CMOS BULLETIN SCMO

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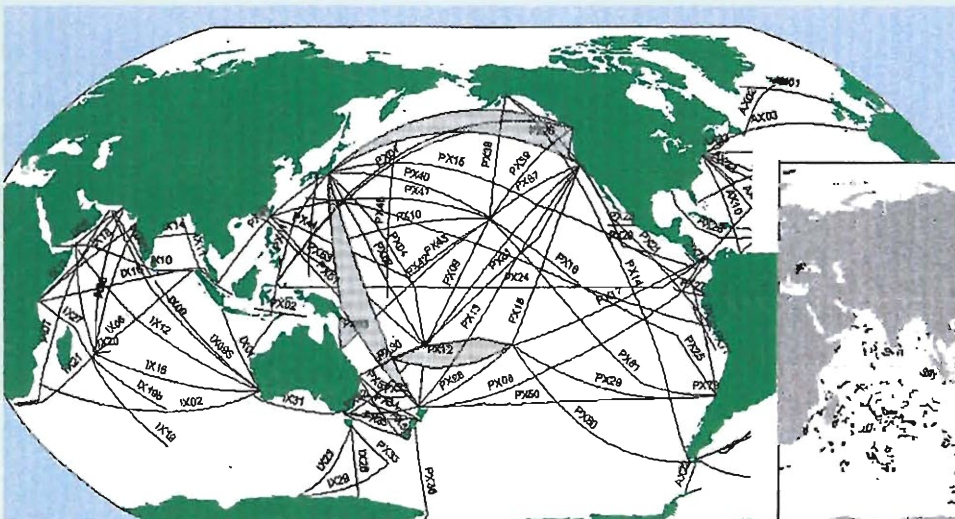

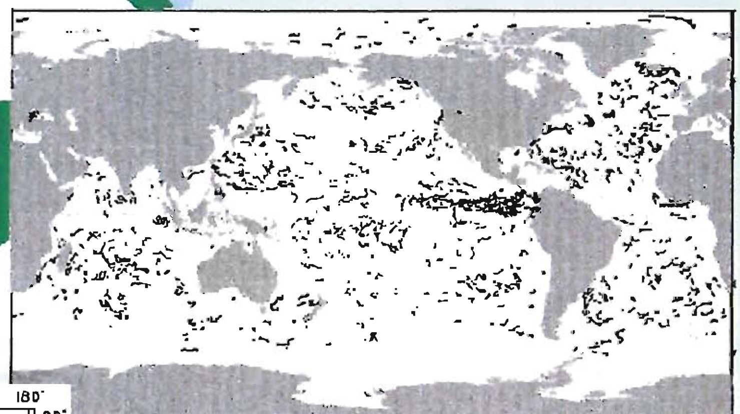

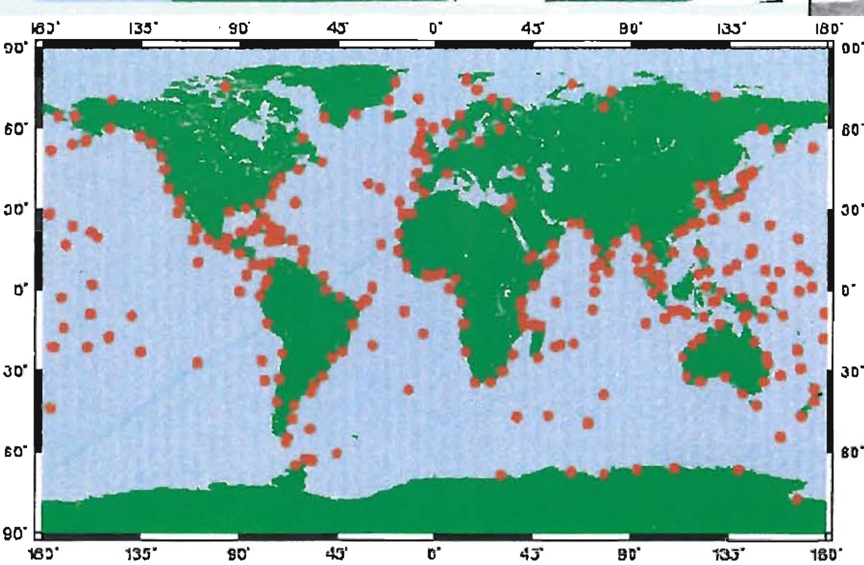

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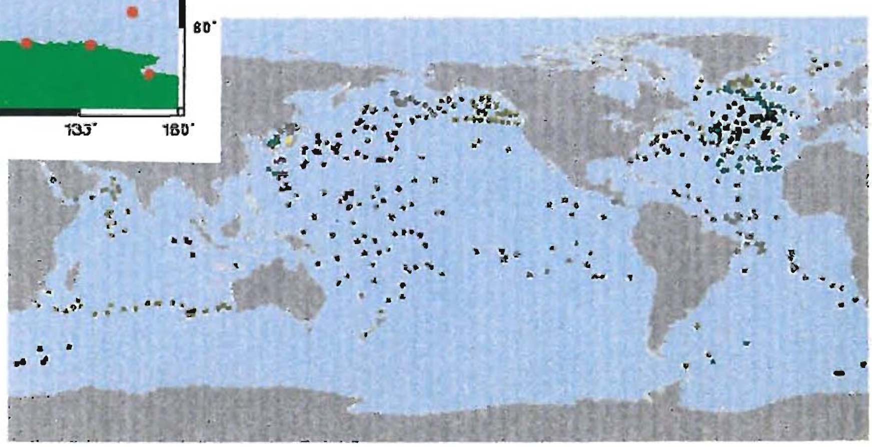

CMOS Bulletin SCMO

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

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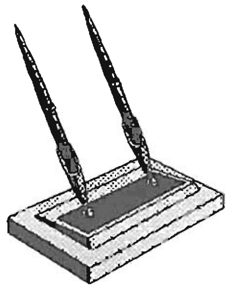
Cover page: Composite picture showing different data products assembled under the umbrella of the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology. An integrated approach is required to assemble such large data sets. To learn more, read the article on page **108**.

Page couverture: Image composite illustrant différents produits de données rassemblées sous l'organisation parapluie du Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology. Une approche intégrée est nécessaire pour présenter de si grands ensembles de données. Pour en savoir plus, lire l'article en page **108**.

....from the President's Desk



CMOS Friends:

I am fortunate enough to be writing this month's message from the shores of a small lake north of Toronto. I have been fortunate to have good weather and clear skies, perfect for viewing August's Perscid Meteor shower. I hope that your summer vacation plans, or however you have spent the past few summer months, have offered you the same.

Over the past two months, as I have taken over the reins of this position from Ron Stewart, I have been pleased to meet and to hear from many of you. I have listened to your views on our Society, and its vision for the next ten years. We now have a core team in place - building on what we have heard from our members - who are working on the Vision Document. We hope to have a final product for you in time for the Congress in June 2003.

One of the many core elements in the "vision" for CMOS is outreach - we need a focus on educating the Canadian public and decision-makers on what we, as oceanographic and meteorological professionals, do on a daily basis, and why our services are essential. If you did not see the recent article by Peter Calamai "Rough Weather Ahead" of the Toronto Star (www.thestar.com, then search under Peter Calamai), I recommend you seek it out. I was pleased to see that Mr. Calamai (a fellow Physicist) was able to sort through the complex issues of our profession, and still come to the appropriate conclusion: when you remove the Atmospheric and Oceanographic professional from the equation, the Canadian public suffers. We live day-to-day in this profession, and we know what value we provide as research scientists, academics, and front line operational scientists. But it is incumbent on us to remind the Canadian public and decision-makers of the value we add - not simply in ensuring that they can pack appropriately for their cottage vacation, but on issues of greater importance - such as climate change, natural disaster mitigation, and how to keep this planet's atmosphere, biosphere and oceans viable for the next century, and beyond.

CMOS is the combined voice of our profession, and we will continue to speak out on your behalf. So that the key people get the right messages - crystal clear. But a voice can also come from you. I encourage each of you to speak to someone - your neighbour, your local educational institution, your local political representative, or your Member of Parliament, to educate them on the challenging and important work you do, and how all Canadians truly benefit from it. Although coverage by the press is very helpful, those who practise in our profession, individually and collectively, are the best spokespersons on the necessity of full, robust oceanographic and meteorological services.

Ron Bianchi,
President / Président

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Articles

Our regular sections / Nos chroniques régulières

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

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

Land Use, Land-Use Change and Forestry, Intergovernmental Panel on Climate Change, Cambridge University Press, Paper Cover, 0-521-80495-7, 2000, $29.95.

Climate Change 2001, Synthesis Report, Contribution of Working Groups I, II, and III to the Third Assessment Report of the Intergovernmental Panel on Climate Change, by Robert T. Watson, Editor, April 2002, Cambridge University Press, Paperback Cover, 0-521-01507-3, $40.00US.

Ocean Waves and Oscillating Systems, Linear Interactions including Wave-Energy Extraction, by Johannes Falnes, Cambridge University Press, 2002, Hardback Cover, 0-521-78211-2, $75.00US.

Inverse Problems in Atmospheric Constituent Transport, by Ian G. Enting, August 2002, Cambridge University Press, Hardback Cover, 0-521-81210-0, $100.00US.

Scattering, Absorption and Emission of Light by Small Particles, by Michael I. Mishchenko, Larry D. Travis and Andrew A. Lacis, June 2002, Hardback Cover, 0-521-78252-x, $90.00US.

Ecological Climatology, Concepts and Applications, by Gordon Bonan, August 2002, Cambridge University Press, Paperback Cover, 0-521-80476-0, $150.00US.

Inverse Modeling of the Ocean and Atmosphere, by Andrew F. Bennett, July 2002, Cambridge University Press, Hardback Cover, 0-521-81373-5, $80.00US.

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. Thank you for your valuable 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. Merci pour votre inestimable collaboration.

