships between different states of health and various weather/climate elements. Representatives of several health-care associations presented their views on the workshop theme from their associations' perspectives. In the afternoon of each day, participants were divided into three working groups to discuss specific health-weather issues and develop recommendations.

Single copies of the proceedings may be obtained by writing to:

Mr. A.R. Maarouf Atmospheric Environment Service 4905 Dufferin Street Downsview, Ontario M3H 5T4 Canada

Tel: (416) 739-4540 Fax: (416) 739-4297 Email: [amaarouf@cid.aes.doe.ca](mailto:amaarouf@cid.aes.doe.ca)

## GEWEX UPDATE GEWEX Green Plan funding for 1993/94

Members of the Canadian GEWEX Science Committee met on March 8 and 9, 1993, at the National Hydrology Research Centre in Saskatoon to allocate the GEWEX Green Plan funds for the fiscal year 1993/94. In attendance were Gordon McBean (U. British Columbia; Chairman), Phil Marsh (NHRI, Saskatoon), Wayne Rouse (McMaster U.), E. (Ric) Soulis (U. Waterloo), Ron Stewart (AES, Downsview), Diana Versegny (AES, Downsview), Les Welsh (AES, Saskatoon), and Terry Krauss (Secretariat).

Twenty-eight (28) proposals totalling \$1.05 million were reviewed by the Science Committee. Based on its review of the Science Committee's recommendations, the Management Committee approved the allocation of \$230k to 17 projects. These recommendations were approved at a meeting of the GEWEX Management Committee on March 26, 1993 attended by Rick Lawford (AES, Saskatoon), John Stone (AES, Downsview), T. Milne Dick (NHRI, Saskatoon), Wally Nicholaichuk (NHRI, Saskatoon) and Terry Krauss (Secretariat). The projects are considered to be essential contributions to the national GEWEX science program. The allocation was as follows:

- \$50k for numerical weather prediction/modelling at AES/RPN, Dorval
- \$71k for various hydrological process studies at NHRI, Saskatoon
- \$25k for hydrological modelling at NHRI, Saskatoon
- \$33k for atmospheric hydroclimatological studies at AES, Saskatoon
- \$18k for cloud system studies to be part of BASE at AES, Downsview
- \$10k for precipitation measurement studies at AES, Downsview
- \$3k for remote sensing studies at AES, Downsview
- \$5k for remote sensing studies at Indian and Northern Affairs/Yellowknife
- \$15k for data management and data set acquisition for the GEWEX Secretariat, Saskatoon

---

## GEWEX NSERC Collaborative Special Project Program (CSPP) Application Update

Eighteen proposals have been received from 12 universities and involving >50 researchers to be supported by a Collaborative Special Project Program (CSPP) grant, to be submitted to NSERC later in the year. The level of funding for the university portion of the Canadian GEWEX program is estimated to be between \$3.5 and \$5 million for a three year

program. The proposals have been sent out for external review. The GEWEX Science Committee will meet in Fredericton, N. B. during the CMOS Annual Congress June 7 to 11, 1993 to prioritize the selection of activities to be included in the CSPP grant application.

---

## Professor Vuglinsky Visits Canada

Professor Valery S. Vuglinsky, Deputy Director of the State Hydrological Institute, St. Petersburg, Russia visited the National Hydrology Research Centre in Saskatoon from March 29 to April 1, 1993. From Saskatoon, Prof. Vuglinsky travelled to Montreal to visit with Prof. L. Mysak at McGill University prior to his return to Russia. In addition to giving a seminar, he met with a number of scientists at the NHRC to discuss cold-region hydrometeorological studies. His visit proved to be important in strengthening links between the land component of the WCRP's Arctic Climate System Study (ACSYS) program and the Canadian GEWEX Program. It is anticipated that several important collaborative initiatives will take place as a result of his visit. The trip was funded by the World Meteorological Organization.

---

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

---

## CMOS Members Receive Accolades

Chris Garrett of the department of Physics and the School of Earth and Ocean Sciences, University of Victoria has been elected a Fellow of the Royal Society of London. Chris is a CMOS member and won the President's prize in 1978.

David Farmer, Gordon McBean and Roger Daley have all been elected Fellows of the Royal Society of Canada. All three are past winners of the CMOS President's Prize, Gordon in 1974, Roger in 1981 and David in 1986. Gordon is presently head of the Department of Oceanography, UBC, and the Vice-President of CMOS, David is a research scientist at the Institute of Ocean Sciences, in Sidney. Roger works at AES in Downsview, and recently completed a tour of duty as the editor of Atmosphere-Ocean.

Alan G. Davenport, professor of civil engineering at the University of Western Ontario, is one of three Canadians awarded 1993 Izaak Walton Killam Memorial Prizes for outstanding lifetime contributions in the fields of engineering, health and the natural sciences. Alan was the first recipient of the Dr. Andrew Thomson Prize in Applied Meteorology, in 1967.

