



Canadian Meteorological  
and Oceanographic Society

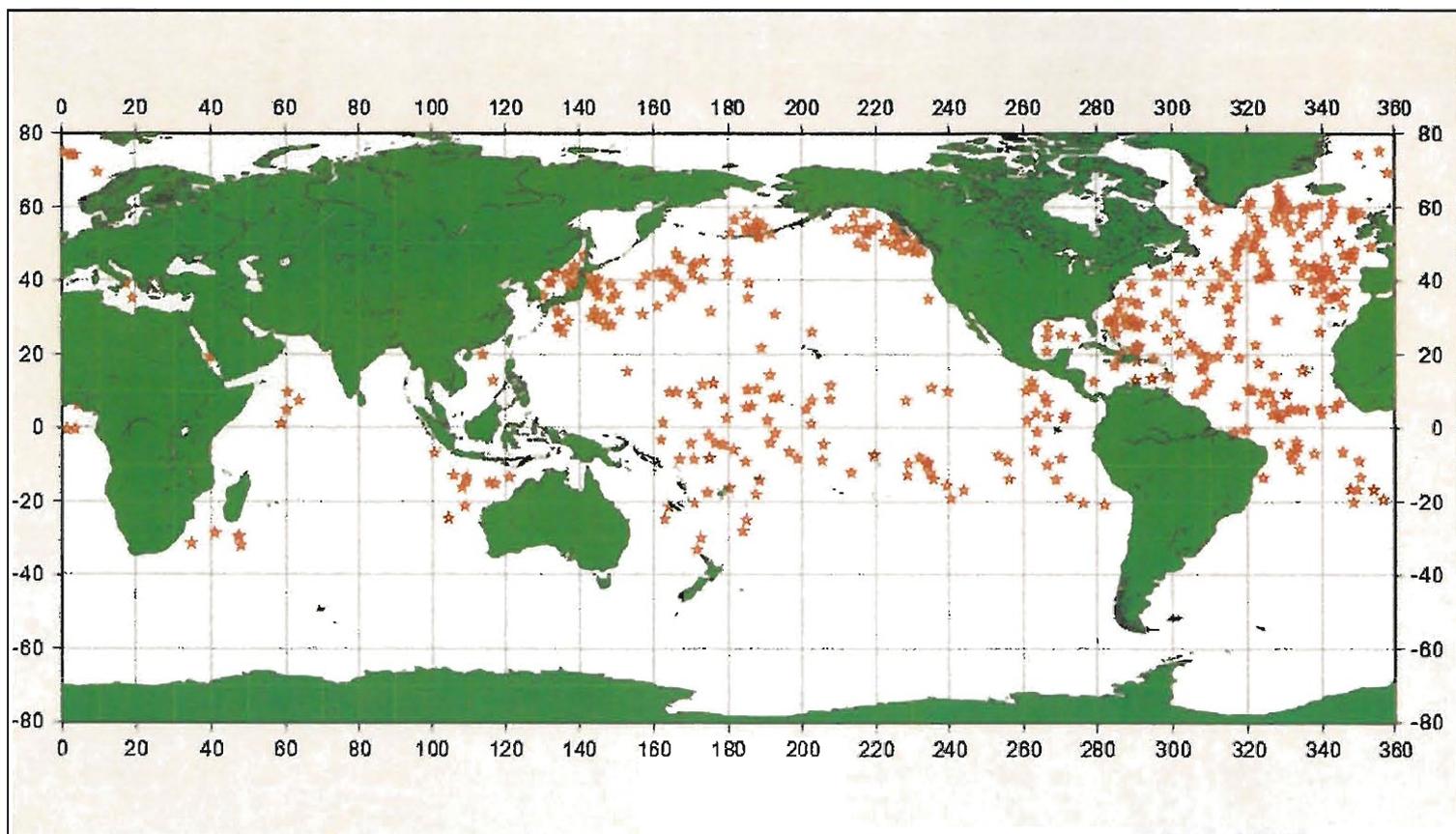
La Société canadienne  
de météorologie et  
d'océanographie

# CMOS **BULLETIN**

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## CMOS Bulletin SCMO

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

Editor / Rédacteur: Paul-André Bolduc  
Marine Environmental Data Service  
Department of Fisheries and Oceans  
12082 - 200 Kent Street

Ottawa, Ontario, K1A 0E6, Canada  
☎ (613) 990-0300; Fax (613) 993-4658

E-Mail: paulandre.bolduc@sympatico.ca

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**Cover page:** Operational oceanography means "sustained systematic applied oceanography". Here is an illustration of a sustained oceanographic experiment where profiling floats are being deployed in the Global Ocean and data reported in real-time. This November update illustration is courtesy of the Japan ARGO Real-Time Data Base. To learn more, read the article on page **163**.

**Page couverture:** L'océanographie opérationnelle signifie "l'exercice continue de l'océanographie appliquée". Nous illustrons ici une expérience océanographique continue où des profileurs dérivants sont déployés dans tous les océans et dont les données sont rapportées en temps réel. L'illustration mise à jour au mois de novembre est une gracieuseté du Japan ARGO Real-Time Data Base. Pour en savoir plus, lire l'article en page **163**.

### CMOS Executive Office Bureau de la SCMO

Suite 112, McDonald Building  
University of Ottawa  
150 Louis-Pasteur Ave.  
Ottawa, Ontario, Canada K1N 6N5  
cmos@meds-sdmm.dfo-mpo.gc.ca  
homepage: <http://www.cmos.ca>  
page d'accueil: <http://www.scmo.ca>

Dr. Neil Campbell  
Executive Director - Directeur exécutif  
Tel: (613) 990-0300; Fax: (613) 993-4658  
E-mail: [cmos@meds-sdmm.dfo-mpo.gc.ca](mailto:cmos@meds-sdmm.dfo-mpo.gc.ca)

Dr. Richard Asselin  
Director of Publications  
Directeur des publications  
Tel: (613) 991-0151; Fax: (613) 993-4658  
E-mail: [pubs@meds-sdmm.dfo-mpo.gc.ca](mailto:pubs@meds-sdmm.dfo-mpo.gc.ca)

## Canadian Meteorological and Oceanographic Society (CMOS)

### Société canadienne de météorologie et d'océanographie (SCMO)

#### President / Président

Dr. Ronald Stewart

Climate and Atmospheric Research Directorate  
Meteorological Service of Canada, Environment Canada  
Tel: (416) 739-4122, Fax: (416) 739-5700  
E-mail/Courriel: [ron.stewart@ec.gc.ca](mailto:ron.stewart@ec.gc.ca)

#### Vice-President / Vice-président

Mr. Ron Bianchi

Vice-President Meteorology, Pelmorex Inc.  
Tel: (905) 566-9511 ext:268; Fax: (905) 566-9370  
E-mail/Courriel: [rbianchi@on.pelmorex.com](mailto:rbianchi@on.pelmorex.com)

#### Treasurer / Trésorier

Dr. Michael W. Stacey

Department of Physics, Royal Military College of Canada  
Tel: (613) 541-6000 (ext 6414); Fax: (613) 541-6040  
E-mail/Courriel: [stacey-m@rmc.ca](mailto:stacey-m@rmc.ca)

#### Corresponding Secretary / Secrétaire-correspondant

Mr. Fred Conway

Environment Canada, Ontario Region  
Tel: (416) 739-4254; Fax: (416) 739-4721  
E-mail/Courriel: [fred.conway@ec.gc.ca](mailto:fred.conway@ec.gc.ca)

#### Recording Secretary / Secrétaire d'assemblée

Mr. William M. Schertzer

Environment Canada (CCIW), Burlington  
Tel: (905) 336-4770; Fax: (905) 336-4989  
E-mail/Courriel: [william.schertzer@cciw.ca](mailto:william.schertzer@cciw.ca)

#### Past-President / Président ex-officio

Dr. Peter A. Taylor

Dept. Earth and Atmospheric Science, York University  
Tel: (416) 736-2100 ext. 77707; Fax: (416) 736-5817  
E-mail/Courriel: [pat@yorku.ca](mailto:pat@yorku.ca)

#### Councillors-at-large / Conseillers

1) Dr. Susan Allen

Department of Earth and Ocean Sciences, UBC  
Tel: (604) 822-6091; Fax: (604) 822-2828  
E-mail/Courriel: [allen@eos.ubc.ca](mailto:allen@eos.ubc.ca)

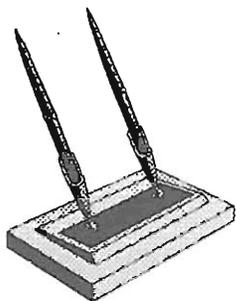
2) Dr. François J. Saucier

Institut Maurice-Lamontagne, MPO, Mont-Joli  
Tel: (418) 775-0791; Fax: (418) 775-0546  
E-mail/Courriel: [saucierf@dfo-mpo.gc.ca](mailto:saucierf@dfo-mpo.gc.ca)

3) Ms. Susan Woodbury

Meteorology Division Manager, Seimac  
Tel: (902) 468-3007 ext: 232; Fax: (902) 468-3009  
E-mail/Courriel: [swoodbury@seimac.com](mailto:swoodbury@seimac.com)

....from the President's Desk



CMOS Friends:

Well, Christmas is fast approaching although it certainly doesn't seem like it today as I start to prepare this editorial and the temperature is sitting at 15°C.

I have been looking over our CMOS web site and, as always, I am reminded of our slogan "CMOS exists for the advancement of meteorology and oceanography in Canada". In one way or another, everything we do can be placed under this banner. In particular, we try to reach out to our members and the larger community through a number of efforts.

One critical means of keeping our members and others up-to-date on developments within our field is through our annual tour speaker. We are very pleased that Michel Jean from the Canadian Meteorological Centre will be this year's speaker; he will be travelling across the country this coming spring. Michel has a great deal of experience in operational meteorology, and he is currently the manager of MSC's Environmental Emergency Response Division through which he is extending his responsibilities from issues of volcanic ash and radionuclide dispersion to include the modelling of ambient air quality.

We also help to ensure that parliamentarians and others in Ottawa are exposed to the excitement of top notch science. In this regard, I would like to take this opportunity to thank Bill Pugsley who has, for the last several years, been a member on the PAGSE (Partnership Group for Science and Engineering) selection committee for upcoming "Bacon and Eggheads" presentations. Through the work of this committee, a number of Canadian science stories have been, and continue to be, presented to the Ottawa decision-makers.

I should add that PAGSE has other means of informing the Ottawa crowd about science, how it operates, and how important it is. This group organizes an annual symposium that addresses important scientific and related matters. The theme for 2002 is "Networking and International Relations". These are fundamental issues for us in meteorology and oceanography, and I expect that our efforts will be discussed at this high-profile event.

We encourage interest in meteorology and oceanography within schools across the country. One way that we do this is through sponsorships of prizes at science fairs. Ron Hopkinson recently conducted a survey of the CMOS Centres to determine their level of involvement.

<i>Volume 29 No. 6</i> <i>December 2001 - décembre 2001</i>	
<b>Inside / En Bref</b>	
from the President's desk by Ron Stewart	<b>page 161</b>
Books in Search of a Reviewer / Livres en quête d'un critique	<b>page 162</b>
Books now being Reviewed / Livres présentement en révision	<b>page 162</b>
<b>Articles</b>	
Operational Oceanography and DFO: Where are we and where do we go? by D. Bancroft	<b>page 163</b>
La Fondation canadienne pour les sciences du climat et de l'atmosphère: Réseau de recherche à l'Université Dalhousie	<b>page 170</b>
Canadian Foundation for Climate and Atmospheric Sciences: Network Research at Dalhousie University	<b>page 173</b>
Increased Rains Could Change Impact of Amazon Deforestation	<b>page 175</b>
Añd may all your Christmases be white by Dave Phillips	<b>page 176</b>
<b>Our regular sections / Nos chroniques régulières</b>	
Book Review - Revue de littérature	<b>page 178</b>
In memoriam	<b>page 181</b>
CMOS Business / Affaires de la SCMO	<b>page 183</b>
Report / Rapport	<b>page 187</b>
Conferences - Conférences	<b>page 190</b>
CMOS-Accredited Consultants - Experts- Conseils accrédités de la SCMO	<b>page 192</b>
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The majority of the Centres support one or more local (regional) science fairs by providing prizes in meteorology and/or oceanography. A prize is usually either cash (typically \$50-\$125) or a book, and it may include a plaque for the winning project's school or a CMOS science fair certificate as well. A few Centres provide general cash support to the local science fair instead of, or in addition to, prizes. Most CMOS Centres that support science fairs also supply judges in meteorology and/or oceanography. CMOS support of science fairs is one means of promoting the science of meteorology and oceanography at the local

level. And, I can assure you that the local Centres would be delighted if you'd like to become involved in these activities.

Our web site is an important means through which CMOS reaches out to its members and others. This site has about 50 visits per day and Bob Jones is always making improvements to it. For example, at the top of the main page you will see "New" tags identifying the new bilingual "Site Index". If the site's search engine fails to give you the needed information, however, consulting this index should help. Don't forget to pass along your suggestions for improving the web site; Bob would be pleased to hear from you.

In conclusion, note that our 2002 Congress is fast approaching. As you are probably aware, its theme is "The Northern Environment". Such a theme certainly brings us together and I am sure that it will lead to a very successful Congress. Our Congresses are, of course, one of our most important avenues of communication.

So, with these few examples of many, you can appreciate that CMOS continues to communicate with its members and others "to advance meteorology and oceanography in Canada". Please give us comments and suggestions as to how to do this better.

Chat with you again soon.

Ronald Stewart  
President / Président

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### Books in Search of a Reviewer Livres en quête d'un critique

*The Earth's Plasmasphere*, by J.F. Lemaire and K.I. Gringauz, January 1998, Cambridge University Press, Hardback Cover, 0-521-43091-7, 350 pages, \$90.00US.

*Emissions Scenarios*, Intergovernmental Panel on Climate Change, Cambridge University Press, Paper Cover, 0-521-80493-0, 2000, \$44.95.

*Methodological and Technological Issues in Technology Transfer*, Intergovernmental Panel on Climate Change, Cambridge University Press, Paper Cover, 0-521-80494-9, 2000, \$35.95.

*Ionospheres, Physics, Plasma Physics, and Chemistry*, by Robert W. Schunk and Andrew F. Nagy, Cambridge University Press, Hardback, 0-521-63237-4, 2000, \$100.00.

If you are interested in reviewing one of these books for the *CMOS Bulletin SCMO*, please contact the Editor at the e-mail address provided below. Of course, when completed, the book is yours. The instructions to be followed when reviewing a book for the *CMOS Bulletin SCMO* will be

provided with the book. Thank you for your collaboration.

Si vous êtes intéressés à faire la critique d'un de ces livres pour le *CMOS Bulletin SCMO*, prière de contacter le rédacteur-en-chef à l'adresse électronique mentionnée ci-bas. Bien entendu, le livre vous appartient lorsque vous avez terminé la critique. Les instructions qui doivent être suivies lors de la critique d'un livre dans le *CMOS Bulletin SCMO* vous parviendront avec le livre. Merci pour votre collaboration.

Paul-André Bolduc, Editor / Rédacteur-en-chef  
[CMOS Bulletin SCMO; paulandre.bolduc@sympatico.ca](mailto:paulandre.bolduc@sympatico.ca)

### Books now being Reviewed Livres présentement en révision

*Scattering of Waves from Large Spheres* by Walter T. Granby, Jr., Cambridge University Press, Hardback cover, 0-521-66126-9, \$95.00US. Reviewer: Diane Masson, Institute of Ocean Sciences.

*Climate Change Impacts on the United States*, National Assessment Synthesis Team, US Global Change Program, Cambridge University Press, Paperback, 0-521-00075-0, 612 pages, \$39.95US. Reviewer: William A. Gough, University of Toronto at Scarborough.