Paul-André Bolduc, Editor / Rédacteur-en-chef
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Books Now Being Reviewed
Livres maintenant en révision

Climate Change Impacts on the United States, National Assessment Synthesis Team, US Global Change Program. First published in 2001, Cambridge University Press, Paperback, 0-521-00075-0, 612 pages, $39.95US. Book being reviewed by **William A. Gough**, University of Toronto at Scarborough, Scarborough, Ontario.

Methodological and Technological Issues in Technology Transfer, Intergovernmental Panel on Climate Change, Cambridge University Press, Paper Cover, 0-521-80494-9, 2000, $35.95. Book being reviewed by **Paula Coutts**, SENES Consultants Limited, Richmond Hill, Ontario.

The Earth's Plasmasphere, by J.F. Lemaire and K.I. Gringauz, Cambridge University Press, Hardback Cover, 0-521-43091-7, $90.00US. Book being reviewed by **Richard Marchand**, University of Alberta, Edmonton, Alberta.

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. Book being reviewed by **Richard Marchand**, University of Alberta, Edmonton, Alberta.

Synoptic and Dynamic Climatology, by Roger G. Barry and Andrew M. Carleton, Routledge, Paperback, 0-415-03116-8, $60.00US. Book being reviewed by **Ken Little**, Mountain Weather Centre, Kelowna, BC.

Geosphere-Biosphere Interactions and Climate, Editors: Lennart O. Bengtsson and Claus U. Hammer, Cambridge University Press, October 2001, Hardback Cover, 0-521-78238-4, $74.95US. Book being reviewed by **Charles Schafer**, Geological Survey of Canada - Atlantic, BIO, Dartmouth, Nova Scotia.

Radiative Transfer in the Atmosphere and Ocean, by Gary R. Thomas and Knut Stamnes, March 2002, Cambridge University Press, Paperback Cover, 0-521-89061-6, $45.00US. Book being reviewed by **Chris McLinden**, ARQX, Air Quality Research Branch, Meteorological Service of Canada, Toronto, Ontario.

La météorologie au service de l'armée sous-marine entre 1940 et 1945

par Hans Walden[1]

Pérégrinations

En novembre 1940, le Commandant en Chef de la Flotte sous-marine allemande, l'Amiral Dönitz, s'installa avec son état-major à Kernével, près le Lorient; le Service météorologique de la Marine décidait alors d'établir une antenne à demeure auprès de lui. C'est ainsi que l'auteur de ces lignes devint, d'une façon qui devait se révéler durable - plusieurs années - et malgré quelques interruptions, le chef de cette antenne. Celle–ci s'installa à la limite de Kernével et de Larmor, dans une construction de style que les Français aisés considéraient comme une maison de vacances.

Cependant, à la suite du coup de main britannique sur Saint-Nazaire, en mars 1942, la décision était prise de replier l'état-major de la Flotte sous-marine vers Paris. Ce transfert correspondit à une réduction importante en personnel de l'antenne météorologique dont l'activation fut poursuivie avec un seul spécialiste installé dans les locaux du détachement Marine-ouest, qui s'était établi dans la capitale française.

À la suite de la nomination de l'Amiral Dönitz à la tête de la Marine, l'état-major de la Flotte sous-marine gagna Berlin en mars 1943 (Steinplatz) et, à cette occasion, le personnel fut à nouveau renforcé.

Bientôt pourtant, les dures attaques aériennes contre la capitale allemande et la destruction partielle des installations de l'état-major conduisirent à un nouveau déplacement de ce dernier; le 17 décembre 1943, les quartiers étaient pris au camp "Corail", à proximité de Bernau, dans le nord de Berlin.

On atteignit ainsi 1945 où l'état-major et son antenne météorologique s'installèrent, le 3 février à Sengwarden, près de Wilhelmmshaven, puis le 24 mars à Plön, dans l'Holstein. Début mai 1945, l'ensemble était dissous à Meierwik.

Il faut noter que l'on dispose aujourd'hui encore du journal de route de l'antenne météorologique de la Flotte sous-marine. Ce document, commencé en janvier 1941, se termine le 23 avril 1945 par des annotations du docteur Wilhelm Schnapauff qui était, en ces derniers temps, le chef de l'antenne.

Les tâches de l'antenne météorologique

Apporter des renseignements sur la situation et sur son évolution en fonction des conditions particulières et des zones dans lesquelles combattaient les submersibles, constituait la tâche essentielle assumée auprès du Commandant en chef de la Flotte sous-marine et de son état-major. Dans le débuts, on s'intéressa à peu près uniquement à l'Atlantique nord comme théâtre des actions sous-marines, zone à laquelle vint un peu plus tard s'ajouter la mer du Nord; au cours de l'automne 1941, la Méditerranée complétait le domaine couvert puis, à partir de 1942, on s'intéressa à des zones plus éloignées encore.

Dr Hans Walden and I first met as delegates to the Intergovernmental Oceanographic Commission some forty years ago and subsequently served together as members of the Canada - Germany Scientific Agreement. We have corresponded with one another ever since our first meeting. Dr. Walden is a meteorologist, author and painter and served in the German Submarine Service during WW II; he is one of the principal contributors in documenting the history of the German Marine Weather Service from 1933 - 1945.

Neil Campbell
Executive Director, CMOS

Au moment où le Commandant en chef plaçait ses bâtiments en position d'attente devant les convois adverses, grand compte était tenu des prévisions. Il arrivait parfois à l'Amiral de fixer son choix définitif à la suite d'un court entretien avec le météorologiste. Dans le cadre de cette guerre des convois, on désirait surtout bénéficier d'une bonne visibilité et d'une mer peu agitée. Par contre, le calme plat et la mer d'huile se révélaient défavorables, les sous-marins devenant alors aisément repérables par l'adversaire. À l'opposé, une visibilité réduite et une mer calme étaient appréciées au moment des opérations de ravitaillement des sous-marins en haute-mer, menées par de grands submersibles spécialisés appelés familièrement "vaches à lait"!. Enfin, mentionnons les glaces flottantes et les icebergs qui pouvaient gêner considérablement les opérations.

[1] Docteur, République Fédérale d'Allemagne; traduction J. Sarchen.

À propos de l'auteur

Savant reconnu, le docteur Hans Walden a exercé au cours des dernières décennies nombre de responsabilités en Allemagne et, dans le cadre des actions de l'OMM, il a eu souvent l'occasion d'entretenir de fructueuses relations avec ses collègues météorologues et océanographes.

C'est un volet particulier de ses activités d'un passé lointain que nous offre ici le docteur Walden qui, au cours de la dernière grande guerre, occupa de façon durable les fonctions de conseiller météorologique de l'Amiral Dönitz.

Le *CMOS Bulletin SCMO* est redevable au docteur Neil Campbell, directeur éxécutif de la SCMO, qui a obtenu ce texte pour le bénéfice de nos lecteurs. C'est un privilège pour le *CMOS Bulletin SCMO* de pouvoir publier ce texte d'un acteur et témoin d'événements historiques majeurs.

Ayant en main la plus récente des cartes synoptiques spécialement tracées en vue des opérations, le météorologiste décrivait, deux fois par jour, à l'Amiral et à son chef d'état-major, la situation et son évolution. De plus, c'était toujours par un exposé des conditions météorologistes que débutait le grand briefing de la matinée. L'Amiral posait souvent des questions précises: fréquemment il s'enquérait également de choses touchant le climat. De plus, entre ces moments ponctuels de consultation, il lui arrivait de se faire expliquer tel ou tel point.

L'Amiral insistait aussi pour disposer, dans toute la mesure du possible, de prévisions à long terme sur la mer Baltique, concernant la durée et la sévérité des conditions hivernales ainsi que l'extension des glaces; c'est, en effet, dans cette zone qu'était assurée la formation à la mer des sous-mariniers et celle-ci pouvait ainsi se trouver interrompue. Des prévisions à la plus longue échéance possible étaient donc souhaitées et d'est dans cet esprit que l'on s'attacha, à partir du printemps 1944 à établir des pronostics expérimentaux portant sur dix jours et dont l'élaboration s'appuyait en partie sur une météorologie non-synoptique (voir plus loin).

Le météorologiste prenait fréquemment part aux discussions qui avaient lieu au moment des comptes rendus fait à l'Amiral par les commandants de sous-marins rentrant d'opérations.

Dans le journal de route mentionné plus haut, on trouve à la date du 20 septembre 1942 la mention suivante: "il s'avère toujours plus évident que les conditions météorologiques sont déterminantes pour la réussite des opérations menées contre les convois de l'Atlantique nord".

On vit même, fin 1942, paraître quelques "informations" visant à tromper l'ennemi et signalant que la Flotte sous-marine se passerait désormais des services de météorologistes spécialisés. Par contre, en 1943, une enquête fut menée en vue de déterminer si les routes des convois étaient établies par l'adversaire en fonction des types de temps.

Le service météorologique auprès des commandants de zone

En 1943, on affecta des météorologistes aux commandants de zones, respectivement la Flotte sous-marine ouest, en France, et la Flotte sous-marine de la mer du Nord, en Norvège. La tâche de ces spécialistes ressemblait à celle assumée auprès du Commandant en chef. De son côté, le commandant des sous-marins installé à Marseille était assisté par le Service local de météorologie marine.

Des météorologistes de la Marine servaient périodiquement comme instructeurs dans la stages de formation du personnel sous-marinier.

La tâche météorologique des sous-marins

Du fait du manque criant d'observations sur l'océan Atlantique, il était particulièrement difficile au Service météorologique d'élaborer des analyses précises pour les zones à l'ouest de l'Europe. Dans le nord et dans l'ouest de l'océan, peu nombreuses étaient également les observations en provenance des stations terrestres. Il se révéla ainsi qu'une assistance passablement satisfaisante du Commandant en chef n'était possible qu'en disposant de renseignements relevés dans la zone même des opérations. C'est alors que se révélèrent d'un grand secours les vols journaliers de reconnaissance météorologique assurés sur une base irrégulière par l'Escadre de combat 40 sur l'Atlantique jusq'à quelque 20° de longitude ouest.