Bob W. Stewart was awarded an Honorary Doctor of Science degree at the convocation of the University of Victoria, May 27th. Dr. Stewart is a CMOS member of long standing and received the Tully Medal from CMOS in 1988.

Our sincere congratulations to all of these worthy recipients, their work brings credit to our research community.

---

# CLIMATE RESEARCH NEWS

Please send climate research-related material to Ross Brown, Canadian Climate Centre, Phone: (613) 996-4488, Fax: (613) 943-1539, e-mail: brownr@ncr.dots.doe.ca

## Canadian Climate Research Network

A "Call for Letters of Intent" has been issued by the Climate Research Branch of AES to solicit collaborative participation in the Canadian Climate Research Network (see research notice in this issue). The "Call" was mailed to members of the scientific community who contributed to a series of Network-sponsored workshops held across Canada over the last 18 months, and to Canadian universities. The notice appearing in this issue of CMOS will also appear in *DELTA* and the *DSS R&D Bulletin*. For copies of the "Call" or further information please contact Ross Brown, Network Coordinator, at the numbers shown above ("l'appel" est aussi disponible en français).

## Canadian Arctic Climate Workshop

The following report is an abridged version of a draft workshop report compiled by Anne Walker (AES/CCC) and distributed to workshop participants for comment. For a copy of the complete workshop report, please contact Anne at (416) 739-4357.

**Background:** The Canadian Arctic Climate Workshop was held in Ottawa on December 10-11, 1992, to discuss the current status and future direction of Canadian research on the Arctic climate system and related processes. The workshop was one of a series of meetings held across Canada to define research activities and foster collaboration within the context of the Canadian Climate Research Network. The main focus of the workshop was ocean-atmosphere and land-atmosphere interactions, and a major theme underlying the discussions was the potential contribution of Canadian research to the Arctic Climate System Study (ACSYS) proposed by the World Climate Research Program.

The workshop organizing committee was composed of representatives from the Canadian Climate Centre (J. Stone, A. Walker), Fisheries and Oceans Canada (E. Carmack, P. Jones), and McMaster University (M.-K. Woo). The specific objectives of the Workshop were: (1) to identify the strengths and weaknesses of current arctic climate process research, and to recommend directions and priority areas for future studies in Canada; (2) to help develop Canada's position concerning the development of and participation in ACSYS; and (3) to explore mechanisms for collaborative research on important arctic climate processes.

Over 50 Canadian researchers participated in the Workshop, representing universities, the federal government and the private sector. The workshop comprised of a series of invited scientific overview presentations, followed by discussions in two working groups. Presentations and discussions on Day 1 focused on the scientific issues of: (i) ocean-atmosphere interactions, and (ii) land-atmosphere interactions. On day 2, the focus was on technical issues of (i) data and observations, and (ii) theory and modelling.

**Overview Presentations:** G. McBean (U. of British Columbia) provided an overview of the World Climate Research Program (WCRP) and emphasized the need for ACSYS as a study of processes within a region of coupled atmosphere-ocean-ice-terrestrial components. E. Carmack (IOS/DFO), Canada's representative on the International ACSYS Scientific Steering Committee, presented an overview and progress report on ACSYS, and proposed that Canada should consider offering to host the ACSYS Project Office. A. Clarke (BIO/DFO) provided an overview of Arctic oceanographic processes, with a focus on the issues of deep water formation, and the role of sea ice within the Arctic climate system.

M. Woo (McMaster Univ.) was the first of three speakers to address issues concerning Arctic land-atmosphere interactions. He pointed out a number of unique characteristics of the Arctic terrestrial environment, such as permafrost and extensive snow and ice cover, which need to be better represented in climate models. W. Rouse (McMaster Univ.) focused on the vertical and horizontal exchanges of radiation and energy in the Arctic terrestrial environment, and the inadequacy of the existing surface-based radiation measuring network for studying these exchanges. R. Koerner (GSC/EMR), provided an overview of ice cap research and the relationship of ice caps with the climate of the circumpolar region. He emphasized the importance of time scale when looking at trends, and noted several shortfalls in the empirical temperature and snow accumulation relationships currently used as input to ice cap models.

E. LeDrew (U. of Waterloo) was the first of three speakers to discuss the technical issues related to data acquisition in the Arctic. His presentation focused on the use of remote sensing techniques for addressing Arctic science issues such as understanding seasonal and interannual variability in sea ice extent and concentration, and for verification of GCMs. C. Labine (Campbell Scientific) provided an overview on the use of automatic weather stations to collect land-based measurements. He noted that improvements in power storage and electronics mean that it is now possible to operate stations in extreme environments, such as on ice caps, on a year-round basis. P. Jones (BIO/DFO) presented an overview of oceanographic data collection issues in the Arctic. Icebreakers, such as the *Polarstern*, were noted to provide significant advantages for oceanographic data collection in polar regions.