*Tsunami: The Underrated Hazard*, by Edward Bryant, Cambridge University Press, Hardback Cover, 0-521-77799-X, July 2001, \$74.95US. Reviewer: Bob Jones, Nepean.

*Land Use, Land-Use Change and Forestry*, Intergovernmental Panel on Climate Change, Cambridge University Press, Paper Cover, 0-521-80495-7, 2000, \$29.95. Reviewer: Ted Munn, University of Toronto.

*Nonlinear and Nonstationary Signal Processing*, by W.J. Fitzgerald, R.L. Smith, A.T. Walden and P.C. Young, Cambridge University Press, Hardback Cover, 0-521-80044-7, March 2001, \$95.00US. Reviewer: Brenda Topliss, Bedford Institute of Oceanography.

*El Niño and The Southern Oscillation, Multiscale Variability and Global and Regional Impacts*, Edited by Henry F. Diaz and Vera Markgraf, Cambridge University Press, Hardback Cover, 0-521-62138-0, 2000, \$90.00. Reviewer: William Hsieh, University of British Columbia.

*Metmen in Wartime, Meteorology in Canada 1939-1945* by Morley Thomas, ECW Press, Paperback Cover, 1-55022-448-4, 2001, \$19.95 Can. Reviewer: Howard L. Ferguson, Toronto.

*Data Analysis Methods in Physical Oceanography* by William J. Emery and Richard E. Thomson. Elsevier, Paperback Cover, 0-444-50757-4, 2001, Price unknown. Reviewer: Paul Myers, University of Alberta.

## Operational Oceanography and DFO: Where Are We and Where Do We Go?

by Douglas Bancroft<sup>1</sup>

**Résumé:** Le terme "océanographie opérationnelle" ne signifie pas la même chose pour différentes personnes. Pour le besoin de cette présentation, nous définissons "océanographie opérationnelle" par "une application scientifique dans le but de fournir des produits et services à valeur ajoutée, à temps et précis, qui affecte les décisions des usagers". L'océanographie opérationnelle n'est donc qu'une application continue et systématique de l'océanographie. Avant de poser la question dans quelle direction le MPO (Ministère des Pêches et Océans) devrait se diriger en océanographie opérationnelle, l'auteur énumère les différents programmes existant au sein du ministère, tant au niveau international que national.

Operational Oceanography means different things to different people. For this paper, we will define applied oceanography as being "the application of science to provide timely, accurate, value added oceanographic products and services that affect decisions of clients". Operational Oceanography is merely "sustained, systematic applied oceanography".

The Department of Fisheries and Oceans (DFO) has historically supported a number of operational oceanographic programs in the regions and nationally, but often with little co-ordination or strategic goals.

There are a number of converging factors that make a co-ordinated national review of the way ahead for DFO Operational Oceanography timely and important. They include:

- the availability of large, historically unprecedented real time oceanographic data sets (e.g. ARGO floats, more advanced satellite remote sensing abilities) that could be used as inputs into new Operational Oceanography programs. It is noteworthy that while DFO has planned for operational oceanography observing systems, we do not as yet have a plan to produce and deliver data products in a timely manner to Canadians;
- the requirement for better knowledge of the present state of the ocean as an input into seasonal and inter-annual operational long range climate forecasts (e.g. El Niño Southern Oscillation);
- the recent consensus among fisheries managers that knowledge of the present and forecast state of eco-systems is essential to protect fisheries resources;
- the emerging need of the aqua-culture sector for timely information on the probability of unfavourable

oceanographic conditions (temperature extremes, ice, plankton blooms, low oxygen concentrations);

- the need for real-time ocean current and water level information for Search and Rescue, marine environmental emergencies and safe navigation of large vessels in restricted seaways such as the St. Lawrence river and various harbours;
- the need for scientific information to protect the fisheries and fisheries habitat from the discharge of operational wastes and potential oil spills associated with the continued expansion of Canada's offshore oil and gas industry;
- new, sophisticated computer models to forecast future ocean currents that are being developed by various academic communities will need to be implemented in an operational sense;
- a newly established collaborative initiative among DOE, DFO and academics at Dalhousie University for a Centre for Marine Environmental Prediction (CMEP) ) to develop real time observing technology and models;
- the new integrated Ocean Observing System for the Gulf of Maine (GoMOOS) that is being established by the US and State of Maine which will extend over Canadian waters; and finally
- while regions are making significant advances in tailored Operational Oceanography programs, there is a vacuum in terms of national policy, e.g. there is no policy with respect to the issue of sea level height storm surge warnings, unlike the DOE Meteorological Service of Canada (MSC) with clearly defined policies with respect to public warnings for the safety of Canadians.

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<sup>1</sup> Senior Science Advisor, Oceanography and Climate Branch  
Fisheries and Oceans Canada, bancroftd@dfo-mpo.gc.ca

## Examples of existing DFO operational oceanographic programs

### 1) International Level

Project Argo is a new array of temperature/salinity profiling floats, as a major component of the Global Ocean Observing System (GOOS). It builds on the existing upper-ocean thermal networks, extending their spatial and temporal coverage, depth range and accuracy, and enhancing them through addition of salinity and velocity measurements. The Argo global float array complements the Jason satellite altimeter mission. Argo will provide a quantitative description of the evolving state of the upper ocean and the patterns of ocean climate variability. The data, coupled with satellite altimeter measurements of dynamic height, will be used for initialisation of ocean and coupled forecast models. A primary focus of Argo is seasonal-to-decadal climate predictability, but a wide range of applications for high-quality global ocean analyses is anticipated.

### 2) National Level

#### 1) MEDS

**National Data Management Committee.** Marine Environmental Data Service (MEDS) manages and archives ocean data collected by DFO, or acquired through national and international programmes conducted in ocean areas adjacent to Canada; and then disseminates data, data products and services to the marine community in accordance with the policies of the Department. Data management, archival and dissemination of physical oceanographic data and data products on national and international scales are still the core MEDS mandate; however, it has been broadened to include chemical and biological oceanography. Data are collected and managed by a distributed system of DFO archive centres. Policy, standards, and responsibilities are developed by a National Data Management Committee (NDM) chaired by MEDS with regional members. The NDM provides advice on scientific data management issues, and develops and implements short- and long-term goals for data management for the Science Sector of DFO. The working group also co-ordinates and standardises processing, archival, and access procedures and policies for these data. MEDS and the regional centres thus provide co-ordinated data, data products and services to the marine community.

**Operational Oceanographic Programs.** MEDS has been involved in operational oceanographic programs for many years. Currently MEDS carries out operational activities in the areas of ocean profile, surface drifters, surface waves, along track ship measurements, and tides and water levels. We both acquire data from networks in operational timeframes, and submit data as well.

**Water Level Data.** The water level data are collected in collaboration with the Canadian Hydrographic Service. The regional offices of CHS maintain a system of tide gauges on Canadian coasts, and water level gauges within the St. Lawrence Seaway system. Historically, MEDS accepted data sampled at 15-minute intervals, but this is changing so that higher resolution sampling and other variables besides sea level will also be managed.

**Wave Measurement Program.** MEDS has had a long connection to measurements of waves around Canada. Up until the mid-1990s, a wave measurement program was run by MEDS. In the late 1970's MEDS was using line of sight radio to send data from buoys to oil drilling platforms. Later, as new technology came along, MEDS used satellite transmissions to collect the data from offshore buoys. As the wave measurement program shifted to an Environment Canada responsibility, MEDS began to collect the data from their buoys. Now, the sole sources of wave information are from EC buoys and from US buoys moored in waters close to Canada. The Canadian buoy data are downloaded daily from a GOES satellite ground station. The data from the US buoys arrive on the Global Telecommunications System (GTS). The data are processed daily and entered into a MEDS archive. MEDS has some query capabilities on their web site to permit looking at and retrieving wave data.

**WOCE & Surface Drifters.** MEDS' involvement in the surface drifters program began in late 1978. In 1985 MEDS became a global data centre for drifter data. During WOCE MEDS paired with the Global Drifter Center in Miami to contribute to the WOCE program. Data from drifters are acquired daily and accumulated over the course of a month at which time they are processed into our archives. Some clients wish data more frequently than this and for them, MEDS constructs files each day that are sent by ftp to them. Data from surface drifters report over the GTS and are usually less than six hours old.

**Ship Data.** Since 1990, MEDS has been acquiring along track sea surface data collected from ships and sent over the GTS in the TRACKOB code form. These are typically hourly measurements of T, S and surface currents, that are anywhere from hours to many days old. There is as yet no formal international program for these data but one is currently being formed. Data from these ships are available on request from MEDS.

**GTSP.** In 1990, MEDS began a cooperative program with the US, Japan, France, Germany and Australia to improve the management of ocean profiles (concentrated on T and S data). The project (called GTSP for Global Temperature-Salinity Profiles Program) concerned ocean profiles collected by ships at sea, their acquisition, and dissemination to clients. MEDS' role in this is to acquire these data, again from the GTS, to process them and pass them on to users. The data arrive each working day, and are passed through quality control and duplicates checking software on a three-times-per-week basis. The data are

then added to our own archives, passed to the US NODC, and subsets sent to clients all over the world. Data in this stream can be anywhere from hours to many days old.

**GTS.** To support Canadian researchers and to contribute to this international program, MEDS also acts as an insertion point for data onto the GTS. Profile data collected by DFO researchers are sent to MEDS as they become available, and we format them and send them to the GTS.

**Autonomous Floats Program.** A new program is under development for handling profile data collected by autonomous floats, the in-situ instrumentation of the Argo program. For this program, MEDS acquires the raw data from the communications system used by the floats, converts the data to profiles, applies automated QC procedures, converts to distribution formats and forwards the data to the GTS, and soon to an internet server set up for the program. These processes run automatically every 6 hours, 7 days a week.

## ii) LAURENTIAN REGION

The Maurice Lamontagne Institute (MLI) has developed several significant operational oceanographic programs over the years in a progressive and logical manner, with sound plans for further building. This was accomplished largely with "B base" funds. They have also established very good client links, both internal and external to DFO. Highlights of existing and near-term Laurentian Region programs are summarised below:

**OSL.** Initiated as a major research and development project, the Observatory of the St. Lawrence / "Observatoire du Saint-Laurent" (OSL) offers an Intranet-Internet portal dedicated to the exchange, dissemination, and presentation of oceanographic data collected in the St. Lawrence marine ecosystem. It acts as a virtual centre of co-ordination, a "crossroads" on the marine information highway, and serves a vast array of clients (producers and users of St. Lawrence environmental data) and facilitates access to or exchange of scientific information. The innovative approach used for visualising, sharing and disseminating oceanographic data within a multi-disciplinary environment, should permit the cross-analysis of all the information available on the St. Lawrence, and thus contribute to a better understanding of this large and complex ecosystem. Microsoft Network (France) has already rated OSL as one of the three best ocean web sites among about 75 other similar sites referred to around the world;

**Data buoys.** One meteorological buoy collects data in the north-western region of the Gulf of St. Lawrence. These data are available in near-real-time through an agreement with Environment Canada and DFO-Laurentian Region. A second DFO buoy will be instrumented soon with the collaboration of the Space Plan and will be located in another region of the Gulf of St. Lawrence. MLI is also involved with a consortium of Québec universities, in the

preparation of a proposal to acquire 5 oceanographic buoys of the MAREL type from IFREMER (France). If successful, these buoys should allow the collection and measurements of some 15 different oceanographic variables at three depths (i.e., temperature, salinity, currents, wave heights, turbidity, dissolved oxygen, chlorophyll, nutrients, meteorological variables, etc.). This network of buoys will provide the real-time monitoring information that is needed, for example, to ground-truth satellite data, to provide information for all kind of operational purposes, to calibrate regional oceanographic models, to detect toxic algal blooms, etc;

**Ship-based Observations.** IML has developed an original ship-mounted data collecting system that is installed on two commercial ships (soon on four ships) and one Canadian Coast Guard ship. One of these ships travels once a week between Montreal and St. John's and the other one travels along the north coast of the Gulf, collecting temperature and salinity data on a continuous basis. Eventually, chlorophyll data should be collected with an upgrade of the instrumentation. An original system was developed to download the collected data at each passage near the Maurice Lamontagne Institute by UHF radio link. These data are available on line in near-real-time on the OSL web site;

**Remote Sensing.** MLI has just completed the field work of a water optic program that should provide the data necessary to ground-truth satellite signals that are used to estimate temperature and primary production in coastal waters affected by freshwater runoffs. Over the last 4 years a bank of surface water optical data was built for the whole Gulf of St. Lawrence system containing data from different hydrographic regions at different seasons. With that data bank, they will be able to develop specific satellite algorithms that will allow a reasonable estimation of primary production in the ecosystem. An automatic processing system is also near completion for the production of maps of surface temperature distributions. Satellite coverage extends to the Arctic and Hudson Bay as well as St. Lawrence system as MLI operates two satellite receiver stations (MLI and Resolute Bay). SSTs are produced in near-real-time for the eastern Canada region and in a delayed mode for the Arctic region because of slow data links with the Resolute Bay station. Finally, the remote sensing laboratory is also involved, through the Space Plan, in the development and installation of buoys in the St. Lawrence to monitor in real-time its optical properties and allow a better use of remote sensing data from ocean colour satellites such as SeaWiFS, Meris, Modis, etc;

**Physical Oceanographic Modelling.** MLI conducts a broad range of regional modelling research and operations, including tides and currents, sea ice, water temperature and salinity structures, storm surges and oil slick movement and dispersion. As a ship routing parameter, they are also examining the energy costs of transits through ice using internal pressure stresses in ice. In

collaboration with DOE (MSC, CIS, CMC), they are developing fully coupled sophisticated regional atmospheric/ocean models at very high resolutions (i.e., 5km grids improving to 2km in the near future). These models already provide sea temperature forecasts for fisheries management, ice and water level forecasts for navigation purposes, oil-spill drift in environmental emergencies, sea-surface currents for search and rescue-CCG;

**Biological Oceanographic Modelling.** MLI ocean science staff are also working closely with biologists in relating inter-annual variability of cold intermediate waters with biological production of species such as snow crab, mackerel, cod, etc. These studies are used to produce "State of the Gulf" reports for managing stocks. Other biological modelling projects include toxic algae, carbon flux and the development of an ocean/atmosphere model of the dimethylsulfide (DMS) flux (Green House Gases);

**Proposed Operational Oceanographic Centre.** MLI is working at establishing a Service Centre for Operational Oceanography (SCOO) in the St. Lawrence Seaway. This centre would provide services and information dealing with oil spills drifts, currents and tide level predictions, storm surges, sea ice distribution and other different aspects for the safe and durable utilisation of the marine environment; and finally,

**Climate Change Program.** MLI intends to build an integrated climate change program dealing specifically with the problem of climate variability in the two enclosed coastal seas under its jurisdiction, viz. the St. Lawrence and the Hudson Bay/Strait ecosystems. This is needed to address such problems as detection, prediction, impact and adaptation to climate variability in these two ecosystems. MLI proposes to develop and use three dimensional numerical models to detect and predict changes in the hydrodynamics of the Gulf of St. Lawrence and Hudson Bay systems; to validate and calibrate these models using monitoring results at hand or that will be acquired; and to use the model predictions as a basis to assess the impact that the past or predicted hydrodynamic changes may have had (or will have) on living resources.

### iii) MARITIMES REGION

The Bedford Institute of Oceanography (BIO) is actively involved with a number of operational, and near operational oceanographic initiatives in the Maritimes Region.

Especially worthy of note is the ice-ocean forecast initiative of the BIO Coastal Sciences Section, Ocean Sciences Division (OSD), funded by the Program for Energy Research and Development (PERD) to demonstrate the use of ocean models developed or adapted at OSD for real-time forecasting. Three forecast models are already in place:

- Princeton Ocean Model (POM) and multi-category sea-ice Canadian East Coast coupled model, implemented for the Labrador Sea and the surrounding continental shelves. Using atmospheric forcing fields from DOE MSC CMC, this model provides continuous updated daily forecasts of ice concentration and thickness;

- Second generation spectral surface wave model implemented for the North West Atlantic, again using atmospheric forcing fields from DOE MSC CMC; and

- A Grand Banks open ocean tide model for water level and currents.