Les sous-marins transmettaient des observations de surface:

a) comme "navire météorologique", le plus souvent deux fois par jour sous forme d'émission de courte durée, en langage codé et chiffré;

b) suivant les circonstances du moment sur demande spéciale du Commandant en chef et de la même manière;

c) à la suite d'une émission radio d'une autre nature, en langage clair;

d) à partir de l'été 1942, sous forme d'un message rédigé en langage clair quand un météorologue était spécialement embarqué.

Naturellement le souhait du chef de l'antenne de l'état-major était de voir le maximum de navires participer au réseau d'observation. De son côté, l'Aviation demandait de façon quasi continue des observations météorologiques en provenance des sous-marins; l'Amiral donna souvent suite à ce désir mais jamais de façon systématique.

Les analyses et les prévisions établies par l'antenne tenaient évidemment compte des observations portant sur les vagues.

Malheureusement, les bulletins des navires, transmis sous forme réduite, comportaient assez souvent des erreurs vraisemblablement en grande partie imputable aux transmissions radioélectriques.

Relativement fréquentes se révélaient les erreurs d'indication de la pression atmosphérique et grandes étaient les difficultés auxquelles on était exposé au moment de l'analyse. En effet, les différences de pression liées au niveau de plongée du submersible et aussi aux chocs occasionnés lors du grenadage par l'adversaire, tous éléments qui jouaient eux-mêmes sur l'état des baromètres et des barographes, faisaient que les indications transmises portant sur la pression atmosphérique étaient souvent erronées.

La disponibilité de baromètres dans les ports à l'appareillage avec étalonnage différé, semblait une formule relativement satisfaisante pour le météorologiste attaché à éliminer dans la mesure du possible les erreurs les plus flagrantes.

Aux sous-marins qui observaient des pressions manifestement fausses, le météorologiste de l'état-major communiquait par radiotélégraphie des valeurs corrigées qui se rapprochaient de la réalité.

En vue de réduire les erreurs de transmission, à partir de l'automne 1942, les stations de réception de la Flotte sous-marine captèrent les messages météorologiques (formule courte) sur les fréquences tactiques. De ce fait, l'information parvenait à l'état-major par les voies les plus rapides et c'est ce dernier qui se chargea, pour un temps, de transmettre les renseignements aux autres autorités et stations intéressées.

Avec la prise en compte des données en altitude (en particulier) de la circulation vers 5 000 mètres) on peut considérer que la prévision du temps s'améliora sensiblement. Pour obtenir de tels renseignements, le Centre instrumental de la Marine réalisa un type de radiosonde pouvant être utilisé par un sous-marin en surface. C'est ainsi qu'une première eut lieu en mai 1941 dans l'Atlantique où l'on vit le système mis en oeuvre par un météorologiste, le docteur B. Schröder. À partir de la fin de cette même année, l'exploitation en routine du radiosondage à bord des sous-marins par un météorologiste spécialement embarqué était assurée d'une façon suivie.

On visa alors à établir une permanence dans les mesures de façon telle que deux sous-marins radio-sondeurs se trouvent simultanément à la mer. Il faut dire que l'exécution d'un radiosondage dans ces conditions était toujours difficile, voire dangereuse, non seulement du fait des conditions météorologiques du moment, mais aussi parce que l'émission de signaux radioélectriques de la sonde pouvait mettre l'adversaire en éveil, et ceci jusqu'à une distance de quelque 200 milles.

Faits intéressants

Parmi les opérations menées par les sous-marins, on peut noter le mouillage de bouées automatiques, l'installation de stations à terre, le transfert de personnel d'exploitation, et enfin l'escorte de navires d'observations météorologiques...

On peut ainsi comptabiliser 44 mouvements, dont 8 en 1942, 10 en 1943 et 20 en 1944 utilisant les moyens d'une trentaine de submersibles. Les bouées étaient mouillées en différents points de l'Atlantique nord et les stations installées en des sites aussi variés que le Labrador, le Spirzberg, l'Ile aux Ours, Jan Mayen ou le golfe de Botnie. Plusieurs missions importantes ont également été menées dans les zones stratégiques comme la limite de la banquise, par exemple.

À noter encore que de nombreux ballons de caoutchouc se révélèrent défectueux et inutilisables.

Malgré les efforts qui furent ainsi prodigués, on doit cependant considérer que dans l'ensemble, le rendement du radiosondage par sous-marin resta limité.

Par contre, dès 1942, et notamment après des essais menés en juin à bord du U-124, on pensa qu'un météorologue embarqué était susceptible de fournir par radio nombre de renseignements utiles. C'est donc en vue de cette tâche et après essai de bulletin suffisamment courts mais comportant cependant les principaux éléments d'observation ainsi que la tendance générale qu'à partir de juillet 1942 on affecta progressivement nombre de météorologistes de la Marine aux sous-marins des opérations. Il appartenait au chef de l'antenne météorologique de la Flotte sous-marine de vérifier et d'apprécier l'efficacité opérationnelle de ce personnel.

De tous ces spécialistes, nombreux furent ceux qui ne revinrent pas, partageant le sort des équipages. Cependant le nombre exact n'en a pu être déterminé, tant lors de l'examen du journal de route de l'antenne que des autres documents disponibles.

Les efforts déployés par le Service météorologique de la Marine pour couvrir l'océan Atlantique et la zone polaire passèrent également par l'utilisation de bouées automatiques et de stations à terre mises en place par les sous-marins. Ces derniers assuraient aussi la relève du personnel nécessaire au fonctionnement des stations. En outre, les submersibles escortaient vers leur position de stationnement, les navires spécialement destinés à l'observation météorologique.

Au cours des années 1944 et début 1945, le Service météorologique de l'Aviation se montra désireux de placer son propre personnel pour armer des stations en zone polaire et demanda pour cela l'aide des sous-marins. Cette aide était généralement accordée; il faut noter ici qu'une certaine rivalité se manifestait parfois entre les services météorologiques de la Marine et ceux de l'Aviation.

En septembre 1944, l'Amiral Dönitz critiqua sévèrement la manière dont était menée l'assistance météorologique en zone nord. Il se réserva de prendre lui-même toute décision au sujet de missions météorologiques déterminées; en outre, il refusa de remplacer les vols de reconnaissance météorologique de l'Aviation par des actions similaires menées par les sous-marins. Il lui arriva au moment de l'exposé sur la situation météorologique, de poser des questions sur la nécessité pour les sous-marins d'exécuter des observations.

En avril-mai 1944, le docteur Reimers, chef de l'antenne météorologique auprès du commandement ouest de la Flotte sous-marine, réussissait à découvrir le code de chiffrement des observations météorologiques de l'adversaire ce qui constitua un important atout pour l'élaboration des cartes synoptiques.

Information des sous-marins à la mer

Certains sous-marins essayèrent d'abord de capter les signaux permettant d'établir la carte synoptique sur l'océan (dite "Ozeka") établie par le Service météorologique central de la Marine. Cette réception se révélait difficile, souvent impossible. Cependant, la carte similaire tracée à l'antenne de la Flotte sous-marine, basée sur un maximum d'observations parvenues en un minimum de temps, se révélait de meilleure qualité. Tout naturellement, à partir du 6 mars 1943, cette carte fut émise; ses coordonnées étaient transmises à petite vitesse, en graphie, deux fois par jour, à destination des submersibles dotés d'un météorologiste. De cette façon, le sous-marin était à même d'apprécier quelle idée se faisait l'état-major de la situation générale.

En dehors de ces émissions régulières, on pouvait, sur initiative de l'Amiral, par exemple lors d'opérations contre les convois, transmettre aux navires les prévisions établies par l'antenne météorologique. En général, les sous-marins, qu'ils soient au combat ou en mission spéciale (mouillage de bouées...) réclamaient, à courir, des renseignements sur l'évolution des conditions sur l'Atlantique nord.

Signalons que dans quelques cas, peu nombreux, on embarqua spécialement un météorologiste à bord 'une unité au sein d'une "meute" de sous-marins; il était chargé de la "conduite météorologique" des opérations; un spécialiste sur le théâtre même de l'action, disposant des éléments de la situation générale, était mieux à même d'intervenir qu'un météorologiste installé à terre.

Collaboration avec d'autres services

En mars 1941, le météorologiste attaché au Commandant en chef de l'Aviation de la côte Atlantique utilisa pendant une dizaine de jours les services de l'antenne météorologiste de la Flotte sous-marine avant que son propre service ne soit correctement organisé.

En mars 1942, l'antenne prenait en charge la maintenance météorologique des ballons captifs (barrage anti-aérien) déployés au-dessus de Lorient.

Suivant les circonstances, l'antenne apportait son concours à d'autres Services de la Marine; ce fut le cas en août 1942, en faveur de l'état-major des sous-marins italiens installés à Bordeaux.

Une consigne, applicable à partir de mars 1943, indiquait que le bulletin établi par l'antenne météorologique pourrait en cas de besoin, contenir des indications portant sur des zones d'opération extérieures à celles des sous-marins.

À noter encore qu'en 1943-1944, avant le grand briefing, les météorologues de l'antenne se concertaient souvent par téléphone avec leurs collègues attachés à d'autres services, s'exposant mutuellement leur manière d'interpréter la situation. Il en allait de même avec les météorologistes du Service central de la Marine quand ceux-ci préparaient la carte de situation générale ("Ozeka").

En novembre 1943, alors que ce même Service de la Marine (installé Woyrscstrasse à Berlin) était sévèrement touché du fait des attaques aériennes contre la capitale, l'antenne météorologique de la Flotte sous-marine (installée sur Steinplatz) se révéla d'un efficace secours pour ce Service.

Concernant les glaces, les échanges d'informations tournaient rond entre l'antenne et le Service de météorologie maritime de l'État (professeur Wüst).