L. Mysak (McGill Univ.) was the first of two speakers to address issues related to climate modelling in the Arctic. His presentation covered a wide range of material concerned with better understanding of decadal-scale variability in the coupled ice/ocean/atmosphere system. It was recommended that future research focus on mixed layer circulation in the Arctic, possible connections to the North Pacific, and the role of interannual forcing (wind stress, air temperature and runoff). N. McFarlane (CCC), provided an overview of global climate modelling (GCM) activities in the Canadian Climate Centre (CCC). A number of deficiencies were noted in the way the existing model handled sea-ice, and it was indicated that a key thrust of future modelling work is the effective coupling of ocean/atmosphere/ice in the GCM.

# CLIMATE RESEARCH NEWS (Cont.)

**Recommendations:** The workshop included four working group discussions organized around two major themes: (1) What are the research gaps and the priority areas to solve first? and (2) What role should Canada play in ACSYS? The recommendations of the working groups are listed below:

**Ocean-Atmosphere Interaction:** E. Carmack (IOS/DFO) provided a summary of discussions. The main issues raised were: (i) atmospheric forcing (e.g. role of atmospheric chemistry in radiative fluxes and model response, evaluation of regional importance of P-E, improve forcing fields); (ii) ocean circulation (e.g. mapping of circulation patterns, archiving and rescue of historical data, in-situ monitoring on shelves, deep ocean and straits, participation in IABP, shelf ventilation); (iii) freshwater cycle (e.g. improve quality of runoff data, flux divergence estimates from models); (iv) sea ice (e.g. form links with CRYSYS, ice-mixed layer coupling, seasonal variability in ice motion, ice thickness measurements, polynyas); and (v) climate modelling (e.g. time and space scales of observed variability, feedback mechanisms, development of coupling and nesting methods, coupling of Arctic to global ocean, parameterization of ice edge processes). The formation of links with other experiments such as BASE and CRYSYS, and increases in measurement and monitoring activities were identified as priorities.

**Land-Atmosphere Interaction:** A. Taylor (GSC/EMR), presented an overview of discussions. As a guideline for the discussions, the Arctic was defined to comprise the region north of the treeline. The key problems and knowledge gaps identified in order to improve climate models and predictions were: (i) the need to improve radiation measurements over the region; (ii) the need to characterize the hydrology of Arctic river basins in order to improve predictions of freshwater runoff into the Arctic Ocean; (iii) the need to measure glacier accumulation and melt as separate parameters which are more meaningful to GCMs than mass balance; (iv) the need for more information on the spatial and temporal variability of snow extent, depth, water equivalent and albedo; (v) the need for increased mesoscale modelling, especially of the effects of sea breezes which may extend 100 km inland from Arctic coasts; and (vi) the need to know the current state of permafrost and ice content and its influence on the long-term surface energy budget.

**Data and Observations:** B. Goodison (AES/CCC), reported on discussions related to remotely sensed, autostation, and conventional oceanographic data. The main recommendations were: (i) request that AES formally archive autostation data; (ii) carefully assess data needs in relation to scientific problems; (iii) establish a regular network for information and data exchange; (iv) plan for multiple-use observing sites, which should take into account potential overlaps with international programmes such as the Arctic Monitoring and Assessment Program; (v) identify long-term time series of data that exist or could be built upon; (vi) identify data needs and data sets that are important for linking land and ocean studies; and (vii) review existing hydrologic studies on basins as a step toward categorizing Arctic drainage basins for modelling purposes. In order to assess data use and needs throughout the Canadian research community, the group recommended that a survey be designed and circulated as a means of collecting this information. E. LeDrew volunteered to take on the

responsibility of survey design and circulation with help from other members from the working group.

**Theory and Modelling:** K. Moore (U. of Toronto), presented an overview of discussions. The group organized its discussion around the issues of (i) theory and modelling needs, (ii) observations required, and (iii) possible ACSYS-related efforts. Each of these issues was discussed in relation to sea ice, oceans, land and atmosphere modelling. With regard to theory and modelling, the group recommended that modelling efforts be focused on sea ice rheology and growth, snow accumulation and redistribution, the dynamics of ocean flows at shallow/narrow passages, the parameterization of leads and polynyas, incorporation of runoff modelling into GCM's, and parameterization of sub-grid variability of surface moisture. To support these modelling efforts, the group identified the following data and observation requirements: ice thickness transects, ocean boundary conditions (e.g. surface forcing, inflow/outflow), ocean bottom topography, rawinsonde launches during ocean basin transects, enrichment of sparse weather data, and ocean moorings to obtain continuous current records. The potential ACSYS-related research efforts which were identified by the group included: intercomparison of sea ice models; forcing of sea ice models with meteorological data from NWP models; test performance of NWP models in the Arctic; data assimilation studies with NWP models to fill gaps in observations; and, conduct an Arctic modelling effort similar to TOGA using a regional ocean model and global atmospheric model.