Model output from this initiative includes sea-ice, ocean current, surface waves, sea surface elevation, tides and surface drift. Maps, animations and graphs generated from these models are already made available to the general public via the internet.

These and other BIO-developed numerical hydrodynamics models are also being used to provide advice and predictions of ocean currents, drift and sea level variations for a number of operational problems as they arise. For example, forecasts of ocean current and drift were provided to various search and recovery command teams and units during the SwissAir recovery operation on the Scotian Shelf near Halifax.

Other Maritime Region operational oceanographic initiatives include:

**Remote Sensing.** Chlorophyll-a concentrations from SeaWiFS the satellite, and sea-surface temperature from NOAA AVHRR satellites, for the North West Atlantic, are presented as semi-monthly composite images and individual satellite passes for 9 pre-defined areas. In addition, derived Primary Production images are displayed on the same scale as the semi-monthly composites. The series started in September 1997 and is ongoing.

**Atlantic State of the Ocean.** Published annually, this document supports fisheries oceanography, and details the impact of physical variation of water properties on biological productivity;

**Oil Spill, Bioremediation.** BIO scientists routinely provide information for the development of improved operational guidelines for use by the spill responders. Advice is also provided on recommended technologies and procedures during real world incidents. All this is based on several ongoing studies to evaluate the long-term environmental impacts of oil spills, and that develop and validate oil spill countermeasure technologies to accelerate recovery rates. Oil spill countermeasure technologies under evaluation include bioremediation/phytoremediation, surf-washing and chemical dispersants;

**GoMOOS.** The Gulf of Maine Ocean Observation System is a recent initiative of the State of Maine to design and build a coastal ocean observing system in the Gulf of Maine, sponsored by the US Office of Naval Research. The monitoring system includes an array of nearshore (coastal embayments) and offshore (shelf and basins) moorings measuring waves, currents, meteorology, and a suite of physical, chemical and biological variables through the water column. In addition, a network of long-range CODAR is intended to monitor surface currents at 3 km resolution over most of the inner Gulf from Nova Scotia to Cape Cod. DFO's present role in GoMOOS is to develop a high-resolution, state-of-the-art wave forecast model and to assess its skill relative to the existing US Navy product.

**CANSARP Experiment:** Six years of CCG-sponsored (NIF, project funds) joint research between BIO and Dalhousie has culminated in the delivery of the Dalhousie surface current forecast model for the Scotian Shelf to BIO. The goal of this program is to replace the present surface current module in CANSARP with the Dalhousie model, but as yet there is no viable scheme developed for running the Dalhousie model operationally.

**Centre for Marine Environmental Prediction (CMEP).** The CMEP initiative, located at Dalhousie University in Halifax, involves researchers from academia, government and private industry and is providing a focus for interdisciplinary research and education pertaining to the observation and prediction of physical, chemical and biological changes in the marine environment. The CMEP/DFO partnership is providing "critical mass" for research as well as leveraged funding for the infrastructure required for the research.

As part of a project to assess the utility of sea level data for constraining basin scale ocean models, researchers from BIO and Dalhousie University have already developed innovative methods to constrain mean and/or annual variations of ocean conditions without directly influencing variability at other time scales. Comparisons between the resulting ocean model predictions and observations are encouraging and bode well for further improvements through the assimilation of other data sets into numerical models.

Another project being undertaken by DFO in partnership with the CMEP group will focus specifically on the assimilation of data into basin scale models. DFO Science has already agreed to participate in the Argo program- an international program to maintain an array of approximately 3000 profiling floats throughout the global ocean from 2003 to 2005. This program will provide one of the critical in situ data sets for the Global Ocean Data Assimilation Experiment (GODAE). The CMEP/DFO effort will focus on the assimilation of Argo float data into numerical models in order to obtain the best possible estimates of the seasonal evolution of conditions in the upper km of the North Atlantic Basin. The results will be used in the interpretation of physical and biological observations from the region.

The CMEP group has recently been awarded a grant of \$3.6M from the Canadian Foundation for Innovation to establish the infrastructure required to carry out a broad range of research activities in the area of Marine Environmental Prediction. This funding will be used for a significant upgrade of computer resources to the level required for basin scale data assimilation.

#### iv) PACIFIC REGION

Existing DFO Operational Oceanography services are diverse, and include tide and current predictions, sea surface temperature charts used by fishers and managers, model forecasts, chlorophyll-a and primary productivity satellite imagery maps, as well as emergency response forecasts during oil spills and other incidents. Highlights of existing and near term Pacific Region programs are summarised:

**Fraser River tide/currents.** A tide and current prediction system for the lower reaches of the Fraser River has been built by IOS scientists, and is used extensively by area municipalities, the Harbour Authority and Canadian Coast Guard. The latter pays for upgrades to the model. Demand for these predictions is very high during periods of high freshet. There is also much consultative work as well, during the freshet periods;

**Fraser River temperature.** IOS OSAP provides real time predictions of the Fraser River flow rates and temperatures, in support of management decisions concerning migrating salmon stocks. Forecasts are based on two numerical models of river, i.e. a UBC watershed model and a temperature model that is forced by meteorological fields. Forecasts are issued from July to mid-September, with predictions out to 10 days issued twice weekly. Ten real time temperature and flow meters also allow for reasonable "now" casting. Forecasts are issued to fisheries managers, and the "Fraser Environmental Watch". This information has proven key to the setting of harvesting quotas;

**Second Narrows, Vancouver Harbour.** CHS provides real time measurements and data display for navigation. Currents are displayed in real time in the Harbour Master's office. (First such system in a navigation channel in Canada). Other systems may be installed at Seymour Narrows and Duncan Bay in the near future;

**Sea Level.** Potential storm surges along the lower mainland of BC (especially during the Christmas-New Year period each year) have resulted in a need to provide real-time observations and short-term forecasts. This would be especially true if a storm surge occurs when winter solstice declination tides are coupled with ENSO and/or storms and wet weather. IOS scientists are starting to develop (in collaboration with MSC) a surge prediction model for southern BC. The first step will be a display on the web of near-real-time sea level observations compared to predicted ones, together with weather forecasts;

**Permanent Water Level Data Base.** This has been an essential long data set for engineers etc looking to build breakwaters, wharves, etc;

**Tides and Currents.** Various DFO researchers have worked over the decades on a series of full tidal models. These were the first full-tidal numerical models of shelf and ocean waters in Canada, and covered the west coast ocean basin (Strait of Georgia, Juan de Fuca), and have produced the first tidal current atlas based on such a numerical model. These tools for tidal analysis and prediction are now in almost all tide prediction software in Canada. Sales of *Canadian Tide and Current Tables* using this software now exceed \$3,000,000, and bring in \$240,000 gross revenue per year. DFO scientists have also established software to enable the local Rescue Co-ordination Centre to predict drift for Search and Rescue (SAR). They also collaborated to develop a program to predict oil spill motion in BC coastal waters, based on tidal current predictions and wind drift, and worked with a private company to develop commercial software to predict currents in 90% of BC coastal waters. There is much ongoing work to provide real time predictions of currents, based on numerical models, that take into account high resolution wind forcing; and

**Tsunamis.** CHS oversees the real time sea level reporting system for tsunamis, with response team available 24 hours - 7 days a week to provide advice to Provincial Emergency Teams, as well as acts as the DFO member of the regional intra-departmental Environmental Emergency Response Team. CHS plans to further improve the response capability of the three dedicated tsunami monitoring Stations by making the water level information available in real time to Tsunami Warning Centres and Provincial Emergency Program officials via the internet; and allowing CHS responders to communicate directly with the monitoring stations and the IOS base station using handheld Personal Data Assistants (PDAs) and cellular phone links. Both initiatives will help ensure rapid access to information at times outside of normal office hours. In addition, there is a funded, three-year program, to develop numerical models for estimating tsunami wave amplitudes and currents resulting from earthquakes. The study will focus on harbours and anchorages along the west-coast of Vancouver Island. The results of the model simulations will assist the Canadian Coast Guard in developing tsunami preparedness and Search and Rescue (SAR) guidelines, and for preparing information for public distribution.

## **Future Operational Oceanographic Development**

DFO operational oceanographic programmes should be developed to support DFO Long-Term Priorities (in italics). Relevant examples include:

- Development and use of tools to quantify the level of ecosystem health, and to provide scientific knowledge on

the primary mechanisms that control the fate, transport, and detrimental effects of contaminants at affected sites (e.g. Halifax and Sydney Harbour) to "*Manage and Protect the Marine and Freshwater Environment*";

- Real time information on changes in the ocean environment and primary productivity with forecasts of their impact on ocean eco-systems as a tool to better "*Manage and Protect the Fisheries Resource*";

- On-line publication of past, present and forecast conditions of the oceans to all Canadians, in order to better "*Understand the Oceans and Aquatic Resources, and to acquire, apply and communicate knowledge on Canada's oceans to support the activities of clients, partners and the operational branches of DFO*"; and

- Real time forecasts of surface currents and sea level change (e.g. storm surges) in order to "*Maintain Marine Safety and improve the safe use of the marine environment and minimise loss of life and damage to property*".

## **Partnerships**

DFO is very constrained by resources, so it is essential that partnerships be developed. While partnerships with academic agencies and institutes could be used to develop the tools and models needed to implement operational programs, academic institutions are not well suited to deliver operational programs.

Nevertheless, several potential partners are already delivering operational ocean products. EC MSC has the national mandate for production of certain operational oceanographic products such as wave heights, and ice coverage charts. The DND naval Meteorological and Oceanographic (METOC) Centres on both coasts have long term experience in operational oceanography tailored to military requirements. DFO CCG, in partnership with DND and EC, maintain a capability of making local short-term forecasts of ocean conditions in support of Search and Rescue (SAR) and environmental emergencies.

## **Private Industry**

There are already a number of private sector oceanography, meteorological and environmental consulting companies that produce specialised analyses and forecasts of wind, waves and currents for offshore operations including ship routing, and environmental impact statements (EIS) in support of industrial operations. The role and nature of what should be done by government, versus that most appropriate to industry needs to be clearly spelled out. To date, industry and DFO have had successful partnerships in many aspects of operational oceanography (e.g. remote sensing, model development, monitoring instrumentation, etc.), to the great benefit of both sectors, and indeed, all Canadians.

## Hydrographic Service

The Canadian Hydrographic Service (CHS) of DFO has great experience with many aspects of "operational oceanography", e.g. mapping, charting, data bases, tides and currents. This discussion paper has not dealt with many of these areas of operational oceanography, but it is clear that further consultation is essential to determine the optimum role for CHS with respect to the development and implementation of operational oceanographic programs within DFO.

## Other Areas of Interest

There is no mechanism in place for Arctic Storm Surge monitoring and forecasting. As on- and offshore oil and natural gas exploration and production increase in the Arctic, so will the number of persons and infrastructure potentially at risk to extreme storm surge and coastal erosion events. Forecasting warnings for such events requires complex coupled shallow water wind wave height, and storm surge models. A proposal for developing such forecast model is still awaiting funding. Even if developed, how it would be operated and by whom would also need to be identified.

Aquaculture interests have also requested model support, in such areas as oxygen replenishment, transport of disease, etc. This would require the ability to model mud flats, with resolution from 2km to 30m. This presents great challenges to science as well as operations.

The internal partnerships/clients between Science and the other key DFO sectors (i.e. Oceans and Coast Guard) also need to be more fully examined.

## Next Steps

DFO NCR Science staff are continuing internal, inter-departmental, and regional consultations. Much more liaison with industry is required to examine the benefit of existing and potential collaborative programs, to determine optimum roles.

The full integration of operational oceanography with a national sustained, systematic ocean monitoring program also needs to be addressed.

DFO Science is also examining future oceanographic modelling initiatives in collaboration with EC that would exploit EC subject matter strengths in such areas as coupled models and operational data assimilation.

Finally, as DFO develops a national policy on operational oceanography, and fosters its continued development in a co-ordinated manner, feedback from all affected communities is essential, and most welcome.

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## Société canadienne de météorologie et d'océanographie Canadian Meteorological and Oceanographic Society

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### Information

Président Comité scientifique: François Saucier (saucierf@dfo-mpo.gc.ca)

Responsable des exposants: Jean-Louis Chaumel (jean-louis\_chaumel@uqar.qc.ca)



## **The Canadian Foundation for Climate and Atmospheric Sciences (CFCAS)**

## **La Fondation canadienne pour les sciences du climat et de l'atmosphère (FCSCA)**

**INVESTISSEMENT DE 8,9 MILLIONS DE DOLLARS DANS UN NOUVEAU RÉSEAU DE RECHERCHE À L'UNIVERSITÉ DALHOUSIE**

### **L'amalgame de l'océanographie et des sciences de l'atmosphère pour une meilleure compréhension du changement climatique**

Halifax, Nouvelle-Écosse - 21 septembre 2001 – L'honorable Robert Thibault, Ministre d'État à l'Agence de promotion économique du Canada atlantique, au nom de l'honorable Brian Tobin, Ministre de l'Industrie et Ministre responsable du Conseil de recherches en sciences naturelles et en génie du Canada (CRSNG), l'honorable Herb Dhaliwal, Ministre de Pêches et Océans Canada, et la Fondation canadienne pour les sciences du climat et de l'atmosphère (FCSCA), a annoncé aujourd'hui des investissements importants dans le Réseau de recherche canadien SOLAS (Canadian Surface Ocean Lower Atmosphere Study).

Le CRSNG et la FCSCA investiront près de neuf millions de dollars dans le Réseau SOLAS, tandis que Pêches et Océans Canada apportera une contribution à peu près équivalente à celle du CRSNG, de la FCSCA et de tous les autres partenaires. Cette contribution consistera en heures de service de navires, jusqu'à concurrence de près de 90 jours, en travail accompli par plusieurs scientifiques et en prêt d'installations de recherche et d'équipement.

Ce réseau de recherche étudiera les interactions-clés entre l'atmosphère et les océans liées aux changements climatiques. "Les recherches effectuées par les chercheurs qui œuvrent au sein de SOLAS sont essentielles, en ce qu'elles devraient permettre une meilleure compréhension des phénomènes liés aux changements climatiques. L'insatiable curiosité de ces chercheurs et leurs perspectives innovatrices aideront à hisser le Canada au premier rang dans le domaine des études du climat", a affirmé M. Thibault.

"En tant qu'organisme majeur de recherche océanographique au Canada, mon ministère est fermement décidé à faire avancer la compréhension scientifique en coopérant avec d'autres organisations", a affirmé Herb Dhaliwal, Ministre des Pêches et des Océans. "Le Réseau SOLAS ouvre aux scientifiques du Ministère des perspectives passionnantes de travail en collaboration avec d'autres chercheurs de premier rang au pays afin d'accroître nos connaissances sur les changements climatiques".

M. William Miller, professeur d'océanographie à l'Université Dalhousie, dirigeant du Réseau SOLAS et membre du comité de direction scientifique sur l'étude International Geosphere-Biosphere - SOLAS, a abordé l'axe d'étude du groupe de recherche: "Nous croyons que la connaissance des processus écologiques, chimiques et physiques intervenant dans la rétroaction entre l'océan et l'atmosphère est essentielle à la compréhension et à la prédiction de l'impact global des changements climatiques". M. Miller et son équipe de recherche vérifieront cette hypothèse au cours de deux expéditions importantes dans le Pacifique subarctique et dans la région du nord-ouest de l'Atlantique, au cours desquelles ils recueilleront des échantillons des océans et de l'atmosphère. Le Réseau SOLAS engagera la collaboration de 43 chercheurs canadiens, dans les domaines de l'océanographie et des sciences de l'atmosphère, issus de neuf universités, d'établissements gouvernementaux et de partenariats internationaux avec l'industrie. SOLAS offrira également à 30 étudiants diplômés et à 15 scientifiques de niveau postdoctoral des occasions d'acquérir une formation dans un contexte de collaboration internationale.