Il faut louer également l'action de l'Observatoire de la Marine de Greifswald qui aida efficacement l'antenne de la Flotte sous-marine de maintes façons, répondant aux demandes de recherches et de réalisations instrumentales dans les meilleurs délais.

Recherches et prévisions à long terme

Les sous-marins avaient une vitesse relativement limitée, tant en surface qu'en profondeur. Dans de nombreux cas, ils ne pouvaient rattraper les convois qui leur étaient signalés par d'autres submersibles. Ce manque de mobilité rendait difficile la préparation des opérations, les unités ne pouvant se déplacer suffisamment vite d'une zone à l'autre.

Des prévisions à long terme des types de temps revêtaient dans ces conditions une grande importance pour la conduite de la guerre sous-marine. Les réalisations dans ce domaine du groupe de recherche du Service météorologique national ne parvenaient pas jusqu'à l'état-major de la Flotte sous-marine. Le météorologiste de ce dernier (l'auteur de ce texte) commença donc de sa propre initiative (et pour lui-même dans un premier stade) à travailler sur des essais de prévision à dix jours. La démarche suivie se basait essentiellement sur la méthode des points de symétrie et des quasi-périodes du cours de la pression atmosphérique en des sites géographiquement sélectionnés. À partir d'avril 1944, habitude fut prise de mentionner ces prévisions à la fin de l'exposé de la situation actuelle et des prévisions à court terme. L'Amiral Dönitz, Commandant en chef de la Marine, leur manifestait un grand intérêt et prit l'habitude d'en vérifier le degré d'exactitude; manifestement encouragé par une série de prévisions passablement exactes, il en parla même à Hitler (fin avril-début mai 1944). Malheureusement, ces prévisions devaient dans la suite de cette période se révéler moins heureuses.

Par ailleurs, le Service météorologique de la Marine élabora, avec l'aide du groupe de recherche de Hambourg, des prévisions portant sur cette même échéance de dix jours. Un contrôle de qualité fixa le taux de réussite autour de dix pour cent (10%) au dessus de la limite non significative de cinquante pour cent (50%). À noter encore que des informations sur les travaux menés depuis le début 1944 par le docteur Kunze sur les prévisions à dix jours n'étaient pas parvenues à l'antenne.

Notes du Rédacteur:

1) La traduction peut sembler parfois lourde. Nous avons préféré la garder ainsi pour refléter la "saveur" de la langue allemande.

2) L'article original présentait plusieurs images saisissantes de l'activité de recherche faite durant les années 1933-45. Cependant la mauvaise qualité des images présentées nous a empêché de les reproduire avec l'article de Hans Walden.

NASA STUDY LINKS EL NIÑO and SOUTHERN OCEAN CHANGES[1]

NASA researchers have found strong relationships between El Niño episodes and changes in climate and sea ice cover around Antarctica.

Identifying these relationships is important because it provides new insights into the changing characteristics of the Antarctic region and their role in Earth's climate system.

The findings, published in the March 1 issue of the American Meteorological Society's *Journal of Climate*, show that although the total ice coverage of the southern ocean has not changed significantly over the last 20 years, the El Niño and its related Southern Oscillation appear to affect regional ice distributions. The oscillation is a recurring warming and cooling of the surface ocean in the central and eastern Pacific. El Niño refers to the warm phase of the oscillation.

"Understanding the connection between the Southern Oscillation and southern ocean climate and the sea ice cover will substantially improve our understanding of global climate," said Dr. Ron Kwok, a senior research scientist at NASA's Jet Propulsion Laboratory, Pasadena, Calif. "Our study concludes that the southern ocean's climate and ice cover is somehow connected to climate in the tropical latitudes. While we don't know yet the cause-and-effect relationship between the two, we do know the changes in sea ice cover cannot be explained by local climate variations alone and are instead linked to larger scale climate phenomena."

The study was conducted by scientists at JPL and NASA's Goddard Space Flight Center, Greenbelt, Md. It is based on data from 1982 to 1999. The NASA scientists also noted changes in sea ice cover in regions not normally associated with El Niño, such as the Weddell Sea east of the Antarctic peninsula.

The strongest links were observed in the Amundsen, Bellingshausen and Weddell seas of the west Antarctic, where the connections are localized and well defined. Within these sectors, higher sea level pressure, warmer air temperature and warmer sea surface temperature are generally associated with the El Niño phase.

A number of observations in the scientific literature can be explained by this El Niño Southern Oscillation connection. Examples include a record decrease in sea ice coverage in the Bellingshausen Sea from mid-1982 through early 1999; the reduced sea ice concentration in the Ross Sea; and the shortening of the ice season in the eastern Ross, Amundsen and far western Weddell seas. Four El Niño episodes over the 17 year period occurred at the same time as ice cover retreats in the Bellingshausen and Amundsen seas, showing unique associations between the Southern Oscillation and this region of the Antarctic.

"The study shows that the impact of El Niño is global and that processes as remote as those in the polar regions are affected," said co-author Dr. J. Comiso, senior research scientist from Goddard. "The effect can be profound since these El Niño episodes affect the Weddell and Ross seas. These areas are regarded as key sources of cold and dense bottom water that influences global ocean circulation. Also, the ice cover in the Bellingshausen Sea is the habitat for a wide variety of marine life and is crucial to their survival."

Data for the study were acquired from several sources, including satellite data from the National Oceanic and Atmospheric Administration, Washington, D.C.; climate data from the joint data set of the National Centers for Environmental Prediction, also in Washington, and the National Center for Atmospheric Research, Boulder, Colo.; sea ice data from the National Snow and Ice Data Center in Boulder; and sea ice motion data from JPL's Remote Sensing Group.

The complete paper, "Southern Ocean Climate and Sea Ice Anomalies Associated with the Southern Oscillation," is available to journalists from Alan Buis at (818) 354-0474.

The American Meteorological Society is the nation's leading professional society for scientists in the atmospheric and related sciences. The study was funded by the Cryospheric Sciences Program within NASA's Earth Science Enterprise, a long-term research effort dedicated to understanding how human-induced and natural changes affect our global environment.

JPL is a division of the California Institute of Technology in Pasadena.

1: Taken from the American Meteorological Society (AMS) web site: http://www.ametsoc.org/AMS

Characterizing Vulnerability to Climate Change[2]

by A. Holly Dolan[3]

Of late, 'vulnerability' has become a favourable term in leading climate change discussions. Vulnerability represents the susceptibility of a system to climate-related effects and the ability of the system to respond to such changes. The Intergovernmental Panel on Climate Change (IPCC) endorses consideration of vulnerabilities and defines it as:

> *"the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including variability and extremes. Vulnerability is a function of the characteristics, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity and its adaptive capacity".*

Vulnerability analyses in climate change research generally adopt the IPCC conceptualisation of vulnerability. Here, adaptation is fundamental, as the level of vulnerability is determined by <u>unfavourable consequences remaining after adaptation</u>. Thus, understanding how to reduce our vulnerability to climate change through the promotion of adaptation is an important component of dominant climate change research and of political agendas worldwide, including Canada's.

Vulnerability is not an uncommon term in many other well-established scholarly fields including risk and natural hazards, disaster management and famine research. These bodies of research enrich conceptualisations and understanding of vulnerability, but appear little used in climate change research, in part a result of the difficulty incorporating these concepts into climate models and scenario exercises and the confusion around the term itself. Although used repeatedly in many literatures, vulnerability is hardly a simple indicator or descriptor of a society; it is a rhetorical warning of danger, which is undeniably value-laden. Regardless, vulnerability has become a 'term of art' and a basis for analysis in many different disciplines.

Given the many and varied conceptualisations of vulnerability, it would be enlightening to discuss and analyse the term and consider those attributes that are important for its application. Three key questions are important when considering 'vulnerability'; (1) who is vulnerable; (2) to what is the entity vulnerable; and, (3) why is the entity vulnerable? These may seem like simple questions, but they are often taken for granted, and not clearly identified in underlying vulnerability analyses.

Who is vulnerable?

It is important to clearly identify the entity that is vulnerable. In the broadest sense, you can have vulnerable natural systems and vulnerable human systems. In global climate change research, the relationship between the natural and human system is the focus and this relationship is often quantifiable and direct. For example, the predominant approach is to consider the changes in the physical environment first. Impacts on human systems, such as socio-economic systems such as agriculture,

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[2] Source: The Climate Network, Vol. 7, No.2, Summer 2002; reproduced here with authorization of the author and the editor.

[3] Royal Roads University, Associate Researcher, University of Victoria

forestry, water resources, are considered secondary or tertiary impacts as a result of changes in the physical environment. Due to the nature of 'global' climate change and the current capabilities of climate change models, the scale of the 'vulnerable' is generally quite broad and based on larger units such as political boundaries (nations), natural and human resource systems (agriculture, fisheries, forests) and geographic locales such as coastlines, watersheds, and other biophysical regions.

> *"Vulnerability is multi-layered and occurs at the scale of the individual, household, community, region, province, nation, and globe".*

In other studies, the 'who' is vulnerable can represent much smaller units. For example, in food security and risk and hazards research, the focus is more on individuals and households and analyses consider the determinants that make individuals, households and certain groups of people vulnerable, paying particular attention to local determinants within the broader political economy. Thus, vulnerability is multi-layered and occurs at the scale of the individual, household, community, region, province, nation, and globe. Broader scale frameworks in climate change tend to be at the aggregate level. These risk overlooking heterogeneities in vulnerability at other scales. Smaller scale units, while considering these heterogeneities, risk inapplicability to the nature of the global climate change problem as currently defined in the dominant paradigm.

Vulnerable to what?

The IPCC clearly identifies that the external climate event or shock is the 'to what' that is under consideration. For example, sea level rise, temperature and precipitation changes and changes in the severity and frequency of extreme events represent external stresses or shocks to which systems are vulnerable. While this is a strength of climate change research, there is a danger here that vulnerability becomes too attached to physical assets that are measured in terms of physical attributes (e.g. spatial extent of drought, return periods of flooding). Vulnerability here is determined in terms of physical exposure and the effects remaining after adaptation occurs. Thus, the result is a preoccupation with the physical event at the expense of considering other external stresses (e.g. socio-economic stresses).