**Canada's Role Within ACSYS:** The final discussions of the workshop focused on identifying the potential contributions Canada could make to the international ACSYS program. Based on the discussions held throughout the workshop, it was unanimously agreed that Canadian arctic climate process research has the potential to make an important contribution to the international ACSYS research efforts. A recommendation was therefore made for the establishment of a formal Canadian ACSYS Committee to coordinate Canadian involvement in ACSYS. This recommendation was unanimously supported by all the workshop participants, and J. Stone tasked P. Jones and M. Woo with compiling a draft list of potential members which could be circulated amongst the participants for comment. The second ACSYS issue discussed dealt with the potential for Canada to host the International Secretariat for ACSYS. This would allow Canada to have more input to the science planning process of ACSYS, and it would represent a highly visible Canadian contribution to the WCRP. G. McBean noted that the costs of running the Secretariat office would be in the range of \$150,000 to \$200,000 per year, which Canada would have to bear. He also indicated that an offer from Canada to host the ACSYS Secretariat would be favourably received at the international level. In response to the above discussions, L. Mysak, on behalf of McGill University, and J. Garrett, on behalf of IOS, both announced that their respective institutions would welcome the opportunity to host the ACSYS International Secretariat. B. Bornhold (Royal Society of Canada) suggested that the International Polar Institute being established in Montreal, would also be a suitable host agency. The workshop participants unanimously endorsed the recommendation that the International ACSYS Secretariat be located at a Canadian site and that a formal offer should be put forward to the international organization committee.

# Call for Letters of Intent to Participate in the Development of the Canadian Climate Research Network

The Climate Research Branch of the Atmospheric Environment Service is soliciting letters of intent to participate in the development of the Canadian Climate Research Network. The Network is being established under the Green Plan Global Warming Science Program to stimulate and coordinate research on key physical problems in climate change and variability. In its final form, the Network is envisaged to consist of a series of **collaborative** research groups linked together by high speed communications, with access to supercomputer resources.

The research agenda of the Network reflects the key scientific uncertainties laid out in the 1990 IPCC Scientific Assessment and the 1992 IPCC Supplementary Report, together with recommendations made by Canadian scientists in a series of Network-sponsored workshops held across Canada:

- 1) Oceanic-atmospheric circulation modelling - leading to the development of fully coupled air-sea-ice global climate models.
- 2) Climate variability - leading to an improved understanding of the natural variability of the earth's climate system and improved prospects for detection of the enhanced greenhouse effect.
- 3) Air-sea-ice interaction processes (e.g. fresh water fluxes, transfer of momentum, salt, heat and moisture, oceanic carbon cycling) - leading to greater understanding of atmospheric and oceanic climate interactions, and better parameterizations of processes.
- 4) Land-air interactions (e.g. precipitation, evaporation, terrestrial carbon cycling, ecosystem response) - leading to the development of improved representation of land surface processes in GCMs.
- 5) Clouds and aerosols - leading to improved parameterization of cloud and aerosol-related climate processes.
- 6) Interactive atmospheric chemistry - leading to the inclusion of climate relevant chemicals as active constituents in climate models.
- 7) Regional climate modelling - leading to the development of regional climate models for coupling to GCMs.
- 8) Arctic climate processes - an interdisciplinary theme to focus research on climate processes which are particularly significant for Canada.
- 9) Paleoclimatic modelling - leading to greater understanding of long-term variability in the climate system.

A sum of \$600K has been committed to support Network research in fiscal year 1993/94, and this amount will be increased significantly over the following years. At present, the period of Green Plan Network funding extends to 1996/97.

Information required for the preparation of "Letters of Intent" and on the review process can be obtained from the Network Coordinator, Mr. Ross Brown, at (613) 996-4488, or by e-mail at [brownr@ncr.dots.doe.ca](mailto:brownr@ncr.dots.doe.ca). To be considered in the first round, "Letters of Intent" must be received by the Director of Climate Research, Atmospheric Environment Service, by **June 30th**.

# Appel de lettres d'intention pour participer à la conception du Réseau canadien de recherche climatologique

La Direction de la recherche climatologique du Service de l'environnement atmosphérique sollicite des lettres d'intention pour la participation à la création du Réseau canadien de recherche climatologique. On établit ce réseau en vertu du Programme d'étude scientifique du réchauffement de la planète, rattaché au Plan vert, pour stimuler et coordonner la recherche sur d'importants problèmes physiques du changement et de la variabilité climatologique. Sous sa forme définitive, on considère que le Réseau se compose d'une série de groupes de recherche qui collaborent entre eux, reliés par des communications à haute vitesse et ayant accès aux ressources d'un superordinateur.