M. Gordon McBean, président du conseil d'administration de la FCSCA a déclaré: "Les connaissances conjuguées des scientifiques de renommée internationale que compte SOLAS permettront inévitablement de prédire de manière plus précise les changements climatiques et leurs répercussions sur notre environnement et notre santé. Ceci cadre avec l'un des objectifs de la FCSCA qui est de fournir aux décideurs les meilleures données scientifiques possibles afin de redoubler d'effort pour combattre les changements climatiques". "La portée de la coopération entre les océanographes et les chimistes spécialistes de l'atmosphère du Réseau SOLAS est extraordinaire. En raison du regroupement de la recherche dans des domaines pertinents, SOLAS devrait être en mesure de développer des modèles climatiques beaucoup plus précis", a affirmé André Isabelle, directeur, Environnement et ressources naturelles au CRSNG, au nom du président du Conseil, Tom Brzustowski.

Trois autres réseaux de recherche environnementale ont été annoncés en mai dernier, à Montréal, par le Dr Gilbert Normand, secrétaire d'État, Sciences, Recherche et Développement (voir *CMOS Bulletin SCMO*, Vol.29, N0.5, pages 147-150).

Le CRSNG est le principal organisme national chargé d'effectuer des investissements dans les gens, la découverte et l'innovation. Il appuie la recherche fondamentale universitaire par l'entremise de subventions de recherche, des projets de recherche dans le cadre de partenariats entre les universités, le gouvernement et le secteur privé, ainsi que la formation de personnel hautement qualifié.

La Fondation canadienne pour les sciences du climat et de l'atmosphère est une initiative du gouvernement du Canada visant à renforcer la capacité scientifique du Canada, à améliorer notre compréhension des éléments climatiques et à fournir des données pertinentes aux décideurs. La FCSCA subventionne la recherche de scientifiques d'universités canadiennes portant sur les systèmes climatiques, les changements climatiques, le temps violent, la qualité de l'air et des prévisions environnementales marines.

#### Établissements participants:

##### 1) Organismes subventionnaires:

CRSNG;  
FCSCA.

##### 2) Universités:

Université Dalhousie;  
Université McGill;  
Université du Québec à Montréal;  
Université du Québec à Rimouski;

Université de la Colombie-Britannique;  
Université York;  
Université de Calgary;  
Université Memorial;  
Université de Victoria.

##### 3) Organismes d'État:

Pêches et Océans Canada;  
Service météorologique du Canada  
(Environnement Canada).

##### 4) Entreprises:

BDR Research;  
Ocean Carbon Systems, Inc.

Pour obtenir plus de renseignements, veuillez communiquer avec M. William Miller, Université Dalhousie, Réseau SOLAS, (902) 494-7177, [william.miller@dal.ca](mailto:william.miller@dal.ca)

### **Le réseau de recherche Surface Ocean Lower Atmosphere Study (SOLAS)**

Le Canada étant délimité par trois océans, il lui est primordial de s'intéresser à l'impact des mécanismes océaniques en évolution sur les conditions atmosphériques, les ressources et le transport. Le réseau de recherche SOLAS fait partie d'une nouvelle initiative internationale visant à comprendre les interactions entre les océans et l'atmosphère, ainsi que les conséquences de ces interactions sur le changement climatique global.

#### Objectifs de recherche:

- Déterminer la distribution des gaz à l'état de trace dans les régions du nord-ouest de l'Atlantique et du Pacifique subarctique, et la manière dont ces gaz affectent les propriétés chimiques et physiques de l'atmosphère;
- Augmenter notre aptitude à estimer les émissions de gaz à l'état de trace provenant des bassins océaniques entiers, en utilisant des techniques de télédétection;
- Augmenter notre capacité à modéliser des échanges océan-atmosphère tant à l'échelle régionale que saisonnière, de manière à améliorer les méthodes de prédiction du changement climatique.

La caractéristique unique de SOLAS fait appel à un nombre important de résidents spécialistes de la recherche atmosphérique et marine. Le réseau exigera la collaboration de 43 chercheurs issus de neuf universités, de 22 chercheurs de Pêches et Océans Canada et du Service météorologique du Canada, de deux

collaborateurs de l'industrie ainsi que de partenaires internationaux dont le nombre augmentera. Ce groupe de chercheurs étudiera les interactions principales entre le système biochimique marin et l'atmosphère, et l'impact de ces interactions sur le changement climatique. Le réseau de recherche canadien SOLAS fournira à 30 étudiants diplômés des occasions d'acquérir une formation.

**In the next *CMOS Bulletin SCMO* Issue**

**Dans le prochain numéro du  
*CMOS Bulletin SCMO***

1) The Canadian Prairie Drought of 2001: a four billion dollar shortfall? by Ray Garnett, University of Saskatchewan.

2) Sensitivity of spring wheat yield of the Canadian Prairie Region to climate variations by Ali Basiji and William A. Gough.

3) Project Atmosphere Canada, Science Education – Rising to the Challenge by Eldon Oja, MSC.

Don't miss reading your next issue, *CMOS Bulletin SCMO*, Vol.30, No.1, February 2002.

Ne manquez pas de lire votre prochain numéro du *CMOS Bulletin SCMO*, Vol.30, No.1, Février 2002.

Résultats de recherche escomptés:

■ Une meilleure information et une meilleure compréhension de la composition chimique de l'atmosphère ainsi que de la surface de l'océan;

■ Une rétroaction exacte sur les conditions climatiques, à temps pour permettre d'ouvoir y réagir et de prendre des mesures correctives;

■ Une augmentation de la capacité de former des scientifiques de l'environnement qui soient initiés aux techniques de pointe en matière de recherche océanographique et atmosphérique.

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## **The Canadian Foundation for Climate and Atmospheric Sciences (CFCAS)**

## **La Fondation canadienne pour les sciences du climat et de l'atmosphère (FCSCA)**

### **\$8.9 MILLION FOR A NEW RESEARCH NETWORK AT DALHOUSIE UNIVERSITY**

#### **Ocean and atmospheric science integrated for a better understanding of climate change**

(Halifax, Nova Scotia - 21 September 2001) – The Honourable Robert Thibault, Minister of State for the Atlantic Canada Opportunities Agency, on behalf of Minister Brian Tobin, Minister of Industry and Minister responsible for the Natural Sciences and Engineering Research Council of Canada (NSERC), the Honourable Herb Dhaliwal, Minister of Fisheries and Oceans, and the Canadian Foundation for Climate and Atmospheric Sciences (CFCAS) today announced major investments in the Canadian Surface Ocean Lower Atmosphere Study (SOLAS).

NSERC and CFCAS will contribute almost \$9 million directly to the new research network, with Fisheries and Oceans matching this support (and that of other partners) through the contribution of almost 90 days of ship time, the expertise of several scientists and the use of research facilities and equipment. The Research Network will study the key interactions between the atmosphere and oceans as they relate to climate change.

"The research carried out by SOLAS scientists is essential because it will allow us to better understand the diverse phenomena that are linked to climate change. The insatiable curiosity of these researchers together with their innovative approaches will help make Canada a world leader in the field of climate studies," said Mr. Thibault. "As the major marine research organization in Canada, my department is deeply committed to advancing scientific understanding through collaborative partnerships with other organizations," Mr. Herb Dhaliwal said. "The SOLAS initiative is an exciting opportunity for my department's scientists to work with other leading researchers in Canada to increase our knowledge of climate change."

Dr. William Miller, professor of Oceanography at Dalhousie University, project leader for SOLAS and member of the the Scientific Steering Committee for the International Geosphere-Biosphere Programme's SOLAS initiative, described the research group's basic premise: "We think that quantitative knowledge of the ecological, chemical and physical processes involved in the feedback between the ocean and the atmosphere is essential for understanding and predicting the global impact of future climate change. Examining these critical processes is what SOLAS is about." Dr. Miller and his research team will address these problems during two major expeditions to the Pacific Subarctic and the Northwest Atlantic, where they will gather oceanic and atmospheric samples.

The SOLAS Network involves 43 Canadian researchers in oceanographic and atmospheric science from nine universities and government institutions, as well as international industry partners. SOLAS will also allow 30 graduate students and 15 postdoctoral scientists to further their training in a setting of international collaboration.

Gordon McBean, Chair of the CFCAS Board of Trustees, believes that "the combined knowledge of the internationally-renowned scientists that make up the SOLAS network will inevitably result in more precise predictions about climate change and its impacts on human health and the environment. This meets one of CFCAS's objectives, which is to provide decision-makers with the best scientific data possible, as a tool to help curb climate change."

According to André Isabelle, NSERC's Director, Environment and Natural Resources, who spoke on behalf of Council president Tom Brzustowski, "The extent of cooperation between oceanographers and atmospheric chemists in the SOLAS network is extraordinary. Thanks to the integration of research in so many relevant fields, SOLAS should be able to develop far more precise climate models."

Three other environmental research networks were announced last May in Montreal by Dr. Gilbert Normand, Secretary of State for Science, Research and Development (see *CMOS Bulletin SCMO*, Vol.29, No.5, pages 144-146).

NSERC is the primary federal agency investing in people, discovery, and innovation. The Council supports both basic research through research grants and project research through partnerships of universities with industry. NSERC also supports the advanced training of highly qualified people in both areas.

The CFCAS is an initiative of the Government of Canada designed to help the country meet its environmental objectives. The CFCAS funds research in the areas of climate system science, climate change, extreme weather, air quality, and marine environmental prediction.

#### Participating Establishments:

##### 1) Granting Agencies:

NSERC;  
CFCAS.

##### 2) Universities:

Dalhousie University;  
McGill University;  
Université du Québec à Montréal;  
Université du Québec à Rimouski;  
University of British Columbia;  
York University;  
University of Calgary;  
Memorial University of Newfoundland;  
University of Victoria.

##### 3) Government agencies:

Department of Fisheries and Oceans;  
Meteorological Service of Canada (Environment Canada).

##### 4) Industry:

BDR Research;  
Ocean Carbon Systems, Inc.

For more information, please contact Dr. William Miller, Dalhousie University, SOLAS Network, (902) 494-7177, [william.miller@dal.ca](mailto:william.miller@dal.ca)

## **The Surface Ocean Lower Atmosphere Study (SOLAS) Research Network**

Bounded by three oceans, Canada has a vital interest in the impact of changing ocean processes on weather patterns, resources, and transportation. The SOLAS research network is part of a new international initiative aimed at understanding the interactions between the oceans and the atmosphere, and the implications of those interactions for global climatic change.

#### Research Goals:

- To determine the distribution of trace gases across the northwestern Atlantic and sub-Arctic Pacific, and how they affect the atmosphere's chemical and physical properties;
- To increase our capacity to estimate trace gas emissions from whole oceanic basins using remote-sensing technology;
- To increase our capacity to model ocean-atmosphere exchange over regional and seasonal scales, thereby improving methods for predicting climate change.

SOLAS integrates a wide range of atmospheric and marine-research specialists. The network will involve 43 researchers from nine universities, 22 government researchers from the Department of Fisheries and Oceans and the Meteorological Service of Canada, two industrial collaborators and a growing number of international partners. Together, they will examine the key interactions of the marine biochemical system and the atmosphere, and the impact of these interactions on climate change. The SOLAS network will provide training opportunities for 30 graduate students.

#### Possible Research Outcomes:

- Improved information and understanding of the chemical composition of the atmosphere and surface ocean;
- Accurate feedback on climatic conditions to allow us to respond and to take remedial action;
- Increased capacity to train environmental scientists who are familiar with state-of-the-art methods in oceanographic and atmospheric research.

## Increased Rains Could Change Impact of Amazon Deforestation

Scientists and computer simulations have long predicted that the deforestation of the Amazon Basin would mean less rainfall and evaporation and warmer temperatures for the area. However, a new look at climatological data sets for the area finds that rainfall in the Amazon Basin has increased more than 20% in the past 40 years, and that may change the impact of the deforestation.

What may be the cause of the increased rainfall and why does it differ from the numerical models? According to Tsing-Chang Chen and his colleagues at the Department of Geological and Atmospheric Sciences at Iowa State University, in Ames Iowa, the models did not take into account climatic changes in global scale circulation patterns - worldwide shifts in rainfall patterns. Their research is published in the October 2001 *Bulletin of the American Meteorological Society*.

"Previous scientific studies relating forest re-growth, erosion rates, plant succession, nutrient cycling and insect populations to deforestation of the Amazon Basin may have overlooked this important contributing factor," said Chen. "Interdecadal changes in circulation patterns are driving more water vapor toward the Amazon Basin, thus increasing local rainfall."

Based on several sources, it is estimate that most of the Amazon rainforest would disappear in less than 100 years. Numerous computer simulations using climate models predict that when all of the Amazon rainforest is replaced by pasture, there will be higher surface temperatures and less evaporation and rainfall. These hydrological changes after a massive deforestation may make reforestation difficult over the Amazon Basin.

But instead of drying, which would be expected due to deforestation, Amazonia has experienced increased precipitation, which would accelerate forest regeneration and erosion.

"The increased precipitation perhaps has suppressed the full, either positive or negative, regional or global climatic impact of deforestation," added Chen. For instance more rain could have enhanced new growth in deforested and reforested lands. On the other hand the enhanced rainfall may have made soil erosion worst. Plant and animal species could also be changed due to the changes in precipitation.

"We do not yet realize the impact of increased precipitation in this region," said Chen. "But what we did learn from this research is that studies assessing the impact of deforestation in the Amazon Basin must take into account changes in global circulation patterns."

Making scientifically informed decisions about future land-management policies in the Amazon will be more difficult than previously thought, according to Chen.

"Failure to consider global circulation changes over an interdecadal time scale might lead to poorly formulated long-term land management policies. For example, a future possible decrease in global water-vapor convergence over the Amazon would exacerbate local precipitation reductions due to deforestation and could lead to drought of magnitude not anticipated from studies of the past 40 years."

Chen and his colleagues analyzed the Global Historical Climatological Network, longwave radiation, and reanalysis data over the Amazon Basin.

Source: [www.ametsoc.org](http://www.ametsoc.org) (5 october 2001).

Note from the Editor: The PDF file of the paper, entitled "*Suppressing Impacts of the Amazonian Deforestation by the Global Circulation Change*," is available by contacting Stephanie Kenitzer at (425) 432-2192 or by e-mail at [Kenitzer@dc.ametsoc.org](mailto:Kenitzer@dc.ametsoc.org)



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## And may all your Christmases be white

by Dave Phillips

Long before Irving Berlin composed "White Christmas", snow on the ground Christmas morning was as important as turkey, tinsel and toys. Indeed, for most Canadians, Christmas celebrations are not the same on mornings when the landscape is a dreary brown or an emerald green.

For early North American pioneers, noting the colour of the ground cover on December 25 was thought to be helpful for forecasting weather conditions in the coming months. Among the popular Christmas weather proverbs are:

A green Christmas makes a heavy harvest.

At Christmas, meadows green;

At Easter, covered with frost.

The shepherd would rather see his wife enter  
the stable on Christmas Day than the sun.

If windy on Christmas Day, the trees will  
bear much fruit.

A warm Christmas, a cold Easter;  
A green Christmas, a white Easter.

Christmas in mud, Easter in snow;  
Christmas in snow, Easter in mud.

Thunder during Christmas week indicates  
there will be much snow during the winter.

If ice will bear a man at Christmas,  
it will not bear a mouse afterward.

To predict the likelihood of a white Christmas where you live, we turn to weather records collected over the past 30 years. The accompanying table shows the chances of snow covering the ground to a depth of two centimetres or more sometime between Christmas Eve and Boxing Day.