> *"There is a preoccupation with physical events at the expense of considering other external stresses such as socio-economic stresses".*

In food security literature the undesirable outcome (e.g. famine) is what people are vulnerable to, rather than an outcome of a relationship between an external event and a vulnerable entity. The 'to what' is therefore not unambiguous and represents any stress in the physical, social, economic or political environment. While indeed ambiguous, its strength is its focus on vulnerability as a pre-existing condition, rather than as a result of interactions with a climate event. Thus, it is policy-relevant because specific interventions aimed to improve the capacity of people to respond to stress can be assessed more directly.

Why vulnerable?

Dominant climate change research borrows early natural hazards concepts in considering the determinants of vulnerable systems and the capacity of societies to cope with external shocks. A human ecology approach, natural hazards characterized vulnerability in terms of a systems absorptive capacity. When losses to a system were experienced, the hazard had exceeded a system's absorptive capacity. Here, response to such an event was generally equated with 'organismal adjustments' stemming from ecological systems theory. Reducing vulnerability then became an exercise in determining the place, timing and extent of an external shock directing efforts toward reduction using scientific, technological and institutional mechanisms. Similarly, in dominant climate change research increasing capacities to adapt, involves economic, technological and institutional considerations, because these are determined to be the solutions to improving absorptive capacities.

In other studies, the focus of attention is directed to the pre-existing conditions of vulnerability that might place people at high levels of risk. Here, processes of 'structural' change (i.e. changing underlying patterns that create and perpetuate poverty) become the focal point over the external event and descriptions of structural conditions that represent system resiliency (e.g., lack of economic and institutional means to cope). Vulnerability becomes a human relationship not a physical one; it is socially allocated rather than an outcome of the occurrence of a climate event. Thus, an understanding of vulnerability is contingent on an understanding of the cultural and social conditions and structural and historical circumstances that put certain individuals and groups of people at risk to a diverse range of stresses (e.g., climate-related, political, economic). Those who are vulnerable lack access to resources (e.g., wealth and real income, formal and informal social security) and therefore are limited in their ability to respond to, cope with and recover or adapt to any stress placed on their livelihoods. This approach is appropriate for making policy-relevant recommendations, including those for adaptation, that address both short- and long-term needs regarding climate-related changes as the focus is on the 'socio-economic and political context within which the impact process takes place'.

> *"An understanding of vulnerability is contingent on an understanding of the circumstances that put certain individuals and groups of people at risk to a diverse range of stresses (e.g., climate-related, political, economic)".*

The above discussion is only a brief introduction to the differing conceptualisations of vulnerability in various studies, including leading climate change research. Given the many and varied definitions and interpretations of vulnerability, it is important that any vulnerability analysis clearly identifies its underlying framework and associated assumptions. This involves the explicit identification of the 'who', 'what' and 'why' of vulnerability. Climate change research would benefit from a more explicit organizational framework for vulnerability analysis. Perhaps attention to a standard understanding of the nature of vulnerability will compel alternative climate change research approaches that reflect the contributions of other studies. While climate change represents a global problem, the impacts will be expressed at the local level. Current model results are not policy-relevant (i.e. useful for governments) as they are generally too broad scale and speculative. Complementary analyses are needed to identify policy-relevant interventions and that consider pre-existing conditions that expose communities to risks. Given that climate changes will be expressed through changes in averages and changes in frequency and severity of extreme events, many lessons can be learned from past experiences with extreme climate events. There is a germane opportunity in Canada to consider how communities responded to and adapted to past climate-related events paying particular attention to the conditions that both reduced and exacerbated vulnerabilities.

There are also many Canadian case examples of other external stresses, such as economic and environmental restructuring, that communities are exposed to. Adopting a framework that considers pre-existing vulnerabilities and exposures to many different stresses (e.g., economic, political) will allow for these case studies to be examined to help us understand coping capacities applicable to climate change research. Results based on community-level case studies will help us better understand the nature of vulnerability and will help identify applicable and policy-relevant interventions to promote adaptation and reduce vulnerabilities.

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Discussion Paper on Canada's Contribution to Addressing Climate Change[4]

by Rick Lee[5]

Earlier this spring, the federal government released its paper on Canada's contribution to Addressing Climate Change. This paper briefly discusses the science and potential impacts, about which CICS has written often in its newsletter. CICS supports the view expressed in the Discussion paper regarding the science and potential impacts.

While the paper addresses and outlines approaches to reduce and meet the Kyoto targets, there remains a significant emissions gap, and the government outlines sources of uncertainty about the size of the gap (see figure 1).

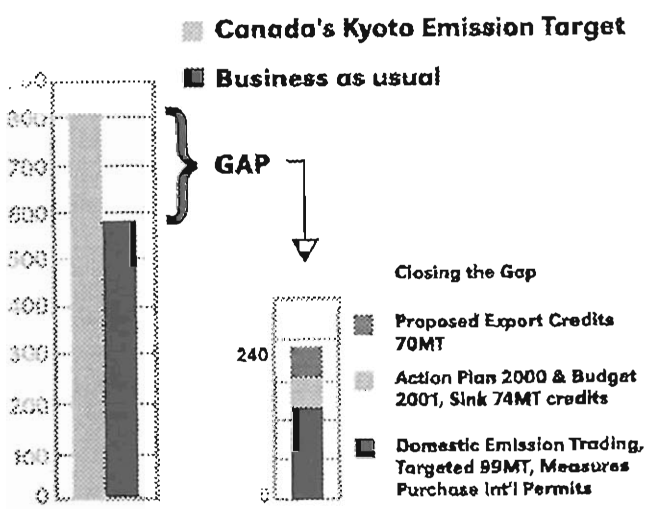

Figure 1: Canada's Kyoto Emission Target showing the gap to be closed.

Even without this gap, climate modellers tell us that there is an unavoidable climate warming as a result of the greenhouse gases that have already been emitted, and the global climate is likely to warm over the next half-century. Evidence of climate change now abounds, from meteorological and from geothermal records. (e.g. http://geophysics.stfx.ca/public/borehole/box1.html).

While reducing emissions is a laudable goal, our ability to adapt to climate change in the short term is equally important. Where do we start when climate affects virtually every aspect of Canadian life? As outlined in the above article, there is a possible lag or disconnect between the timeliness that our vulnerability, impact and adaptation research community can provide answers (definitive research takes years) and the timeline that actions may be required (coming decades). It is CICS' view, shared by many leading climate researchers across Canada, that today, no comprehensive approach exists to managing the three-legged-stool-climate vulnerability, climate modelling and climate scenarios research. Research is, at present, rather ad hoc and we do not know if it addresses the most vulnerable segments of our society, economy and ecology.

This requires leadership amongst the funding agencies. The results of recent funding will not be made known for several months.

In the meantime, until we know more scientifically about the most vulnerable segments of our country, Canada's country-wide consultation and approach to addressing Kyoto warrants your attention. It has far-reaching implications. You can download your own copy from: http://www.climatechange.gc.ca/english/actions/what_are/canadascontribution/Report051402/englishbook.pdf.

Prochain numéro du CMOS Bulletin SCMO

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

Next Issue CMOS Bulletin SCMO

Next issue of the *CMOS Bulletin SCMO* will be published in October 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.

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[4] Source: The Climate Network, Vol. 7, No.2, Summer 2002; reproduced here with authorization of the author and the editor.

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The Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) An Integrated Approach To Marine Programs

by Savi Narayanan[1] and Peter Dexter[2]

Understanding, predicting and managing our environment requires expertise in many disciplines and involvement of many countries around the world. Depending on the key issues and concerns during any given period, the governments organize the responsibilities associated with this enormous task among several departments or ministries. As the focus changes, the departments may regroup as appropriate. In Canada, several decades ago, the physical oceanography and the atmospheric sciences were under the same department whereas the living marine resources were managed by a separate research board. As the fisheries-related issues gained prominence, oceanography and fisheries were brought together under the Department of Fisheries and Oceans, and the Atmospheric Sciences became part of Environment Canada. Recently, the two departments are establishing stronger collaborations to develop programs to better understand and predict climate variability and change.

At the intergovernmental level, the World Meteorological Organization (WMO) and the UNESCO's Intergovernmental Oceanographic Commission (IOC), are responsible for meteorological and oceanographic programs respectively. Each operates independently, with interaction in operational marine programs. In the late sixties, IOC realized that there was a growing requirement for oceanographic data on a global scale for a variety of purposes, and established a permanent Working Committee for the Integrated Global Ocean Station System (IGOSS). At the same time, WMO established an Executive Council Panel on Meteorological Aspects of Ocean Affairs. These two bodies held a number of joint sessions. As the programs evolved, the IOC Working Committee for IGOSS was re-structured several times, and in 1977 it was formally merged with the WMO panel to become the Joint IOC/WMO Working Committee for the Integrated Global Ocean Services System (IGOSS). The word 'station' was replaced by 'services' in the name of the Committee to reflect the ultimate goal of the Committee to provide services rather than just make observations.

Marine meteorology evolved over the years under the Commission for Marine Meteorology (CMM) of the WMO, and its predecessor, the Commission for Maritime Meteorology, whose origins date to 1907, as a key subsidiary body of the International Meteorological Organization, the non-governmental predecessor of WMO. The fleet of voluntary observing ships, recruited under the auspices of CMM, provides essential and highly valued data to the network of National Meteorological Centres to incorporate in their models to generate a range of operational products and services for the marine user community. The data are also increasingly valuable for climate services and global climate studies.