Le programme de recherche du Réseau reflète les principales incertitudes scientifiques exposées dans l'évaluation scientifique de 1990 du GIEC et dans le rapport complémentaire de 1992 du GIEC, le tout avec les recommandations formulées par les scientifiques canadiens dans une série d'ateliers parrainés par le Réseau et tenus dans tout le Canada:

- 1) Modélisation de la circulation océanique-atmosphérique - conduisant à la mise au point de modèles climatiques mondiaux à couplage intégral air-mer-glace.
- 2) Variabilité climatique - conduisant à une meilleure compréhension de la variabilité naturelle du système climatique terrestre et à de meilleures perspectives de détection de l'effet de serre renforcé.
- 3) Processus d'interaction air-mer-glace (courant d'eau douce, transfert de moment, sel, chaleur et humidité, cycles océaniques du carbone, etc.) - conduisant à une meilleure compréhension des interactions climatiques de l'atmosphère et de l'océan et à un meilleur établissement des paramètres de processus.
- 4) Interactions terre-air (précipitations, évaporation, cycles terrestres du carbone, réaction des écosystèmes) - conduisant à une meilleure représentation des processus sur terrain ferme dans les MCG.
- 5) Nuages et aérosols - conduisant à un meilleur établissement de paramètres des processus climatiques liés aux aérosols.
- 6) Chimie atmosphérique interactive - conduisant à l'inclusion des produits chimiques touchant le climat comme éléments actifs des modèles climatiques.
- 7) Modélisation climatique régionale - conduisant à l'établissement des modèles climatiques régionaux pour le couplage aux MCG.
- 8) Processus climatiques de l'Arctique - thème interdisciplinaire conçu pour concentrer la recherche sur les processus climatiques d'une importance particulière pour le Canada.
- 9) Modélisation paléoclimatique - conduisant à mieux comprendre la variabilité à long terme du système climatique.

On a engagé 600 000 \$ pour appuyer la recherche du Réseau pendant l'année financière de 1993/1994 et on augmentera beaucoup ce montant au cours des prochaines années. Pour le moment, la période de financement du Réseau du Plan vert s'étend à 1996/1997.

Afin d'obtenir des renseignements pour préparer les "lettres d'intentions" et des renseignements sur le processus d'examen, vous pouvez vous adresser au coordinateur du Réseau, M. Ross Brown, au (613) 996-4488, ou, par courrier électronique, à [brownr@ncr.dots.doe.ca](mailto:brownr@ncr.dots.doe.ca). Seules les "lettres d'intentions" reçues au plus tard le 30 juin par le directeur de la Recherche climatologique du Service de l'environnement atmosphérique seront étudiées à la première étape d'examen.

# Review/Critique

**Review of "El Niño - Historical and Paleoclimatic Aspects of the Southern Oscillation", H.F. Diaz and V. Markgraf, editors, Cambridge University Press, 1992, 476 pp.**

This is a collection of 20 papers (along with an Introduction and concluding Synthesis written by the editors) that grew out of a 1990 workshop on the historical El Niño record. The final product is, however, much more polished than the typical workshop proceedings. The papers were rigorously reviewed and the publisher has used their usual high standards in the physical production. The result is a very readable collection of papers spanning a fascinating interdisciplinary field. The issue of the stability of the Southern Oscillation over long time scales is one that has attracted ever growing interest since Bill Quinn's pioneering 1978 paper on the historical record. This parallels increasing activity in other aspects of climate variability on decadal to century time scales, and has also received impetus from the development of impressive geochemical tools for high resolution paleoclimate studies.

The book is divided into five sections: "ENSO in the Modern Record", "Use of Historical Records in ENSO Reconstructions", "Paleoclimate Reconstructions of ENSO from Tree Ring Records", "Records from Ice Cores and Corals" and "Low Resolution Paleoclimate Reconstruction of ENSO: Marine and Terrestrial Proxy Indicators", although many papers do not fall comfortably into any one of these categories. The first section includes a paper by Diaz and Kiladis reviewing the global atmospheric teleconnections associated with the El Niño and La Niña extremes of the Southern Oscillation. This is a valuable contribution, particularly as the now standard monograph on the Southern Oscillation by George Philander does not devote much attention to remote teleconnections. The first section also includes the only modelling paper in the collection which is by Meehl and Branstator. They ran a low resolution coupled ocean-atmosphere version of the NCAR model for present carbon dioxide levels and for twice present levels. The model spontaneously generates a Southern Oscillation, and the statistical characteristics of this oscillation in the tropics are not significantly changed in the double carbon dioxide case. This conclusion has to be regarded with some caution, however, since (like other low resolution coupled models) the NCAR model produces an unrealistically weak Southern Oscillation. Meehl and Branstator do find a very significant difference in the extratropical response to conditions in the tropical Pacific in the control and double carbon dioxide models. This is largely attributable to the changes in the extratropical mean flow due to the altered carbon dioxide amount. They suggest that the results are a warning to those interpreting historical El Niño data, in that the tropical Southern Oscillation may be relatively stable, but that the extratropical effects may undergo long secular changes associated with global climate change.