Almost all of Quebec, Northern Ontario, the central and northern Prairies, the Arctic, Yukon and northern British Columbia can count on a white Christmas every year. In southern Ontario, six to eight out of 10 Christmases usually

show up white. There is a 40 percent chance along the Atlantic coast of Nova Scotia, and less than a 20 percent chance or two out of 10 years in the southwestern mainland of British Columbia and on Vancouver Island.

Those dreaming of a white Christmas might consider moving to Québec City, Thunder Bay, Winnipeg or Saskatoon where there is a 100 percent chance that the ground will be white during the holiday season. Those four cities have had a perfect record during the past 30 years, but long-time residents of Winnipeg may remember the snow-free Christmas in 1939. As for other major cities, the likelihood is as follows: Halifax 69 percent, Montréal 83 percent, Toronto 63 percent, Regina 94 percent, Calgary 63 percent, Edmonton 98 percent and Vancouver 6 percent.

This says nothing about the depth of snow - only that there would be 2 centimetres or more. Of the 100 major towns and cities in this survey, Timmins, Ontario, had the deepest average snow cover of 47 centimetres on Christmas morning; Québec City was close at 40 centimetres. For some southeastern cities, downtown locations have a slightly smaller chance of experiencing a white Christmas than suburban locations. For example, downtown Toronto has a 54 percent chance while Pearson International Airport, only 19 kilometres away, has 63 percent. However, in Edmonton, both city and country airports are 98 percent sure of having a white Christmas.

I'm dreaming of a white Christmas  
Just like the ones I used to know

Generally, Christmas has been greener for more Canadians on average over the last five years than at any time over the past 30 years. A trend? Another symptom of the greenhouse effect? No one knows for certain.

On Christmas morning, 1983, most Canadians in eastern Canada, southern Alberta and southern British Columbia woke up to the most widespread green Christmas in 30 years. On the other hand, in 1972, all of Canada was snow-covered during the holiday period. And the years 1971 and 1973 were almost as white from coast to coast.

Will your Christmas be white this year? Again, no one knows for sure. But if the record of the last 30 years holds true, Christmas should be white at Quebec City, Winnipeg, and in the North; green at Victoria and Vancouver; and it could go either way at Toronto, Halifax and St. John's.

Whatever the weather, may your Christmas be merry.

### Christmas Day Snow Cover

	Average Depth (cm)	Greatest Amount - Year (cm)	Least Amount (cm)	Chance of a White Christmas (percent)
St. John's	12	51 - 1958	0	64
Charlottetown	19	89 - 1970	0	85
Halifax	10	64 - 1970	0	69
Fredericton	20	104 - 1970	0	87
Québec City	40	91 - 1968	8	100
Montréal	15	51 - 1970	0	83
Ottawa	18	64 - 1970	Trace	84
Toronto	5	20 - 1963	0	63
London	9	30 - 1963	0	75
Winnipeg	17	80 - 1955	2	100
Regina	14	36 - 1964	Trace	94
Saskatoon	12	28 - 1961	5	100
Calgary	5	25 - 1955	0	63
Edmonton	16	43 - 1970	1	98
Vancouver	1	30 - 1964	0	6
Victoria	32	8 - 1971	0	5
Whitehorse	23	51 - 1971	5	100
Yellowknife	26	51 - 1957	5	100

The *CMOS Bulletin SCMO* Editorial Board wishes every member the Compliments of the Season!

**Welcome 2002!**



Le comité éditorial du *CMOS Bulletin SCMO* présente à tous les membres les souhaits de la saison!

**Bienvenue 2002!**



**The Skeptical Environmentalist  
Measuring the Real State of the World**  
by Bjorn Lomborg  
Cambridge University Press, 515 pages  
(\$46.50)<sup>1</sup>

Book reviewed by Andrew Weaver  
University of Victoria

Have environmental issues become 'overblown'? Perhaps we should recycle less<sup>1</sup>. Why ban DDT when apples are more carcinogenic? Did you know that "our intake of coffee is about 50 times more carcinogenic than our intake of DDT before it was banned"<sup>2</sup>? Does this sound skeptical? Read on.

In 1998, Bjørn Lomborg<sup>3</sup>, an Associate Professor in the Department of Political Science, University of Aarhus in Denmark, wrote a series of controversial articles in the Danish newspaper *Politiken*<sup>4</sup> in which he offered his perspective on a variety of environmental issues. Not surprisingly, this brilliant marketing ploy for his subsequently released book entitled *Verdens Sande Tilstand*<sup>5</sup>, sparked an enormous, and largely negative, response from his colleagues as well as many Danish scientists and researchers<sup>6</sup>.

As the table was being set for the release of an updated and translated version of the book, the British newspaper, *The Guardian*, published a selection of appetizers<sup>7</sup> which immediately stirred the stomach juices of many environmentalists. The entrée, *The Skeptical Environmentalist: Measuring the Real state of the World* instantly became a best seller<sup>8</sup> through its offering of a veritable smorgasbord of reasons why virtually all environmental issues have been overblown or are not of serious concern.

World-wide opposition to the conclusions and contents of Lomborg's book has been fierce. An anti-Lomborg website<sup>9</sup> was set up in Britain by some of his opponents<sup>10</sup> where visitors are greeted by a photo of Bjorn Lomborg who was unaware that dessert consisted of a Baked Alaska<sup>11</sup>.

A perhaps inadvertent consequence of this continued vocal, and high profile criticism is a guarantee that *The Skeptical Environmentalist: Measuring the Real state of the World* will remain a bestseller for a long time to come. But what of the book. Is it really as bad as some of its most vocal critics make out? Is it worthy of so much publicity?

Pick your favourite environmental issue: food/water shortages, deforestation, ozone depletion, pesticide use,



GM foods, pollution (air, sea or land), global warming amongst a few. The Lomborg view is that "children born today — in both the industrialized world and developing countries— will live longer and be healthier, they will get more food, a better education, a higher standard of living, more leisure time and far more possibilities [reviewer's comment: for what?] — without the global environment being destroyed. And that is a beautiful world".<sup>12</sup>

While there is much within the book that I found interesting, and in fact agree with,<sup>13</sup> overall the book fails to provide a compelling case against environmentalism. It is relentless, rather than selective, in criticizing virtually all environmental concerns.

Lomborg uses the work of various United Nations and National agencies whenever it seems to support his points, yet questions the validity of agencies' results when they appear to support opposing opinions. For example, in his discussion of soil erosion<sup>14</sup> Lomborg cites work from UNEP, a UN environmental organization, to suggest that soil degradation has had only a small effect on agriculture production since the end of World War II. Similarly, in support of his discussion of oxygen depletion in coastal waters, he refers to a six volume assessment from the NOAA<sup>15</sup> and the White House Office of Science and Technology.

But when it comes to the United Nations Intergovernmental Panel on Climate Change (IPCC), suddenly the scientific analyses done by hundreds of the world's leading experts no longer stands up to his scrutiny. Instead, Lomborg, a political scientist, offers the reader an apparent explanation for climate change over the 20<sup>th</sup> century that has been overlooked by these scientists. Specifically, we are led to believe that the solar sunspot cycle, through its mysterious relationship with cloud cover is really to blame for global warming. Conveniently left out of the discussion is perhaps the most compelling piece of work that has quantitatively nailed down the role of solar forcing in 20<sup>th</sup> century climate change.<sup>16</sup> Of course, this work was examined and considered in the IPCC Third Scientific Assessment as it developed its recently released statement: "There is now new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities".<sup>17</sup>

Also, on the issue of climate change, Lomborg notes "Forecasting a century into the future is a business fraught with pitfalls"<sup>18</sup>, although when it suits his thesis, he uses 200 year forecasts of population growth<sup>19</sup> and 400 year

<sup>1</sup> Based on a review that appeared in the *Vancouver Sun*, page H18, November 10, 2001.

idealized predictions of global temperature change under assumed technology and economic trends.<sup>20</sup> In several places published papers which support the anti-establishment view of science have lofty adjectives describing them (e.g. "potentially revolutionary research"<sup>21</sup>) and are now published in a "respected journal"<sup>22</sup>; others which don't, are noted with passing reference, apparently ignored (as noted above), or in at least one case disparagingly referred to.<sup>23</sup> Worrying, too, is his advocacy for more open discussions on geoengineering such as "putting sulfur particles into the stratosphere (cooling the earth)"<sup>24</sup>. I would suggest that prior to moving down this path, everyone should read the children's book "The King, the Mice and the Cheese".<sup>25</sup>

The issue of uncertainty is central to arguments concerning the validity of scientific findings, yet are noticeably absent in Lomborg's socioeconomic assessments and projections of the true state of the past, present and future world. This sort of inconsistency takes away from the book, and leaves the reader wondering whether the tactics being used are similar to those of a legal defense team that knows it has lost its case. Numerous questions of doubt are thrown at the public jury with the desperate hope that one will stick and render a not-guilty verdict on our effect on the environment.

On the issue of deforestation, Lomborg paints a picture of a greening, more bountiful earth based partially on his interpretation of United Nations Food and Agriculture Organization (UN FAO) reports. I wondered whether I read the same version of the UN FAO, State of the World's Forests 2001.<sup>26</sup> In their press release, the UN FAO state: "Tropical countries continue to lose their forests at a very high rate... During the 1990s, the loss of natural forests was 16.1 million hectares (ha) per year, of which 15.2 million occurred in the tropics. This corresponds to annual losses of 0.4 percent globally and 0.8 percent in the tropics"<sup>27</sup>. Of course, overall net deforestation was less as there have also been areas of forest regrowth, "Natural forest expansion was estimated at 3.6 million ha annually in the past decade, of which 2.6 million ha were in non-tropical countries and 1.0 million ha in the tropics"<sup>28</sup>, as well as plantations "Plantations also contributed to the gain in forest area, with 1.9 million ha of new plantations per year in tropical countries and 1.2 million ha in non-tropical areas"<sup>29</sup>.

With all this said, Lomborg makes an important point throughout his book, namely that there is an onus on the developed world to assist the developing world to maintain and improve the state of the environment as they so rightly move towards a standard of living parallel to our own. This emphasis on global equity is perhaps the most important aspect of the book. Lomborg rightly points out that many environmental issues have been sensationalised by the media, but fails to note that many of the environmental success stories<sup>30</sup> were indeed the result of new technologies developed in response to policy, that was in turn implemented in response to science and subsequent

public pressure.

As an eternal optimist, and a scientist who has spent many years working in the area of climate change, I too believe that the future bodes well for our children. Perhaps the major difference between our views is that I believe this will arise through a global realization of the value of the environment to our quality of life. I do not believe that market forces alone will lead us towards the Garden of Eden unless, as noted above, we are guided by sound science/technology and sound policy based on this science/technology.

It is a shame that this book spends so much time systematically attacking the work of the Worldwatch Institute and other well-known environmental groups/individuals. This makes for boring prose through which the average reader has difficulty wading. In fact, the book is repetitive at times, and often fails to elucidate the forest from the trees. The text is swamped with 2930 footnotes which makes for a much interrupted read. Buried within footnote 2179, my own work is provided as supporting evidence to a statement concerning climate models being used in curve fitting exercises of the 20<sup>th</sup> century global mean temperature trend. In fact, I had argued the exact opposite in my piece.

The Skeptical Environmentalist will doubtless spark debate in university lectures but it is unlikely to have wide appeal. Unfortunately, I also foresee many thousands of hours being wasted by scientists around the world rebutting snippets from this book that are offered up as justification for not taking action on certain environmental issues.

All in all I thought Lomborg missed a wonderful opportunity to enlighten us all on the science and policy behind the 20<sup>th</sup> century environmentalism. Through a comparison of environmental trends with increases in prosperity, Lomborg develops a central premise that things get better as we get wealthier. While these two factors may coexist, we all know correlation doesn't prove causality.

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<sup>1</sup> p. 209 of *The Skeptical Environmentalist: Measuring the Real State of the World* by Bjørn Lomborg.

<sup>2</sup> p. 235, I suspect that this would depend whether or not crop dusters were spraying DDT over you while you were sipping your morning coffee.

<sup>3</sup> See <http://www.lomborg.com>

<sup>4</sup> See <http://politiken.dk>

<sup>5</sup> Translated to: *The True State of the World*

<sup>6</sup> See <http://www.au.dk/~cesamat/debate.html> for a synopsis of some of the responses to Lomborg's pieces. In addition, a review of his book *Verdens Sande Tilstand* is provided there by his colleague Dr. Mikael Skou Andersen, also in the Department of Political Science, University of Aarhus.

<sup>7</sup> On August 15<sup>th</sup>, 16<sup>th</sup> and 17<sup>th</sup>. The Economist also invited Lomborg to contribute a piece on August 2<sup>nd</sup>.

<sup>8</sup> Currently ranked 55<sup>th</sup> on the Amazon.com sales list.

<sup>9</sup> [www.anti-lomborg.com](http://www.anti-lomborg.com)

<sup>10</sup> According to [www.anti-lomborg.com](http://www.anti-lomborg.com) "This site was started by a bunch of environmental writers, academics and activists in Oxford, England, who were mildly irritated by the publication in The Guardian newspaper of a series of 'green wash' articles written by Bjørn Lomborg"

<sup>11</sup> The pie thrower and author Mark Lynas claimed "I wanted to put a Baked Alaska in his smug face, in solidarity with the native Indian and Eskimo people in Alaska who are reporting rising temperatures, shrinking sea ice and worsening effects on animal and bird life."

(<http://www.anti-lomborg.com/press1.htm>)

<sup>12</sup> p. 352.

<sup>13</sup> For example: indoor air pollution is a bigger issue today than outdoor air pollution; much of the discussion surrounding GM foods is based on ill-founded fear rather than science; increased malaria is not a likely consequence of global warming; there is ample food and water in the world.

<sup>14</sup> p. 105.

<sup>15</sup> National Oceanic and Atmospheric Administration — a United States agency

<sup>16</sup> Stott, P.A., Tett, S.F.B., Jones, G.S., Allen, M.R., Mitchell, J.F.B., and Jenkins, G.J., 2000: External control of 20<sup>th</sup> century temperature by natural and anthropogenic forcings. *Science* **290**, 2133-2137.

<sup>17</sup> *Summary for Policymakers, A Report of Working Group I of the Intergovernmental Panel on Climate Change.* <http://www.ipcc.ch/pub/spm22-01.pdf>

<sup>18</sup> p. 278.

<sup>19</sup> Fig. 11 on p. 46.

<sup>20</sup> Fig. 151 p. 285.

<sup>21</sup> p. 271.

<sup>22</sup> p. 248.

<sup>23</sup> On p. 278, a piece not towing the Lomborg line on solar influences on climate is referred to as an "IPCC-loyal study".

<sup>24</sup> p.323. While not mentioned by Lomborg, some have also discussed putting satellites in orbit with retractable 'umbrellas' to block incoming solar radiation and so combat global warming. Imagine if the umbrella got stuck in 'block-sun mode'!

<sup>25</sup> by Nancy amd Eric Gurney, Beginner Books a Division of Random House, 1965. In this book (a wonderful metaphor for adaptation to climate change), a King's castle is infested with mice (as he likes cheese). The King brings in his wise elders and they suggest bringing in cats to get rid of the mice. This works, but the castle gets infested with cats. Subsequent meetings with the elders suggest bringing in dogs to get rid of the cats, bringing in lions to get rid of the dogs, and bringing in elephants to get rid of the lions. Finally, to get rid of the elephants, the King brings back the mice and learns how to live with them.

<sup>26</sup> <http://www.fao.org/docrep/003/y0900e/y0900e00.htm>

<sup>27</sup> <http://www.unece.org/trade/timber/sofo-press.doc>

<sup>28</sup> *ibid*

<sup>29</sup> *ibid*

<sup>30</sup> For example, ozone depletion, air quality.