With the increasing focus on climate change and the establishment of the Global Climate Observing System (GCOS), whose marine component is designed and implemented as part of the Global Ocean Observing System (GOOS), there was an increasing demand for integrated marine meteorological and oceanographic data and services. The Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) was the result of the recognition of such a need and the efficiencies that may be achieved by combining the expertise and technological capabilities of the WMO and IOC systems. Formally, JCOMM was established through the merger of CMM and the Joint Committee for IGOSS, and the Commission now also encompasses other formerly independent bodies such as the Data Buoy Cooperation Panel and the Group of Experts for the Global Sea Level Observing System (GLOSS).

JCOMM's Vision

The vision of JCOMM is of a dynamic, forward looking body, which coordinates a fully integrated marine observing, data management and services system, responsive to the evolving needs of all users of marine data and products as well as the development of new technologies and capabilities. JCOMM includes as a major outreach programme to enhance the capacity of all

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maritime countries, both to contribute to JCOMM activities and to benefit from the outcome of these activities.

JCOMM's Mandate

JCOMM meets its mandate through:

- *Further development of the observing networks under the guidance of GOOS, GCOS, WWW and other operational programmes, and cooperation with these bodies in seeking commitments for all components of an operational programme in the global oceans.*

- *Implementation of integrated end-to-end data management systems in collaboration with the WMO's Commission for Basic Systems (CBS), the IOC's Committee for International Data and Information Exchange (IODE), the International Council of Scientific Unions (ICSU), and other appropriate data management bodies, to meet the real-time operational needs of the present operational systems and the global observing systems.*

- *Delivery of products and services needed by international science and operational programmes, Members of WMO, and Member States of IOC. An important component of this will be the coordination of the safety-related marine meteorological and associated oceanographic services as an integral part of the Global Maritime Distress and Safety System of the International Convention for the Safety of Life at Sea (SOLAS).*

- *Provision of capacity building through education, training, technology transfer and implementation support to Member States.*

- *Establishment and enhancement of partnerships, liaison and collaboration with other global programs and international agencies both within and outside the UN system.*

JCOMM Organization

JCOMM is a global organization with:

- A current membership of approximately 250 experts in marine meteorology and oceanography; most national delegations include approximately equal numbers of meteorologists and oceanographers providing support to the marine community.

- A global network to provide maritime services including the provision of warnings and weather and sea bulletins according to a broadcast schedule, in conformity with procedures laid down under the Global Maritime Distress and Safety System (GMDSS) protocols within SOLAS.

- Around 6500 volunteer merchant vessels observing meteorology and surface oceanography.

- About 120 volunteer vessels observing subsurface temperature and salinity.

- Approximately 1400 drifters observing meteorology and surface oceanography.

- 100s of moored ocean buoys for meteorology and ocean parameters.

- 10-20 volunteer merchant and research vessels making upper atmosphere vertical soundings.

- Partnership with global programs, such as the Argo pilot program utilizing up to 3000 diving profilers to collect synoptic vertical profiles of upper ocean temperature and salinity.

- Around 400 tidal stations for sea level, some reporting in real time.

- Arctic and Antarctic ice monitoring and notices.

- Collaborations with the satellite community, facilitating on-line acquisition and calibration/validation of altimeter/scatterometer/SAR data, as examples.

- The capacity to provide end-to-end data management support, data acquisition guidance, data management, and data exchange.

- Information dissemination mechanisms and services, e.g. through JCOMMOPS and the JCOMM Electronic Products Bulletin.

- 20 – 30 lead nations in numerical modelling/data assimilation.

- A strong commitment to embracing and supporting new technologies in all elements of JCOMM.

- A major focus on capacity building and implementation assistance for services.

JCOMM is organized within four Programme Areas, each managed by a Coordinator and a small Coordination Group: Observations, Data Management, Services, and Capacity Building. Within each Programme Area, specific activities are undertaken by a number of Expert Teams, Task Teams and Panels. Overall guidance and oversight for the work of the Commission is provided by a Management Committee, chaired by the two co-presidents of JCOMM, and including the four Programme Area Coordinators, representatives of GOOS and GCOS and a small number of other selected experts. The nine members of the current Committee include four meteorologists, four oceanographers and one polar region expert.

Observations Programme Area

The JCOMM Observations Programme Area is the implementation arm of the global marine meteorological and oceanographic observing systems, in particular those supporting or integral parts of GOOS, GCOS and the World Weather Watch (WWW). It is thus responsible: for the development, maintenance, coordination and provision of guidance for the operation of the moored, drifting, ship-based and space-based observational networks including communication facilities: for the evaluation on a continuing basis of the efficiency of the overall observing system; and for suggesting and coordinating changes designed to improve it.

The current observational elements under JCOMM are: atmospheric and oceanic observations from the network of voluntary ships coordinated by the Ship Observations Team (SOT), sea surface measurements from drifting and moored buoys coordinated by the Data Buoy Cooperation Panel (DBCP), the sea level observations coordinated by the Group of Experts on the Global Sea Level Observing System (GLOSS), tropical moorings coordinated by the Tropical Moored Buoy Implementation Panel (TIP), and the Argo Pilot Project coordinated by the Argo Science team under the Ocean Observations Panel for Climate (OOPC). Overall coordination is undertaken by a team consisting of the chairs of these groups and designated experts on various elements of ocean observations.

SOT: This group provides coordination for and integration among the voluntary observing ships scheme (VOS), the Automated Shipboard Aerological Program (ASAP) and the Ships-of-opportunity Program (SOOP). The VOS scheme was essentially initiated almost 150 years ago. Under the scheme, ships plying the various oceans and seas of the world are recruited for taking and transmitting meteorological and surface oceanographic observations. Port Meteorological Officers (PMOs) having maritime experience are appointed for recruiting voluntary observing ships and assisting them in their work. The ASAP in its present form began in the mid-1980s. It involves the generation of upper air profile data from data-sparse ocean areas using automated sounding systems carried on board merchant ships plying regular ocean routes. The profile data are all made available in real time on the GTS, for use by operational centres. Most of the soundings are presently from the North Atlantic Ocean, but the programme is also expanding into other ocean basins, most notably through a new, cooperative Worldwide Recurring ASAP Project (WRAP). The SOOP also makes use of volunteer merchant ships which routinely transit strategic shipping routes (see figure 1). Ships' officers are trained to deploy Expendable Bathythermographs (XBTs) at predetermined sampling intervals to acquire temperature profiles in the open ocean. Selected data, which accurately represent the entire data profile, are transmitted by satellites to shore centres, for insertion and exchange on the GTS, and assimilation into operational ocean models. MEDS coordinates the data management component of the real-time T/S data from ships of opportunity by leading the very successful 'Global T/S Profile Program (GTSPP)'.

DBCP: The Data Buoy Co-operation Panel is the re-named Drifting Buoy Co-operation Panel, which was established in 1985 as a joint WMO/IOC initiative. It was originally concerned only with drifting ocean data buoys, but in 1995 expanded its activities to also encompass moored data buoys on the open ocean, thus its name change. It addresses the requirements and needs for real-time or archival data from buoys, both drifting and moored, coordinates buoy deployments worldwide, and provides a forum for the exchange of technical and related information on buoy technology, communications systems and the applications of buoy data, to both operations and research (see figure 2). The implementation of buoy deployments is coordinated at the regional level through various Action Groups. Of particular interest to Canada are the International Arctic Buoy Program (IABP) and the recently established Pacific Buoy program. MEDS is the designated international data centre for the real-time buoy data.

GLOSS: The Global Sea Level Observing System (GLOSS) oversees the operation of, and collection and management of data from a global network of tide gauge stations, in support of a variety of operational activities in Members/Member States and also of global climate studies (see figure 3). The system is coordinated by the GLOSS Group of Experts, under the JCOMM. Amongst other things, GLOSS operates a GLOSS Core Network (GCN) as well as regional GLOSS networks; it provides tide gauges for ongoing altimeter calibration (GLOSS-ALT); provides data and information to international scientific study groups such as the Intergovernmental Panel on Climate Change (IPCC); and prepares materials for training, outreach and research. MEDS is the national data centre for the tides and water level data in Canada.

TIP: TIP had its genesis in the Tropical Atmosphere Ocean (TAO) array Implementation Panel, established in 1992 under the auspices of the international Tropical Ocean Global Atmosphere Programme (TOGA) to monitor among other things El Niño events. The 1982-1983 El Niño event, the strongest of the century up to that time, which was neither predicted nor detected until nearly at its peak, highlighted the need for real-time data from the tropical Pacific for both monitoring, prediction, and improved understanding of El Niño. Subsequent to the successful implementation of the tropical Pacific Array and the demonstration of its usefulness, the program was extended to the Atlantic under the name of PIRATA, and is in the process of being expanded to the Indian Ocean. In 2001, the Panel was renamed as the Tropical Moored Buoy Implementation Panel to coordinate the buoy-based observations in all the tropical oceans.

Argo: Argo is a pilot program under GODAE and GOOS to collect simultaneous T/S profiles in the global oceans using, by 2005, up to 3000 robotic diving buoys, These platforms are capable of acquiring T/S profiles to a depth of up to 2000m and transmitting data via satellite on reaching the surface. The program aims to receive, process and re-distribute data to the scientific community within 24 hours of its transmission. Globally there are over 500 floats operating currently (see figure 4), of which over 50 are Canadian. Howard Freeland and Allyn Clarke are the scientists involved from Canada, and Bob Keeley from MEDS chairs the international Argo Data Management group. MEDS is the centre for Canadian data.

Data Management Programme Area

The primary objective of the Data Management programme area is to implement and maintain a fully integrated end-to-end data management system across the entire marine meteorology and oceanographic community, in collaboration with existing global data centres and infrastructure. Additionally this programme area will offer its expertise to assist science programs and organizations to specify and implement their own data management requirements, and to facilitate their integration into the overall end-to-end data management system.