The section on historical records begins with an overview by Enfield. His summary makes it clear that there are some periods of the order of 1-2 decades long when the Southern Oscillation is less prominent than normal. A conspicuous example is the period from about 1915 through 1940 which had relatively little El Niño activity (with the exception of the very large 1925-26 El Niño). However, there is little evidence in the record of the last 500 years for any strong changes in

Southern Oscillation on timescales of centuries. Thus, for example, there is no reason to suppose that the Southern Oscillation behaved any differently during the Little Ice Age than in more recent times. The next paper by Quinn is a fascinating attempt to use the history of Nile flooding to extend the chronology of El Niño events back to 622 A.D. The Nile flooding is controlled by the rainfall received in the Ethiopian highlands, and during the mature phase of an El Niño event there is something of a drought in this region (as in most of the tropical western Pacific area). This leads to weaker than normal flooding downstream. Remarkably enough, there is a virtually year-by-year quantitative record of flood levels for the Nile at Cairo extending back at least to the Muslim conquest in 622 A.D. Quinn discusses in detail the many problematic aspects of this data, but he concludes that the Nile flood record can provide a useful indication of El Niño events, and he actually lists a yearly chronology for the period 622-1522 A.D. to supplement his earlier post-1532 data. He finds that the frequency of his inferred El Niño events over most of this record is comparable to that in modern times, except for the period from about 1000-1290 in which the frequency drops markedly. He notes that this period corresponds roughly to the Medieval warm period (or Little Climatic Optimum) identified by many climatologists (mostly using indications from Europe). The implications of the Nile record are also discussed in a separate paper by Anderson.

The last three sections basically deal with various proxy indicators of El Niño activity which are even more indirect than the Nile flood data. Noteworthy here is the paper of Thompson, Mosely-Thompson and Thompson which discusses the use of the oxygen isotope record in tropical and subtropical ice cores, and the paper of Cole, Shen, Fairbanks and Moore on the application of trace metal concentration measurements in the annual "growth rings" of corals.

There are many other interesting papers in this book. Anyone interested in atmosphere-ocean interaction, climate change, geochemistry, environmental effects on biological systems, or the interface between climate and history will find a great deal of stimulation from this collection.

Kevin Hamilton Geophysical Fluid Dynamics Laboratory/NOAA  
Princeton University P.O. Box 308 Princeton, NJ 08542

## Newsletter Advertising Rates

Rates are based on black and white camera-ready copy. Sizes (inches) are full page (7.5 x 9.5), half-page single column (3.5 x 9.5), half-page two-column (7.5 x 4.5) and quarter page (3.5 x 4.5). Other charges will apply when typesetting, artwork or photography are required. **Material for inclusion in the CMOS Newsletter should be sent directly to the editor.** Distribution is to CMOS members, and therefore is approximately 1000 for each issue. There are six issues per year and appear in February, April, June, August, October and December.

Advertisement type	Full Page	1/2 Page	1/4 Page
Commercial **	\$300.00	\$160.00	\$100.00
Position vacancy	\$200.00	\$120.00	\$80.00
Employment wanted	---- Free to members only ----		

\*\* Corporate and sustaining members are charged at the position vacancy rate.

Conference Announcement  
and First Call for Abstracts/Papers

**COASTAL ZONE CANADA '94  
COOPERATION IN THE COASTAL ZONE**



A major international coastal zone management conference, Coastal Zone Canada '94 (CZC'94) will be held in Halifax, Nova Scotia, Canada on 20 - 23 September 1994. The theme of the conference is "Cooperation in the Coastal Zone". Its purpose is to provide an exciting opportunity for participants from many different disciplines and areas of interest to explore strategies for developing new partnerships in coastal zone management. Panel sessions, workshops and Roundtable discussions will examine cooperative approaches and new working relationships among coastal zone stakeholders. Concurrent paper presentation sessions will focus on the sharing of new and existing knowledge, experience, and technologies related to coastal and marine issues.

CZC'94 will be broad in scope covering among other aspects: community initiatives scientific research, engineering development, conservation and protection, socio-economic issues, law and politics and coastal management. Among coastal zone user interest groups expected to attend are residents, community-based organizations, aboriginal groups, scientists and engineers, academics, government (municipal, provincial and federal), primary resource users, industry and business and the military, from Canada and other nations.

A major Trade Show and Exhibition is planned to allow companies and organizations to meet with other conference attendees. In addition, Poster sessions will be a prominent feature of the conference.

CZC'94 will be held at the World Trade and Convention Centre in Halifax. Located on Canada's Atlantic coast, Halifax is a seaport city with a history and tradition of the Maritimes region of Canada, a focus for many coastal zone endeavours, and famous for its hospitality.