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## Montée des eaux du Pacifique: Le Tuvalu sera évacué l'an prochain<sup>1</sup> Premières victimes du changement climatique?<sup>2</sup>

Washington - La montée des eaux due au réchauffement climatique va provoquer l'évacuation de l'archipel de Tuvalu, dont les habitants quitteront définitivement le petit éden du Pacifique à partir de 2002, a annoncé Lester Brown, président du Earth Policy Institute.

*"Les dirigeants du Tuvalu ont admis leur défaite dans la bataille contre la montée des eaux. La Nouvelle Zélande a accepté d'accueillir l'ensemble des 11 000 citoyens de Tuvalu, la migration devant débuter en 2002"*, a écrit le président de cet institut basé à Washington, consacré à l'environnement.

Cet État de Micronésie *"est le premier pays que les gens sont forcés d'évacuer à cause de la montée des eaux, mais ce ne sera certainement pas le dernier"*, écrit encore M. Brown.

*"Après que l'Australie eut refusé d'accueillir les Tuvaluans, la Nouvelle Zélande a accepté l'ensemble de cette population"*, ajoute-t-il.

*"Mais qu'en sera-t-il des 311 000 personnes qui pourraient être forcées d'évacuer les Maldives. Ou des millions*

*d'autres qui vivent dans des pays peu élevés"*, demande ce responsable, fondateur du Worldwatch Institute et toujours président de son comité directeur.

### Marée haute

Tuvalu a une superficie de 26 km<sup>2</sup> répartis sur neuf atolls.

Funafati, capitale du pays située sur une île qui porte son nom, a subi une marée de printemps qui a atteint 3,2 mètres alors qu'aucun endroit du territoire de Tuvalu n'est à plus de 4,5 mètres au-dessus du niveau de la mer.

En septembre, Tuvalu avait été admis à l'ONU, devenant le 189<sup>e</sup> État membre. Anciennement Ellice Islands, l'archipel a fait partie d'un protectorat britannique pendant 86 ans avec les îles Gilbert. Après s'être séparé de ces dernières, Tuvalu est devenu indépendant en 1978.

<sup>1</sup> Selon l'Agence France-Presse. Source: Le Devoir, 16 novembre 2001, page B7.

<sup>2</sup> Le sous-titre est du Rédacteur

## Warren L. Godson

1920 - 2001

Dr. Warren Godson, Emeritus Research Scientist with Environment Canada, died on October 31, 2001. For decades Dr. Godson was Canada's leading atmospheric research scientist. He was Director-General of Atmospheric Research in the Meteorological Service from 1973 to 1984 and then Senior Science Advisor until 1991 when he was appointed Emeritus Research Scientist. Dr. Godson succumbed after a lengthy struggle with cancer at Sunnybrook Health Science Centre in Toronto.

Warren Lehman Godson was born on May 4, 1920, in Victoria, British Columbia. His mother was a high school teacher in mathematics and his father a purser with the Canadian Pacific Steamship Company. Warren's early schooling was in Victoria. He obtained an honours degree in chemistry at the University of British Columbia in 1939 and a master's degree in physical chemistry in 1941. He came to the University of Toronto later that year to work towards a doctorate in chemistry. However, he soon found that his interest in chemistry was considered to be too theoretical by the university and he was persuaded to apply to the Meteorological Service where scientists were being recruited for wartime duties. He applied and was immediately accepted

In 1942 the Meteorological Service was recruiting and training scientists to become meteorologists (metmen) for service with the Royal Canadian Air Force. Early in the training course his instructors realized that Warren Godson was an exceptional recruit and already knew more meteorological theory than either the intensive or advanced training courses had to offer. Consequently, Warren then assisted with the training courses and began research in several aspects of theoretical and applied meteorology. This research led to a master's degree in physics at the University of Toronto in 1944. Warren's only Meteorological Service field experience was in the summer of 1944 when he worked as the principal upper-air forecaster at the Montréal Dorval Transatlantic Forecast Office.

After the war Warren Godson became a member of Dr. Wendell Hewson's new training and research section at meteorological headquarters. He instructed in the Master's degree course in physics (meteorology) and, with colleagues Clarence Penner and Al Crocker, was active in preparing material that could be used by the forecasters in the field. Within a short time he published four major papers dealing with synoptic meteorology and incorporated this work into a thesis for his doctorate which he obtained from the University of Toronto in 1948. Another early significant contribution was his paper on dynamic instability in the new *Journal of Meteorology* in 1950. That year he



was the Meteorological Service's representative at the Royal Meteorological Society's Centenary celebrations in London and delivered a paper on the structure of North American weather systems.

In the expanding Meteorological Service in the postwar years Warren became Superintendent of the Atmospheric Research Section and in the 1972 reorganization, Director of the new Atmospheric Processes Research Branch in the Atmospheric Environment Service (the name of the Meteorological Service 1972-1999). The next year he succeeded Dr. Don McIntyre as Director-General of Atmospheric Research, a position he retained until 1984. For two six-month periods in the 1970s when changes were being made in the leadership of the Service, Warren was called upon to act as Assistant Deputy Minister.

Dr. Godson was a tireless researcher and published scores of papers and articles even as he assumed more administrative duties (by 1962 the count was already ninety-two!). Despite his extensive research planning and direction in the Department, he continued with his significant personal research in areas such as thermal dynamics and radiation, the Arctic stratosphere jet stream winds and temperatures, ozone, induced precipitation evaluation, numerical modelling, climate change and so on. He also had major general management responsibilities in the Meteorological Service since from 1951 to 1984 he was head of its research wing with various titles. In this

position, he presided over all research activities of the Service, guided his research scientists and managers in their work, participated in departmental and national research and advisory programs and played a leading role in helping university researchers obtain grants and other resources for their work in the atmospheric sciences. During the early 1950s he was instrumental in planning the Canadian program for the International Geophysical Year (1957/1958).

Dr. Godson was a Special Lecturer in the Physics Department, University of Toronto, from 1948 to 1961 and was named an Honorary Professor in 1975. When he first taught thermodynamics and radiation he began doing research on those topics which led to a textbook *Atmospheric Thermodynamics* written with Julio Iribarne and published in 1974. His teaching also led him into research on infrared radiation which became his major field of interest after his Ph.D. thesis.

Warren Godson was without doubt the best-known and most prominent Canadian in international meteorology. He was proud to have been named a member of the International Meteorological Organization's (IMO) Aerological Commission in 1947 and for fifty years he continued to be active in affairs of the World Meteorological Organization, successor to the IMO. He was a Canadian delegate to each of the ten sessions of the Commission for Atmospheric Sciences (CAS) between 1953 and 1990 and served a term as the president of the Commission from 1973 to 1977. Over the years he chaired several Commission working groups; he considered his ozone group to be particularly important and he chaired it for several years. He became the world expert on ozone and its effect on supersonic transport and climate and developed an "ozonogram" diagram which was used in many countries. As president of CAS in the early 1970s he promoted the establishment of the WMO Global Ozone Observing System, arranged for Canadian participation and the publication of a periodical *Ozone Data for the World*.

Warren's WMO activities were not limited to the Commission for Atmospheric Sciences since he served as an acting member of the WMO Executive Council in 1977 and again in 1979-1980 when he was acting head of the Canadian Meteorological Service. He participated in the discussions at all the sessions of the WMO Congress between 1963 and 1979 as a Canadian delegate or as the CAS president or as a representative of international scientific associations. Dr. Godson was honoured by WMO in 1975 when he was presented with the IMO Prize, the organization's highest honour. At about that time his friends agreed that Warren was better versed in the WMO convention, regulations and terms of reference than anyone else, even members of the Geneva Secretariat.

Besides his participation in WMO activities Dr. Godson was active in affairs of the International Council of Scientific Unions (ICSU) and affiliated organizations - the

International Union of Geodesy and Geophysics (IUGG) and the International Association of Meteorology and Atmospheric Physics (IAMAS). He was general secretary of IAMAS from 1960 to 1975 when he served as the liaison officer between WMO and IUGG. Later, he served as the elected vice-president and then president of IAMAS from 1975 to 1983. Over this period he served on, and frequently chaired, many international commissions dealing with the upper atmosphere, radiation, ozone, and meteorological data for research. He participated in planning for the Global Atmospheric Research Programme in the 1960s and was the rapporteur for meteorology with the International Year of the Quiet Sun (1962-1967) and the Committee on Water Research (1965-1969). Later in the 1980s he was active in the Scientific Committees on Oceanic Research and on Solar Terrestrial Physics. Throughout his career Dr. Godson travelled extensively in Canada and abroad on behalf of Canadian and international meteorology visiting more than a score of countries in all parts of the world.

Warren also found time to participate in the activities of the professional societies. A Fellow of the Royal Meteorological Society, he was president of its Canadian Branch (the predecessor of the Canadian Meteorological and Oceanographic Society) from 1957 to 1959. He was an elected Fellow of the American Meteorological Society and served as a Councillor between 1967 and 1970.

When Warren stepped down from being research director-general in 1984 he was named Senior Science Advisor in the Meteorological Service. His chief function in this position was to do research and to provide advice. He continued in this role until 1991 when he received a special appointment as Emeritus Research Scientist, a position in which, as he later recalled, he was treated exactly like any other scientist in the Service except that he did not receive a salary. To mark his fifty years of service to both the scientific community and to the Public Service his colleagues organized a daylong symposium on atmospheric science which came to be called "Godson Day." Scientists from Canada and abroad were invited and Warren was presented with a special ministerial medal in recognition of his half-century of service.

Warren Godson was awarded many prizes and awards during his career including the President's Prize of the Canadian Meteorological and Oceanographic Society (three times), the Canadian Darton Prize of the Royal Meteorological Society (three times), the prestigious Buchan Prize of the Royal Meteorological Society in 1964, the Patterson Medal (for meteorology in Canada) in 1967 and the IMO Prize in 1975. He was elected a Fellow of the Royal Society of Canada in 1964 and in 1992 the University of Victoria awarded him an Honorary D.Sc.

Warren Godson was an Anglican. He leaves his wife, Harriet, five children, three stepchildren and sixteen grandchildren.

*Written by Morley Thomas*

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**CMOS Prizes and Awards Nominations for  
2001**

The Canadian Meteorological and Oceanographic Society's annual call for nominations for Prizes and Awards is now under way. All Society members are encouraged to consider nominating individuals of the meteorological and oceanographic community who have made significant contributions to their fields. The awards program provides an opportunity for scientists to recognize their peers, and for media recognition of the sciences of meteorology and oceanography.

The awards categories and criteria are given below. Each category has different and specific nomination criteria which must be met before any nomination can be considered. There is a deadline of February 15, 2002 for nominations to be received by the Secretary of the Prizes and Awards Committee. Nominations can be made to:

Mr. Mike Leduc, Secretary  
CMOS Prizes and Awards Committee  
Meteorological Service of Canada  
4905 Dufferin Street  
Downsview, ON M3H 5T4  
Telephone: (416) 739-4474; Fax: (416) 739-4603  
e-mail: mike.leduc@ec.gc.ca

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**Nominations des Prix et Bourses de la  
SCMO pour 2001**

Les nominations pour le programme annuel de Prix et Bourses de la Société canadienne de météorologie et d'océanographie sont maintenant acceptées. Tous les membres sont invités à proposer la candidature d'individus de la communauté météorologique ou océanographique ayant apporté une contribution significative leur domaine. Le programme de prix procure une occasion aux scientifiques de reconnaître le mérite de leurs pairs. Cela permet également aux sciences de l'océanographie et de la météorologie d'être citées par les médias.

Les catégories et les critères des prix sont donnés ci-bas. Chaque catégorie a des critères spécifiques et différents, lesquels doivent être respectés, avant qu'une nomination soit considérée. La date limite pour la réception des nominations par le secrétaire du Comité des prix et bourses, est le 15 février 2002. Les nominations peuvent être adressées à:

M. Mike Leduc, Secrétaire  
Comité des Prix et Honneurs de la SCMO  
Service météorologique du Canada  
4905 rue Dufferin  
Downsview, ON M3H 5T4  
Téléphone: (416) 739-4474; Facsimilé: (416) 739-4603  
courriel: mike.leduc@ec.gc.ca

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**Prizes and Awards Criteria**

a) The President's Prize

May be awarded to a member or members of the Society for a recent, published contribution or body of work of special merit in the fields of meteorology or oceanography.

b) The J. P. Tully Medal in Oceanography

May be awarded to an individual for outstanding scientific contributions and leadership which have had a significant impact on Canadian oceanography.

c) The Dr. Andrew Thomson Prize in Applied Meteorology

May be awarded to a member or members of the Society for an outstanding contribution to the application of meteorology in Canada.

d) The Prize in Applied Oceanography

May be awarded to a member or members of the Society for an outstanding contribution to the application of oceanography in Canada.

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**Critères d'éligibilité des Prix et Bourses**

a) Prix du président

Peut être décerné à un ou plusieurs membres de la SCMO pour une publication récente, un livre ou une contribution importante dans les domaines de la météorologie et de l'océanographie.

b) Médaille J.P. Tully en océanographie

Peut être décernée à une personne dont les contributions scientifiques exceptionnelles et le leadership ont eu un impact significatif en océanographie au Canada.

c) Prix Dr. Andrew Thomson en météorologie appliquée

Peut être décerné à un ou plusieurs membres de la Société pour une contribution remarquable en météorologie appliquée au Canada.

d) Prix en océanographie appliquée

Peut être décerné un ou plusieurs membres de la Société pour une contribution remarquable en océanographie appliquée au Canada.

e) The Rube Hornstein Medal in Operational Meteorology  
/May be awarded to an individual for providing outstanding operational meteorological service in its broadest sense, but excluding the publication of research papers as a factor, unless that research has already been incorporated into the day-to-day performance of operational duties. The work for which the medal is granted may be cumulative over a period of years or may be a single notable achievement.

f) The Graduate Student Prizes

May be awarded for contributions of special merit in meteorology or oceanography by graduate students registered at a Canadian university or by Canadian graduate students registered at a foreign university. One of these prizes is named the Tertia M.C. Hughes Memorial Prize.

g) Environmental Citations

May be awarded to individuals or groups who have made some outstanding contribution in helping to alleviate pollution problems, in promoting environmental improvement, stewardship or awareness, or in developing environmental ethics.

h) Citation for Outstanding Radio and Television Weather Presentation

Only Canadian weather products or programs will be considered. Nominations can be made for high standards of performance over a period of time or the media outlet's response to a particular event. Normally, submissions include audio tapes of three consecutive radio broadcasts or VHS recordings of three consecutive telecasts along with the date and time of the programs, and the names and addresses of the presenter and station. However, letters of support can also be provided by either Centres or individual Society members. Nominations will be judged on the quality of information, the educational value, the appeal to the audiences, and the level of technical and professional presentation.

Please Note

1. Some prize categories require that a nominee must be a member of CMOS.
2. Receipt of submissions by the Secretary will not be acknowledged unless requested. Acknowledgment when requested will be by telephone.
3. The current title, full address and phone number of the nominee must accompany the submission.
4. Nominees who have not received awards in previous years may be renominated. All criteria provided above apply to renominations. The Committee has recently adopted a policy of considering nominations (kept on file) submitted in the two preceding years. Nominators are encouraged to re-affirm and/or update these nominations.

e) Médaille Rube Hornstein en Météorologie opérationnelle

Peut être décerné à une personne ayant procuré un service exceptionnel dans son sens le plus large. Par contre, la publication des articles de recherche sera exclue, à moins que cette recherche soit déjà incorporée comme aide quotidienne dans le travail opérationnel. Le travail pour lequel la médaille est accordée peut être cumulatif sur une période de plusieurs années ou peut être une seule contribution remarquable.

f) Prix étudiant gradué

Peut être décerné à des étudiants gradués ayant apporté une contribution notable en météorologie ou en océanographie et qui sont inscrits à une université canadienne, ou à des étudiants canadiens inscrits à une université étrangère. Un de ces prix est le Prix commémoratif Tertia M.C. Hughes.

g) Citations environnementales

Peuvent être décernées à des individus ou groupes ayant apporté une contribution importante aux problèmes de la pollution, en promouvant une meilleure qualité environnementale ou en développant un code d'éthique environnemental.

h) Citation pour l'excellence en présentation des prévisions météorologiques à la radio ou à la télévision

Seules les production canadiennes sont éligibles. La nomination peut être basée sur un standard élevé et soutenu de communications ou sur la reconnaissance des médias sur un événement particulier. Une bande audio de trois émissions radiophoniques consécutives ou un enregistrement VHS de trois émissions télévisées consécutives est requis. La date, le temps des émissions, le nom du présentateur, la station, la ville, etc, doivent être indiqués. Toutefois si désirée, une telle justification peut accompagner la bande afin d'aider le comité de sélection. Les extraits soumis seront jugés pour leur valeur informative et/ou éducative, attrait pour le public, et auront un niveau de présentation technique et professionnel élevé, etc.