The activities of this programme area will be undertaken by two groups: the Expert Team on Data Management Practices mandated to develop, recommend, implement and promote best practices for end-to-end data management; and the Expert Team on Marine Climatology, which coordinates and maintains the long-standing system for the exchange, quality control and archival of marine climatological data (primarily observational data from the VOS). Additional task teams and pilot projects will be established as required to address specific aspects of data management. The Data Management Coordination Group consisting of the chairs of its Expert Teams and additional experts from other international science and data management programs will oversee the development of the overall strategy and identify priorities in the field of data management.

The Data Management Coordination Group is currently investigating options to develop a distributed network of databases capable of delivering multi-disciplinary integrated data and information to the user community.

Services Programme Area

The Services Programme Area is responsible for coordinating and regulating the delivery of meteorological and oceanographic data, products and services to the global community. It is organised under five key elements.

Maritime Safety Services are a core ongoing activity. They are delivered primarily in the context of the Global Maritime Distress and Safety System, a component of the International Convention for the Safety of Life at Sea (SOLAS). They include meteorological forecast and warning services delivered to marine users via Inmarsat SafetyNET satellite broadcasts and the Navtex VHF radio system.

The second component is the Marine Pollution Emergency Response Support System. MPERSS's primary objective is to maintain a coordinated global system for the provision of meteorological and oceanographic information for marine pollution emergency response operations outside waters under national jurisdiction.

Sea ice services represent the third component. The work of the Expert Team on Sea Ice is substantially focused on improving the real time detection and measurement of sea ice coverage (extent, type, thickness, movement, etc.), assimilating such data into analysis products and long-term data holdings, and the provision of sea ice services based on the data.

The WMO Wave Programme was established in 1984 in support of National Meteorological Services, which were increasingly required to provide sea-wave analysis and forecasts services. In Canada, this responsibility is shared between Environment Canada and Fisheries and Oceans Canada, and MEDS is the designated national data centre for waves. Under JCOMM, this program has been given the increased mandate to include storm surges as well. Val Swail from EC chairs this Expert Team.

Development of oceanographic services is an emerging issue for JCOMM. The SCG will be forming a team with other PAs, scientific panels and operational agencies to determine how best to meet service requirements for new oceanographic services.

Capacity Building Programme Area

The Capacity Building (CB) Programme Area is an essential, high priority activity, designed to assist all nations to contribute to operational ocean observations and services and to gain maximum benefit from the data and products available via the system. It has the responsibility to help countries increase their capability in marine forecasting and management and to become involved in the various JCOMM Programmes through training, transfer of technology, and provision of equipment, with the objective of improved operational ocean and meteorological services to the users of all countries.

The CB Programme Area consists of a Coordination Group, possible regional user Forums devoted to determining the user requirements for capacity building, and a Task Team on Resources to develop funding support. CB activities will be performed in harmony with the activities and requirements of the other three JCOMM Programme Areas (Observations, Services and Data Management), and coordinated closely with those of GOOS.

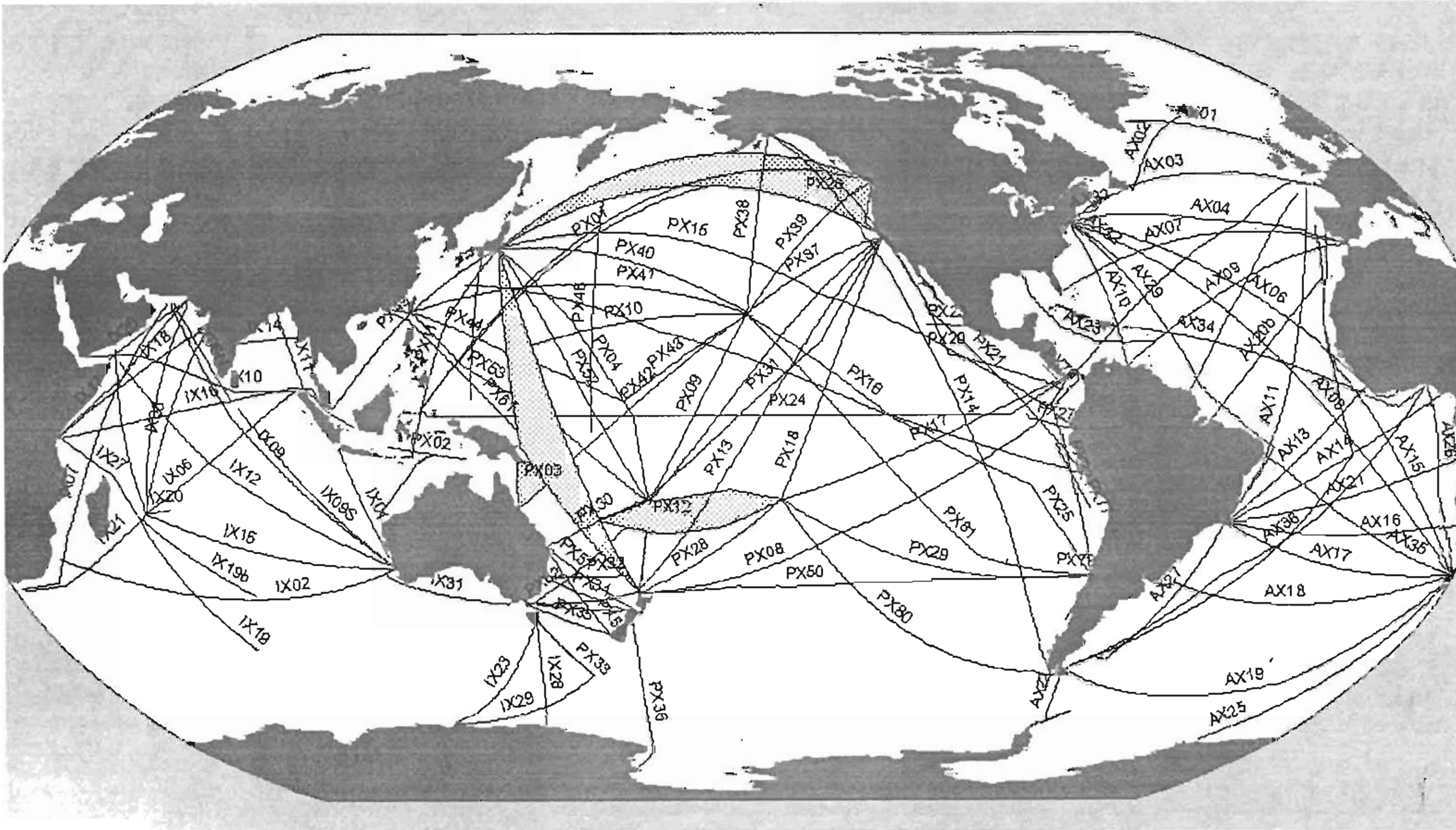

Figure 1: Maps showing targeted SOOP lines where temperature and salinity observations are collected.

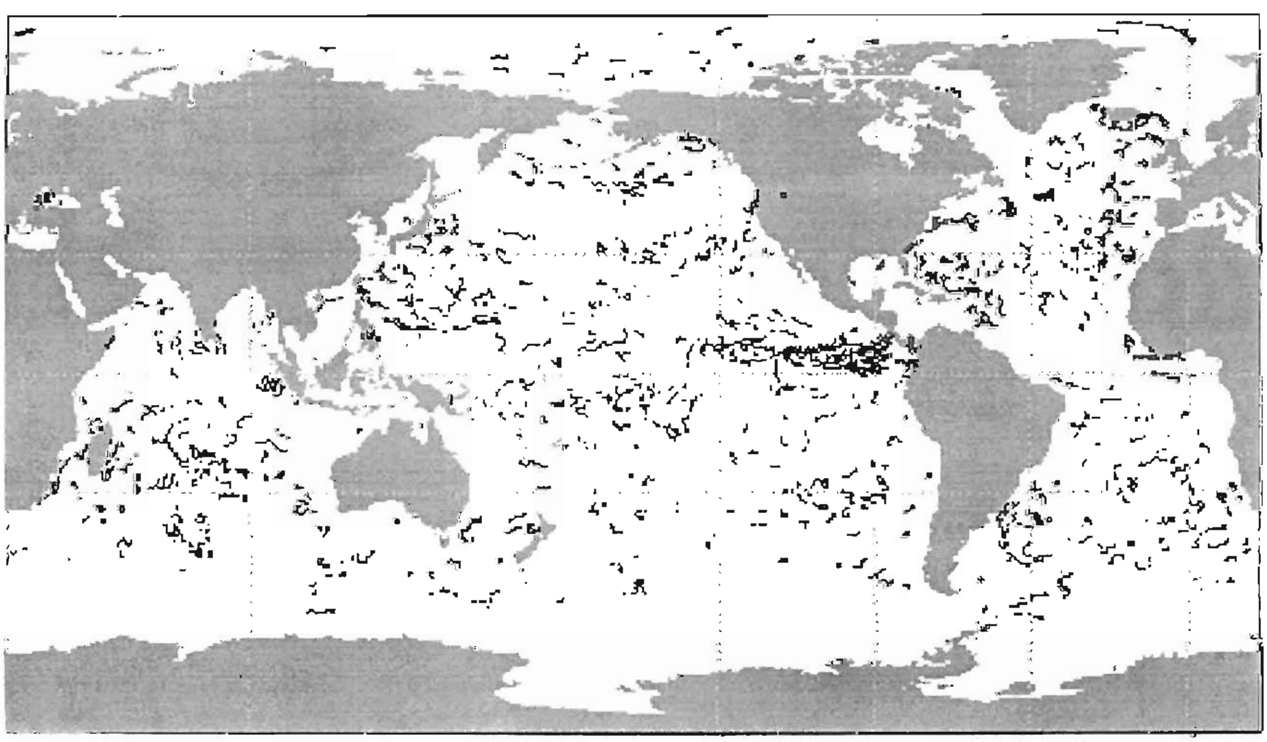

Figure 2: Maps produced by MEDS showing Drifting Buoy tracks for the month of December 2001.