Conference Co-chairs are Mr. Larry Hildebrand, Environment Canada Protection and Conservation and Mr. Brian Nicholls, Marine Assessment and Liaison, Bedford Institute of Oceanography. The conference office is located at the Bedford Institute of Oceanography (P.O. Box 1006, Dartmouth, NS, Canada, B2Y 4A2). Secretariat Phone: (902) 429-9497 Fax (902) 429-9491

**DEADLINE FOR SUBMISSION OF ABSTRACTS:** September 30, 1993 **DEADLINE FOR SUBMISSION OF MANUSCRIPTS:** March 31, 1994



## Meteorological Instruments



### Sensors to Measure:

- Wind Speed
- Wind Direction
- Peak Gusts
- Temperature
- Delta T
- Dew Point
- Relative Humidity
- Precipitation

Contact our Distributor:

CAMPBELL SCIENTIFIC CANADA, ONTARIO Tel: (519) 354-7356 Fax: (519) 354-1558  
CAMPBELL SCIENTIFIC CANADA, ALBERTA Tel: (403) 461-5158 Fax: (403) 450-2531

R.M. Young Company, 2801 Aero Park Drive, Traverse City, MI 49684 U.S.A.  
Tel: 616-946-3980 Fax: 616-946-4772

THE THIRD INTERNATIONAL CONFERENCE ON SCHOOL AND POPULAR METEOROLOGICAL  
AND OCEANOGRAPHIC EDUCATION

(For information see CMOS Newsletter 21(2) April 1993)

REGISTRATION FORM

Last Name: \_\_\_\_\_ First Name: \_\_\_\_\_

Position/Title \_\_\_\_\_ Affiliation: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

City/Province/PostalCode: \_\_\_\_\_

Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_ Telex: \_\_\_\_\_

**Registration (before June 1):**

(\$175 Cdn/\$135 US) Teacher \_\_\_ CMOS \_\_\_ OSC Member \_\_\_ || (\$90 Cdn/\$70 US) Student \_\_\_ ||  
(\$200 Cdn/\$155 US) Other \_\_\_

**Registration (after June 1):**

(\$200 Cdn/\$155 US) Teacher \_\_\_ CMOS \_\_\_ OSC Member \_\_\_ || (\$100 Cdn/\$80 US) Student \_\_\_ ||  
(\$225 Cdn/\$175 US) Other \_\_\_

**Will you be accompanied by your:** Spouse \_\_\_ and Family \_\_\_?

**Additional BBQ tickets:** \_\_\_ tickets @ \$30 Cdn/\$25 US = \$ \_\_\_

**Total Amount Enclosed:** Canadian funds \$ \_\_\_ US funds \$ \_\_\_

Please complete and return as soon as possible to: TIC/LAC, CMOS, PO Box/CP 334, Newmarket, Ontario,  
Canada L3X 4X7 Please make cheques payable to: CMOS - Education Conference

For further information, write to Ms. Sheila Bourque, Chair, Local Arrangements Committee at the above  
address.

Tel: (416)-739-4220 • Fax: (416)-739-4700

FOR OFFICE USE ONLY: No.      Date Rec'd      Postmark      Amount      Student ID      Initials

## 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.

Les entrées sur les pages suivantes sont réservées aux experts-conseil accrédités de la SCMO. Le processus d'accréditation a débuté en décembre 1986. Une liste complète des experts-conseil accrédités de la SCMO peut être obtenue du bureau d'affaires. Les personnes désirant l'accréditation doivent entrer en contact avec la Société à Newmarket afin de recevoir une copie de règlements et un formulaire d'application.

Le document "Règlements de la SCMO pour l'accréditation" liste les critères suivants:

- (1) L'applicant doit posséder un degré universitaire de premier cycle approprié d'une institution reconnue.
- (2) L'applicant doit posséder au moins un des types suivants de formation spécialisée.
  - (i) degré de deuxième ou troisième cycle d'une universitaire reconnue en météorologie ou océanographie;
  - (ii) degré de deuxième ou troisième cycle d'une universitaire reconnue en sciences naturelles ou appliquées ou en mathématiques avec spécialisation dans une des branches de la météorologie ou de l'océanographie; ou
  - (iii) trois années d'expérience de travail en météorologie ou en océanographie.
- (3) Une fois les exigences d'éducation et formation complétées, l'applicant doit avoir au moins deux années de travail, avec performance satisfaisante, dans un champ de spécialisation mentionné dans ce document. Une certaine expérience d'expert-conseil est nécessaire.