Veillez prendre note

1. Certaines catégories de prix sont réservées aux membres de la SCMO.
2. Un accusé de réception pour les candidatures ne sera pas envoyé par le secrétaire à moins d'une demande formelle. Si désiré, un tel accusé se fera par téléphone.
3. Le titre actuel de chaque candidat, ainsi que son adresse complète et numéro de téléphone, doivent être envoyés avec la mise en candidature.
4. Les candidats des années précédentes, qui n'ont pas reçu de prix, peuvent être reconsidérés. Les critères énoncés ci-dessus s'appliquent également à ces nominations. Le comité considérera désormais les nominations antérieures et conservées durant les deux dernières années. Nous encourageons les personnes qui ont fait ces nominations à les réitérer ou à les préciser.

## Notice of CMOS Membership Fee Changes for 2002

By motion, approved at the Annual General Meeting, May 28, 2001 a new membership fee structure comes into effect January 1, 2002.

- Corporate Members** - will be \$250.
- Regular Members** - will be \$60.
- Retired Members** - will be \$40.
- Student Members** - will be \$30.
- Sustaining Members** - will remain at \$170.
- Associate Members** - will be (i) \$40 for reciprocal memberships; (ii) teachers involved in the CMOS School and Public Education Committee.
- Accredited Consultants** - membership fees will be \$60; accredited application fee \$150; annual maintenance fee of \$20.
- Non-member Accredited Consultant fee** - will be \$100 annually.
- Endorsed Weathercasters** - will be \$60 \ initial endorsement fee for TV \$200; initial endorsement fee for radio \$100; annual maintenance fee \$20.
- Fellow** - A member in good standing.
- Honorary Fellow** - exempt from fees.

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## Avis de modification des frais d'adhésion à la SCMO en 2002

En vertu d'une proposition approuvée lors de l'assemblée générale annuelle du 28 mai, 2001, une nouvelle grille de frais d'adhésion prend effet le 1 janvier, 2002.

- Les frais **des membres corporatifs** seront 250 \$.
- Les frais **des membres réguliers** seront 60 \$.
- Les frais **des membres retraités** seront 40 \$.
- Les frais **des membres étudiants** seront 30 \$.
- Les frais **des membres de soutien** demeurent à 170 \$.
- Les frais **des membres associés** seront (i) 40 \$ pour les adhésions réciproques dans d'autres sociétés et ii) les enseignants qui participent au travail du Comité sur l'enseignement public et scolaire de la SCMO.
- Les frais **des consultants accrédités** seront 60 \$ avec des frais initiaux de demande d'accréditation de 150 \$ et des frais annuels de maintien de 20 \$.
- Les frais annuels pour **les consultants accrédités non-membres** seront 100 \$.
- Les frais **des présentateurs météo agréés** seront 60 \$ avec des frais initiaux d'inscription de 200 \$ pour la télévision avec des frais initiaux d'inscription de 100 \$ pour la radio des frais annuels de maintien de 20 \$.
- Les membres émérites** doivent demeurer membres en règle.
- Les membres émérites honoraires** n'ont aucun frais à déboursier.

## Notice of CMOS Publication Subscription Fee Changes for 2002

By a motion approved by the Executive on 9 August, 2001, the publication subscription fees were changed as follows, effective 1 January, 2002:

- Individual subscription** to Atmosphere-Ocean will be \$45.
- Institutional subscription** to Atmosphere-Ocean will be \$125.
- Non-member subscription** to CMOS Bulletin SCMO will be \$60.

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## Avis de changement des prix d'abonnement aux publications de la SCMO pour 2002

En vertu d'une proposition approuvée par l'Exécutif le 9 août, 2001, une nouvelle grille des prix des abonnements prend effet le 1 janvier, 2002:

- L'abonnement individuel** à Atmosphere-Ocean sera \$45.
- L'abonnement institutionnel** à Atmosphere-Ocean sera \$125.
- L'abonnement** à CMOS Bulletin SCMO pour les **non-membres** sera \$60.

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## New Secretary for SCOR and ECOR



CMOS is pleased to announce that Dick Stoddart has assumed the Secretariat functions of the Canadian National Committee for the Scientific Committee on Oceanic Research (SCOR), and the Canadian National Committee for the Engineering Committee on Oceanic Resources (ECOR). Details on the make-up and interests of SCOR and ECOR may be found on the CMOS web site at [www.cmos.ca](http://www.cmos.ca).

Dick had a long and active career in the federal government. He joined Environment Canada in 1966, in the office responsible for Canada's participation in the International Hydrological Decade program, and in its successor program, the Associate Committee on Hydrology. He joined the Department of Fisheries and Oceans in 1978 where he managed several ocean science portfolios in Ottawa, ranging from the oceanic role in

offshore energy development, ocean climate research, operational oceanography, ocean science strategies, and components of Canada's participation in the work of the Intergovernmental Oceanographic Commission. He has also participated in many of the activities of CMOS itself, including: twice as Chair of the very active Ottawa centre, treasurer of the 1994 Ottawa CMOS Congress, and treasurer of the CMOS National Executive for three years.

Since retirement in January 2000, Dick has undertaken a number of contracting assignments for NRCan, DFO and EC. Also, he acted as Executive Director of the Canadian Foundation for Climate and Atmospheric Sciences (CFCAS) for the first fifteen months of its existence. Dick holds an M.Sc. (Engineering) from Queen's University. He may be reached at [dick.stoddart@sympatico.ca](mailto:dick.stoddart@sympatico.ca), and would welcome queries and contributions relative to SCOR and ECOR.

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## Nouveau Secrétaire pour SCOR et ECOR



La SCMO est heureuse d'annoncer que Dick Stoddart a assumé les fonctions de secrétaire du Comité national canadien pour le Comité scientifique de la recherche océanographique ("SCOR"), et le Comité national canadien pour le Comité de l'ingénierie des

ressources océaniques ("ECOR"). On peut trouver des informations sur la composition et les intérêts du "SCOR" et "ECOR" sur le site Web de la SCMO : [www.scmo.ca](http://www.scmo.ca).

Dick a eu une longue et active carrière au sein du gouvernement fédéral. En 1966, il s'est joint à Environnement Canada dans les bureaux responsables pour la participation du Canada au programme de la Décennie hydrologique internationale, et au programme qui lui a succédé, soit le Comité associé d'hydrologie. En 1978, il a travaillé à Ottawa pour le ministère des Pêches et Océans où il a géré plusieurs dossiers océanographiques en rapport avec le développement énergétique marin, la recherche sur le climat océanique, l'océanographie opérationnelle, les stratégies océanographiques et les composantes de la participation du Canada à la Commission océanique intergouvernementale. Il a aussi participé à plusieurs activités de la SCMO en tant que président, à deux reprises, du Centre très actif d'Ottawa, comme trésorier au Comité d'organisation du congrès de la SCMO en 1994, et aussi comme trésorier au Comité exécutif national de la SCMO, pour trois années.

Depuis qu'il a pris sa retraite en janvier de l'an 2000, Dick a accepté quelques contrats avec la RNCan ("NRCan"), le MPO et EC. Il a agi comme Directeur exécutif de la Fondation canadienne pour les sciences du climat et de l'atmosphère (FCSCA), au cours des quinze premiers mois de son existence. Dick détient une maîtrise en sciences (Ingénierie) de l'université Queen. On peut le contacter à son courriel : [dick.stoddart@sympatico.ca](mailto:dick.stoddart@sympatico.ca), et toutes questions et contributions relatives aux comités "SCOR" et "ECOR" sont les bienvenues.

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## Call for Nominations for CMOS Fellows

An opportunity now exists for members or non-members to submit nominations for CMOS Fellows and Honorary Fellows, keeping in mind that nominees for Fellow must be members in good standing. Consideration should be given to the contributions of the nominees to the scientific, professional and educational fields in atmospheric or ocean sciences or services as well as to Canadian society as a whole, as illustrated by the following:

- Research;
- Teaching;
- Technology;
- Professional Services;
- Administration in academia, industry, government or other institutions;
- Communication and interpretation of atmospheric and oceanographic phenomena;
- Weathercasting;
- International meteorological and/or oceanographic affairs; or
- Other.

Each nomination should be signed by the primary sponsor and supported by two others, at least one of whom must be from an establishment other than that of the nominee. Further information and criteria are available for viewing on the CMOS web site (under "About CMOS") at <http://www.cmos.ca>

Application forms are available on the web site or from the Executive Director, Dr. Neil Campbell. Nominations are to be postmarked no later than **April 15, 2002** and may be sent to the office of the Executive Director or (by e-mail) to the Chair of the Fellows Committee, Dr. Peter Taylor, at [pat@yorku.ca](mailto:pat@yorku.ca)

(Version française en page 189)

Engineering Committee on Oceanic Resources Annual Meeting  
September 24/25, 2001 - London, UK.

The Annual Meeting of the Engineering Committee on Oceanic Resources Council (ECOR, an International Nongovernmental Society of Professional Engineers) was held at the headquarters of the Royal Institution of Naval Architects (RINA) in London. The meeting was hosted by Mr. Trevor Blakeley, Chief Executive Officer of the RINA. RINA has about 6500 current members throughout the world; it publishes a diverse suite of technical magazines and journals. One of the magazines is entitled "*Ship & Boat International*". It covers a wide spectrum of topics on small craft design programs that could be of interest to those responsible for new development strategies in regard to inshore vessels for the BIO/CCG fleet.

The first day of the meeting was devoted to discussions on the transfer of the ECOR Secretariat to the RINA offices in London. By the end of the day, a consensus had been reached on moving forward with the transfer and on identifying the resources that would be contributed by ECOR to facilitate ECOR Secretariat operations at the RINA head office. Under this new arrangement, ECOR will have access to the RINA membership and to its international network. Publication of the ECOR journal (*Oceanic Engineering International*) will remain at Memorial University but its distribution will be handled by RINA administrative staff. It was anticipated that future issues of the journal would be printed in significantly larger numbers (perhaps 5000 versus the present 500) to help in promoting ECOR memberships through the RINA network.

The second day of the meeting considered ECOR business items arising from the minutes of the 1999 meeting. Reports were presented by national committee chairs (Canada, Spain, Japan) and considerable time was devoted to a comprehensive (three years) review of ECOR accounts for the OEI journal and the Wave Energy Working Group.

Under new business, Canada made two presentations. One of these was on EMAPS (European Marine and Polar Science), an organization that was set up by the European Commission in 1995 to address the requirements for improved coordination between European marine science organizations. The structure of EMAPS includes a Marine and Polar Board that has been envisioned by Dr. J. Locat (Past Chair, CNC/ECOR) as a possible model for bringing together various Canadian ocean engineering organizations in a structure similar to that of the Canadian Geoscience Council. The EMAPS Marine Board has evolved under the authority of the European Science Foundation (ESF) and is now known as the ESF Marine Board. Its primary mission is to identify and prioritize emerging disciplinary and interdisciplinary marine science issues of strategic European importance, and to initiate

analysis and studies where relevant, in close association with the European Commission] in order to develop an European strategy for marine research. Current information on ESF Marine Board activities can be obtained from its web site (<http://www.esf.org/marineboard/>).

Another noteworthy item presented on the second day of the meeting concerned a report on a vision of European marine science and technology in the 21<sup>st</sup> century. With respect to marine technology, greater European cooperation is predicted to be needed in the areas of ship building, ship safety and ship automation. Undersea exploration and exploitation will require new technologies to exploit deep-sea offshore oil and gas (depths in excess of 1000m). The perceived future needs for this industry include new advances in undersea robotics for industrial applications, autonomous underwater vehicles for bathymetric surveys and scientific measurements, new acoustic and seismic techniques to transmit information and to explore sea floor structures and sediments, and new drilling techniques. Technical progress is also thought to be needed to develop new sensors for scientific research and ocean monitoring (e.g., "biosensors", automated buoys, systems for the detection of chemicals and/or toxins). Wave energy and desalination of seawater are listed as other technical areas that need to be pursued.

The report concludes that European research should target a number of high priority goals. They are:

- 1) to increase knowledge about the marine world;
- 2) to illuminate the economic, social and political importance of the ocean;
- 3) to enhance technological competitiveness of the European marine industry;
- 4) to adopt common strategies to prepare for increased competition from North America and Asia;
- 5) to synergize the efforts of the various national-level European agencies and institutions that have a responsibility for maritime activities in regard to the:
  - mobilization of scientific and technical competence;
  - establishment of strong research networks between academic laboratories, national institutes and the private sector;
  - building and operation of an large common research infrastructure (e.g., oceanographic vessels, satellite networks, supercomputers).

*Charles Schafer, Chair, CNC/ECOR*

**L'effet papillon est-il mort?**

La très sérieuse revue *Pour la science* publie dans son numéro 283 (mai 2001) un article intitulé "L'effet papillon n'existe plus!" et dû à Raoul Robert, directeur de recherches au CNRS (Institut Fourier, Grenoble). Dans cet article, l'auteur s'emploie à montrer que si les trajectoires de petites particules fluides de l'atmosphère sont chaotiques et imprévisibles à longue échéance, il existe à grande échelle des structures bidimensionnelles - similaires aux anticyclones et aux dépressions - douées d'auto-organisation; ces structures sont plus prévisibles que ne le laisserait penser la théorie d'Edward Lorenz, connue publiquement sous le nom d'"effet papillon". Et cela parce que lorsqu'un système possède un grand nombre de degrés de liberté, ses propriétés macroscopiques (ou statistiques) ne sont pas aussi instables que ses propriétés microscopiques. Soyons néanmoins prudents, car le sujet est difficile, et attendons les réactions des spécialistes à ces travaux qui tendraient à remettre en cause la célèbre "limite de prévisibilité" des phénomènes météorologiques.

Source: La Météorologie, 8<sup>e</sup> série, No.34 - août 2001, page 8.

**A National Approach to Marine Protected Areas**

Within the Government of Canada, there are three departments with mandated responsibilities for establishing and managing a range of marine protected areas: Fisheries and Oceans Canada, Environment Canada, and Canadian Heritage. A paper entitled "Working Together for Marine Protected Areas" describes the programs of each department and how they fit together into a complementary and coordinated federal approach. It is available at <http://www.oceansconservation.com/newenglish/library/wtogether/wtogeth.htm>

**Climate Change Information Kit**

Natural Resources Canada and Environment Canada have collaborated to make available a free information kit that contains practical and helpful tips for reducing the effects of climate change and protecting the environment. The free kit can be ordered online at [http://www.climatechange.gc.ca/english/issues/what\\_is/kit\\_form.shtml](http://www.climatechange.gc.ca/english/issues/what_is/kit_form.shtml)

**OCEANPORTAL**

OceanPortal, a website of the Intergovernmental Oceanographic Commission (IOC), is a high-level directory of ocean data and information-related websites. There is an abstract field to facilitate searching via keywords. The OceanPortal is located at

<http://www.oceanportal.org>

**Sea-Level Rise and Climate Change on Prince Edward Island**

A study has been carried out to assess the physical and socio-economic impacts of climate change and accelerated rise in sea-level on the coast of PEI, particularly in relation to an anticipated increase in the frequency and extent of storm-surge flooding in Charlottetown, and an anticipated decrease in sea ice, an increase in wave energy, and a probable increase in rates of shore erosion on the north shore. A summary of the findings is available at <http://www.nrcan.gc.ca/css/imb/hqlib/200160ea.htm>

**Free Electronic Navigation Chart Viewer**

CARIS has released CARIS Easy-ENC, a free electronic navigation chart (ENC) viewer downloadable from its website at <http://www.caris.com>. Functions include pan, zoom, display of multiple charts in the same window, query of user-defined ranges, and application of updates to the base cell file.

**Calendrier 2002 de la Royal Meteorological Society**

Le calendrier 2002 de la Royal Meteorological Society est maintenant disponible. C'est un magnifique calendrier avec des photographies artistiques illustrant la météorologie. Il a été produit en co-opération avec les Sociétés allemandes et françaises. C'est maintenant un calendrier météorologique européen.

Le coût est de 8,50£ pour chaque calendrier ou 35,00£ pour cinq, incluant les frais de poste et d'emballage. On peut se le procurer en écrivant à la Royal Meteorological Society, 104 Oxford Road, Reading, Berkshire, England, RG1 7LL.

**Royal Meteorological Society Calendar for 2002**

The 2002 Royal Meteorological Society Calendar is now ready for distribution. It is beautifully produced with photographs of high meteorological and artistic merit. It has been produced with the co-operation of the German and French Societies. It is really by now an European Meteorological Calendar.

The cost is £8.50each or £35.00 for five including postage and packing. It can be ordered from the Royal Meteorological Society, 104 Oxford Road, Reading, Berkshire, England, RG1 7LL.

## CMOS Congress 2003

The CMOS Ottawa Chapter will be hosting the CMOS Congress in the spring of 2003. Ottawa last hosted this event in 1994, and it was a great success. Bruce Ramsay has agreed to chair the Local Arrangements Committee. Even though there are over 1½ years to go, early preparations are essential in order to hold a successful Congress. If you are interested in participating in the organization of the CMOS Congress 2003, or want any further information, do not hesitate to contact Bruce at (613) 996-4671 or by e-mail at: [bruce.ramsay@ec.gc.ca](mailto:bruce.ramsay@ec.gc.ca)

### Congrès de la SCMO en 2003

The Chapitre d'Ottawa sera l'hôte du Congrès annuel de la SCMO au printemps 2003. La dernière fois qu'un congrès de la SCMO fut tenu à Ottawa remonte en 1994 et tous se souviennent que ce congrès rapporta un vif succès. Bruce Ramsay a accepté de présider le comité local d'arrangement. Bien qu'il reste encore plus d'un an et demi, les préparatifs doivent se faire tôt en vue de présenter un congrès mémorable. Si vous êtes intéressés à participer à l'organisation d'un événement d'une telle envergure, n'hésitez pas à communiquer avec Bruce Ramsay au (613) 996-4671 ou par courriel à [bruce.ramsay@ec.gc.ca](mailto:bruce.ramsay@ec.gc.ca)

### Appel de candidatures pour les Fellows de la SCMO

Les candidatures pour les Fellows de la Société sont maintenant acceptées. Les personnes mises en candidature doivent être des membres en règles de la Société. On devra considérer les contributions des candidats dans les domaines scientifiques et professionnels des sciences de l'atmosphère et océanique ainsi qu'à la société canadienne, tel qu'illustré par les points suivants:

- recherche;
- enseignement;
- technologie;
- services professionnels;
- administration dans les universités, l'industrie, le gouvernement et dans les autres institutions;
- communication et interprétation des phénomènes atmosphériques et océaniques;
- prédiction de la météo;
- les affaires internationales en météorologie et/ou océanographie; ou
- autres.

Chaque candidature doit être signée par le commanditaire principal et doit être endossée par deux autres, dont au moins une personne venant d'un établissement autre que celui de la personne mise en nomination.

Les formulaires d'application sont disponibles au bureau du directeur exécutif Dr Neil Campbell ou sur le site internet de la SCMO. Les soumissions doivent respecter la date butoir du **15 avril 2002** et doivent être expédiées au bureau du Directeur exécutif ou (par courriel) au président du Comité des Fellows, Dr Peter Taylor à [pat@yorku.ca](mailto:pat@yorku.ca)

(English Version page 186)

### RADARSAT-1 Supports Ship Navigation in Northern Waters<sup>1</sup>

Richmond, B.C. - RADARSAT International (RSI) has been awarded two contracts totalling over CDN \$3 million to provide the Canadian Ice Service (CIS) and the Danish Meteorological Institute (DMI) with RADARSAT-1 imagery for ice monitoring and mapping. Both CIS and DMI have used and continue to use RADARSAT-1 imagery extensively for the main purpose of creating ice charts for safe vessel navigation in the waters of Canada and Greenland.

Critical to the renewal of these contracts is the commercial operational capability of the RADARSAT-1 program, whereby data can be delivered within hours of acquisition to the CIS and DMI. In particular, three RADARSAT ground receiving stations - Tromsø (Norway), Gatineau (Canada) and West Freugh (United Kingdom) - are instrumental in the reception and near real-time processing of the satellite data before electronically sending it over the Internet within 2 - 4 hours to the CIS and DMI for further analysis.

"We have been using RADARSAT-1 data operationally since 1996, because the RADARSAT-1 program meets both our strict turnaround timeframe of under 4 hours and our need for routine wide area coverage. Today, we receive up to 10 images daily (each image covers 500 km x 500 km) from which we extract information such as ice concentration, thickness and age in support of marine vessel operators (such as regional Coast Guards and icebreakers) in Canadian waters," said Bruce Ramsay, CIS's Chief of Remote Sensing and Modeling.

Roland Knight, President of RSI, said, "Ice mapping continues to be one of our fundamental applications for RADARSAT-1 satellite imagery. We are pleased to continue our relationships with these long-standing clients to provide valuable ship navigation information to the marine community."

For more information, please contact Cory Rossignol ([crossignol@rsi.ca](mailto:crossignol@rsi.ca)) or Kate Stephens ([kstephens@rsi.ca](mailto:kstephens@rsi.ca)).

<sup>1</sup> Source: RSI News Release, September 6, 2001.

Note from the Editor: Bruce Ramsay is a CMOS Member from the Ottawa Centre.

**CALL FOR PAPERS**  
**36<sup>th</sup> Annual CMOS Congress**  
**May 22 - 25, 2002**

Rimouski, Québec, Canada

**THE NORTHERN ENVIRONMENT**

The 36<sup>th</sup> Annual Congress of the Canadian Meteorological and Oceanographic Society will be held in the charming city of Rimouski, Québec, Canada, 22-25 May 2002. The theme of the Congress is the Northern Environment, with presentations by internationally known keynote speakers and by scientists and students from across Canada and abroad. We welcome oral and poster presentations in the fields of meteorology, climatology, oceanography, and hydrology dealing with all aspects of the Northern Environment such as the dynamics and variability of the cryosphere, the exchanges between the atmosphere and ocean, the carbon cycle, contaminants, and all studies dealing with the limnology, biogeochemistry, and chemistry in arctic and subarctic ecosystems, including fjords, polynyas, marginal sea-ice zones, and the boreal forest. Contributions are also welcomed in all fields of meteorology, climatology, oceanography and hydrology, such as boundary layers, cloud physics, energy and radiation, measurement methods, marine forecasting or operational meteorology, climate modelling, and climate change and variability including palæoclimatology.

**Abstracts:** Abstracts should be 300 words or less and include the name, title, affiliation, mailing address, phone and fax numbers, and email address (if available) of each author, and the thematic area(s) where the paper might best fit in the program. Abstracts must be received no later than February 1, 2002. The accepted abstracts will be published at the time of the meeting.

**Online submission of Abstracts:** Abstracts may be submitted online via the web site <http://scmo-cmos-2002.osl.qc.ca/>. Although online submission is preferred, you may also email (please identify your theme area and whether poster or oral presentation when submitting) your abstract to the following address:

CMOS 2002, Ocean Sciences Directorate  
Maurice Lamontagne Institute  
Fisheries and Oceans Canada  
850, Route de la Mer  
Mont-Joli (QC), Canada G5H 3Z4  
Fax # (418) 775-0546  
Email: [royf@dfo-mpo.gc.ca](mailto:royf@dfo-mpo.gc.ca)

Deadline for abstracts..... February 1, 2002  
Notification of acceptance..... March 1, 2002

For more information about the congress, facilities, location

and special events, you can visit the web site: <http://scmo-cmos-2002.osl.qc.ca/>.

**INVITATION - APPEL DE CONTRIBUTIONS**  
**36<sup>e</sup> Congrès annuel de la SCMO**  
**22 - 25 mai 2002**

Rimouski, Québec, Canada

**L'ENVIRONNEMENT NORDIQUE**

Le 36<sup>e</sup> Congrès annuel de la Société Canadienne de Météorologie et d'Océanographie se tiendra dans la charmante ville de Rimouski, du 22 au 25 mai 2002. Le thème du congrès est l'Environnement Nordique, avec des conférences inédites présentées par des scientifiques reconnus sur la scène internationale et par des chercheurs et des étudiants du Canada et de l'étranger. Vos contributions scientifiques sont sollicitées dans les domaines de la météorologie, de la climatology, de l'océanographie et de l'hydrologie qui traitent des différents aspects de l'environnement nordique tels que la dynamique et la variabilité de la cryosphère, du pergélisol, du cycle du carbone et des contaminants, et également toutes les études portant sur la limnologie, la biogéochimie, et la chimie des écosystèmes arctiques et subarctiques, incluant en particulier les fjords, les polynies, les marges de glace marine et la forêt boréale. Vos contributions sont aussi sollicitées dans tous les domaines clés de la météorologie, de la climatology, de l'océanographie et de l'hydrologie, tels l'étude des couches limites, la physique des nuages, l'énergie et la radiation, les méthodes de mesure, la prévision maritime ou la météorologie opérationnelle, la modélisation climatique, et le changement et la variabilité du climat incluant la paléoclimatologie.

**Résumés:** Les résumés doivent être de 300 mots ou moins et contenir le nom, l'affiliation, l'adresse postale et électronique (si disponible) de chaque auteur ainsi que le thème général auquel la contribution pourrait le mieux correspondre. Les résumés doivent être reçus au plus tard le 1<sup>er</sup> février 2002. Les résumés acceptés seront publiés au moment du congrès.

**Soumission des résumés en ligne:** Les résumés peuvent être soumis en ligne via le site Internet <http://scmo-cmos-2002.osl.qc.ca/>. Les soumissions en ligne sont fortement encouragées mais vous pouvez aussi envoyer votre résumé (en indiquant clairement vos préférences pour un thème et pour le format de la présentation, soit orale ou par affiche) à l'adresse suivante:

SCMO 2002, Direction des Sciences Océaniques  
Institut Maurice Lamontagne  
Pêches et Océans Canada

850, Route de la Mer  
Mont-Joli (QC), Canada G5H 3Z4  
Fax # 418-775-0546  
Courriel: [royf@dfp-mpo.gc.ca](mailto:royf@dfp-mpo.gc.ca)

## Coastal Environment 2002

16-18 September 2002  
Rhodes, Greece

Date limite pour soumettre les résumés....1<sup>er</sup> février 2002  
Notification d'acceptation.....1<sup>er</sup> mars 2002

Pour plus d'information concernant le congrès, les lieux et les événements spéciaux, vous pouvez visiter le site web: <http://scmo-cmos-2002.osl.gc.ca/>

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### Ocean Optics XVI

18 - 22 November 2002  
Santa Fe, New Mexico

The Office of Naval Research and the National Aeronautic and Space Administration announce *Ocean Optics XVI* --- an educational conference to be held November 18-22, 2002 in Santa Fe, New Mexico. Registration begins December 1, 2001. Short Abstract deadline is May 31, 2002.

The conference will include: special plenary speakers, a student poster competition, presentation of the Jerlov Award, short courses, and a trade exhibition. For more information, please visit the conference Web site at [www.oceanopticsconference.org](http://www.oceanopticsconference.org)

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### Oil Spill 2002

17-19 September 2002  
Rhodes, Greece

Oil Spill 2002 (Third International Conference on Oil & Hydrocarbon Spills, Modelling, Analysis & Control) addresses recent research advances in different topics on oil spill modelling, prevention, behaviour, effects, control and cleanup techniques. The conference will gather researchers, engineers and managers from all over the world to discuss state-of-the-art techniques to model, prevent and control oil spills on land and in water bodies.

For more information, visit the conference web site at <http://www.wessex.ac.uk/conferences/2002/oil02> or contact Gabriella Cossutta, Conference Secretariat at [gcossutta@wessex.ac.uk](mailto:gcossutta@wessex.ac.uk)

Coastal Environment 2002 (Fourth International Conference on Environmental Problems in Coastal Regions) will address the subjects of monitoring, analysis and modelling of coastal regions including air and ground phenomena. The conference will focus on topics which need to be recognised in order to prevent, alleviate or minimise environmental problems, allowing a balanced use of the coastal region as a common resource around the world.

For more information, visit the conference web site at <http://www.wessex.ac.uk/conferences/2002/coastal02> or contact Gabriella Cossutta, Conference Secretariat at [gcossutta@wessex.ac.uk](mailto:gcossutta@wessex.ac.uk)

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### Ports & Marinas 2002

18 - 20 September 2002  
Rhodes, Greece

Ports and Marinas 2002 is the third in this international series of successful conferences which aim to examine the rapid developments that are taking place in the management, operation, design and building of ports, marinas and other maritime works. To remain competitive it is essential for industry to incorporate new technology into these areas.

For more information, visit the conference web site at <http://www.wessex.ac.uk/conferences/2002/ports02> or contact Gabriella Cossutta, Conference Secretariat at [gcossutta@wessex.ac.uk](mailto:gcossutta@wessex.ac.uk)

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### Next Issue CMOS Bulletin SCMO

Next issue of the *CMOS Bulletin SCMO* will be published in February 2002. Please send your articles, notes, workshop reports or news items at the earliest to the address given on page ii. We have an **URGENT** need for your articles.

### Prochain numéro du CMOS Bulletin SCMO

Le prochain numéro du *CMOS Bulletin SCMO* paraîtra en février 2002. Prière de nous faire parvenir au plus tôt vos articles, notes, rapports d'atelier ou nouvelles à l'adresse indiquée à la page ii. Nous avons un besoin **URGENT** d'articles.

**New Faculty Position: Environmental (Atmospheric or Oceanic) Chemistry**

This new appointment is for a joint, tenure-track position at any level in Environmental (Atmospheric or Oceanic) Chemistry, shared between the Department of Atmospheric and Oceanic Sciences and the Department of Chemistry. Applicants for this position should have a Ph.D. degree and will normally have had postdoctoral or industrial experience in a research field of interest to the hiring departments. The successful applicant will be expected to teach at the undergraduate and graduate levels, supervise graduate research, and establish a vigorous research program. Review of applications will begin immediately and will continue until the position is filled, with a September 1, 2002 starting date. For more information about McGill University and the two Departments involved, see <http://www.mcgill.ca>. Candidates should forward (**not** by e-mail) a curriculum vitae, research and teaching proposals, and arrange to have at least three letters of recommendation sent to: **Dr. Charles Lin**, Chair, Department of Atmospheric and Oceanic Sciences, McGill University, 805 Sherbrooke Street West, Montreal, Quebec, Canada H3A 2K6. In accordance with Canadian employment and immigration regulations, this advertisement is directed to Canadian citizens and permanent residents of Canada. However, applications from all outstanding candidates will be considered. McGill University is committed to equity in employment.

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