**Susan K. Lally**  
CMOS Accredited Consultant  
General Meteorology, Marine Meteorology

*Oceanroutes Canada Inc.*  
Swire House, 271 Brownlow Avenue  
Dartmouth, Nova Scotia, B3B 1W6 Canada  
Tel: (902) 468-3008 Fax: (902) 468-3009

**Bill Thompson, CCM**  
CMOS Accredited Consultant  
Impact assessments, Hydrometeorology, Aviation Meteorology  
Forest Fire Suppression, Marine Meteorology

*Wm. C. Thompson & Associates Ltd.*  
112 Varsity Green Bay N.W.  
Calgary, Alberta T3B 3A7, Canada  
Tel: (403)-286-6215

## ACCREDITED CONSULTANTS/EXPERTS-CONSEILS ACCRÉDITÉS

### **Mory Hirt**

*CMOS Accredited Consultant  
Applied Aviation & Operational Meteorology*

*Meteorology and Environmental Planning  
401 Bently Street, Unit 4  
Markham, Ontario, L3R 9T2 Canada  
Tel: (416) 477-4120 Telex: 06-966599 (MEP MKHM)*

### **Tom B. Low, Ph.D., P. Eng.**

*CMOS Accredited Consultant  
Research and Development Meteorology*

*KelResearch Corporation  
850-A Alness Street, Suite 9  
Downsview, Ontario M3J 2H5 Canada  
Tel: (416) 736-0521*

### **Ian J. Miller, M.Sc.**

*CMOS Accredited Consultant  
Marine Meteorology and Climatology, Applied Meteorology  
and Climatology, Storms, Waves, Operational Meteorology*

*MacLaren Plansearch Limited  
Suite 701, Purdy's Wharf Tower  
1959 Upper Water Street  
Halifax, Nova Scotia B3J 3N2 Canada  
Tel: (902) 421-3200 Telex 019-22718*

*You could have your business card here*

### **Douw G. Steyn**

*CMOS Accredited Consultant  
Air Pollution Meteorology,  
Boundary Layer Meteorology,  
Meso-Scale Meteorology*

*3650 Carnarvon Street  
Vancouver, British Columbia V6L 3E4 Canada  
Tel: (604) 228-6407 Home: (604) 733-1255*

### **Brian Wannamaker**

*CMOS Accredited Consultant  
Remote Sensing, Instrumentation (oceanography)  
Physical Oceanography, Sea Ice/Icebergs*

*Sea Scan  
R. R. #3,  
Caledon East, Ontario L0N 1E0 Canada  
Tel: (416) 880-0528*

### **R.B.B. Dickison**

*CMOS Accredited Consultant  
Boundary Layer Meteorology, Synoptic Meteorology  
Agrometeorology, Hydrometeorology, Forest Meteorology*

*Atlantic Weather & Environmental Consultants Ltd.  
112 Bloor Street  
Fredericton, New Brunswick E3A 2K4 Canada  
Tel: (506) 450-8802*

### **Mike Lepage, M.S.**

*CMOS Accredited Consultant  
Wind Engineering, Climate Data Management  
Air Pollution Meteorology, Climate Research*

*Rowan Williams Davies & Irwin Inc.  
650 Woodlawn Road West  
Guelph, Ontario N1K 1B8 Canada  
Tel: (519) 823-1311 Fax: (519) 823-1316*

# 1993 MEMBERSHIP APPLICATION FORM-DEMANDE D'ADHESION 1993

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

Title: Dr \_\_\_ Mr \_\_\_ Mrs \_\_\_ Miss \_\_\_ Ms \_\_\_  
 Titre: M \_\_\_ Mme \_\_\_ Mlle \_\_\_

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

Name/Nom \_\_\_\_\_

Regular Régulier  \$40.00/40,00\$

Address/Adresse \_\_\_\_\_

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)

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.

## PUBLICATION SUBSCRIPTIONS - ABONNEMENT AUX PERIODIQUES

ANNUAL RATES - FRAIS D'ABONNEMENT ANNUEL

		Members Membres	Non-members Non-membres	Institutions Institutions
ATMOSPHERE-OCEAN	<input type="checkbox"/>	\$25.00	\$35.00	\$65.00
ATMOSPHERE-OCEAN		25,00\$	35,00\$	65,00\$
Climatological Bulletin	<input type="checkbox"/>	\$15.00	\$20.00	\$25.00
Bulletin-Climatologique		15,00\$	20,00\$	25,00\$
Annual Congress Program and Abstracts	<input type="checkbox"/>	\$ 0.00	\$15.00	\$15.00
Programme et résumés du congrès annuel		0,00\$	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 soutiens. Les membres résidant au Canada, veuillez SVP 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 des groupes.)

Hydrology  
Hydrologie

Air pollution  
Pollution de l'air

Agriculture and Forest  
Agriculture et foresterie

Operational Meteorology  
Météorologie d'exploitation

Floating Ice  
Glace flottant

Mesoscale Meteorology  
Météorologie à la mésoéchelle

Fisheries Oceanography  
Océanographie des pêches

Other (specify)  
Autre (spécifiez) \_\_\_\_\_

June/Juin 1993	Vol. 21 No. 3
----------------	---------------

See over/voir au verso

**CMOS-SCMO  
P.O.Box/C.P. 359  
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'adresse ci-dessus.