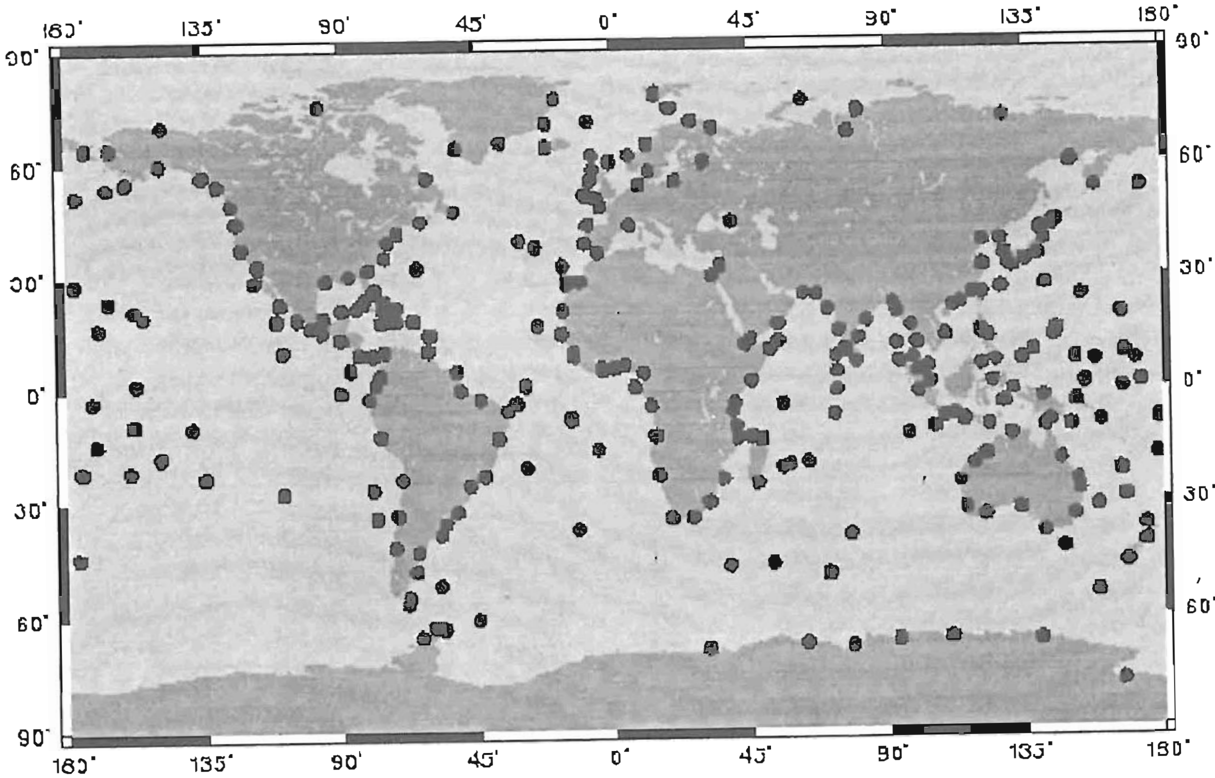

Figure 3: GLOSS Core Network as defined by GLOSS97.

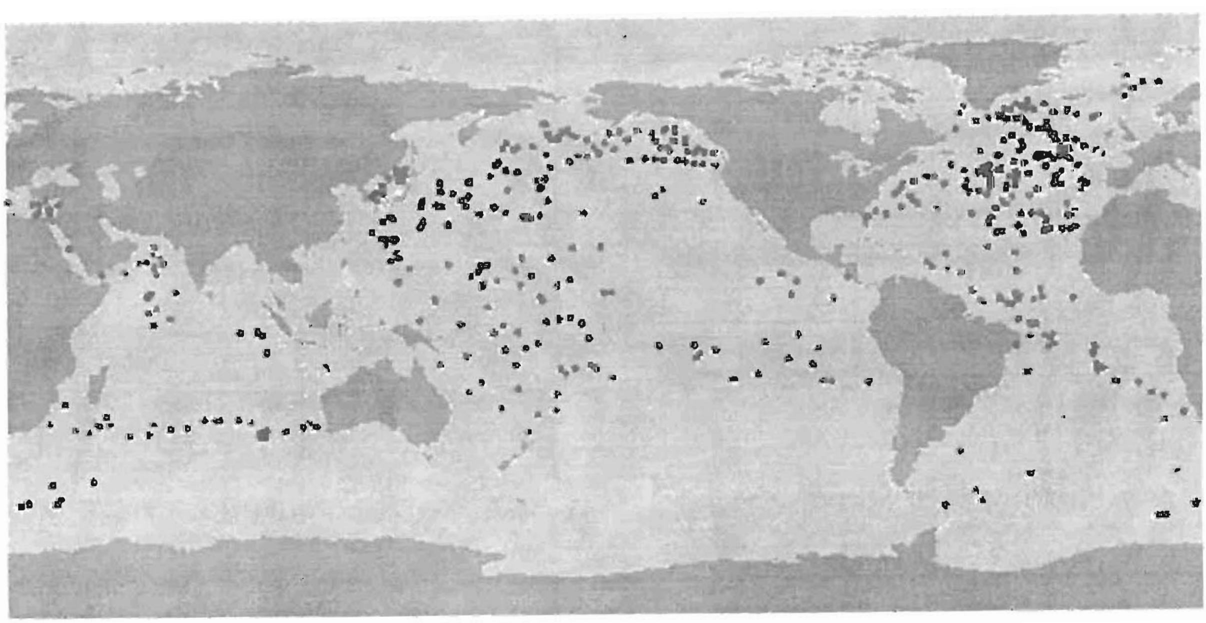

Figure 4: Argo Network, as of 5 July 2002, showing 504 floats from Australia, Canada, China, Denmark, European Union, France, Germany, Japan, Korea, New Zealand, Norway, Russian Federation, United Kingdom and United States.

Products and Communications

Communications and the delivery of data, products and information are fundamental to the success of JCOMM as an operational body. The JCOMM web portal (http://www.jcomm.net/) will be an important element to provide overall information on JCOMM programs, meetings and reports. The registered portal users will automatically receive notices of any new information posted at the site without having to go there each time.

The JCOMMOPS web-site (http://www.jcommops.org/), accessible from the portal, provides detailed information on observational system components, such as the status of Argo deployments, SOOP and VOS routes and sampling, surface drifter deployments and data exchange, satellite data collection systems, data quality, etc.

The JCOMM Electronic Bulletin, accessible from JCOMMOPS, provides scientific products on many aspects of the state-of-the-ocean. As each of the observational elements generates products that may be of interest to a large audience, these will be posted in the bulletin.

Future

In summary, within a year after its first formal session in Akureyri, Iceland, JCOMM has made considerable progress on many fronts. Both the team and the secretariat have worked very hard to implement JCOMM. It is a fact that JCOMM can succeed only if it is known and accepted in each country. Both Environment Canada and Fisheries and Oceans Canada are major contributors to JCOMM by nominating experts to various teams, by hosting and leading scientific and technical workshops, and by participating in the planning and implementation of global programs of relevance to Canada. As a demonstration of Canada's commitment to JCOMM and operational oceanography, the next session of the whole Commission will be hosted by Canada in 2005 in Halifax.

Dame Nature n'aime pas les jets

Paris – Quoique minimes, les effets sur la température au sol des traînées de condensation laissées dans le ciel par les réacteurs d'avions sont bien réels, selon une étude citée par la revue britannique *Nature*.

Les scientifiques tablaient sur une telle hypothèse depuis longtemps mais n'ont eu l'opportunité de la vérifier qu'à la faveur des attentats du 11 septembre, qui avaient donné lieu à une exceptionnelle fermeture du ciel américain aux avions civils pendant trois jours.

Une équipe de l'université de Whitewater (Wisconsin) menée par David Travis a mis en évidence le fait qu'il y avait eu une augmentation "anormale" de la moyenne des températures (écart moyen entre la température maximale diurne et la température minimale nocturne) pendant la période considérée. Ils ont confronté les données fournies par 4000 stations météo du territoire sur les trois jours considérées avec celles recueillies pour des intervalles de temps équivalents entre les années 1977 et 2000. Ils ont découvert que l'amplitude diurne (écart entre les deux températures extrêmes) était supérieure de plus d'un degré Celsius dans le cas d'un ciel sans trafic aérien.

L'absence d'avions, et donc de sillage gazeux, explique en partie cette anomalie dans les températures, selon les chercheurs cités par *Nature*. Ces traînées qui s'effilochent dans le ciel se comportent comme des cirrus. Ces nuages élevés agissent comme des isolateurs, en réfléchissant la chaleur du soleil et en captant les rayons.

Source: AFP, Le Devoir, Jeudi 8 août 2002, page A4.

SCOR Working Groups Reports

The Scientific Committee on Oceanic Research (SCOR) sponsors international working groups to focus attention on important ocean science issues. Working groups are usually formed of not more than 10 members, to deliberate on a narrowly-focused topic and develop a publication for the primary scientific literature. Their work is intended to be completed in 4 years or less. SCOR has sponsored (alone or with other organizations) 120 working groups, including the current ones. See the SCOR Web site for information about past and current working groups: http://www.jhu.edu/~scor/wkgroups.htm

We present here a short report of progress done for Working Groups 106, 107, 108, 112, 114, 118 and 119.

WG 106 Muddy Coasts of the World: Processes, Deposits and Function

This Working Group has completed its work with the publishing, by ELSEVIER, of "*Muddy Coasts of the World: Processes, Deposits and Function*" ISBN: 0-444-510192, 556 pages.

Edited by 1) T. Healy, Coastal Marine Group, Ruakura Satellite Campus, The University of Waikato, Private Bag 3105, Hamilton, New Zealand;
2) Y. Wang, State Pilot Laboratory of Coast and Island Exploitation, Nanjing University, Nanjing 210093, People's Republic of China;
3) J.-A. Healy, Coastal Marine Group, Ruakura Satellite Campus, The University of Waikato, Private Bag 3105, Hamilton, New Zealand.

Description

The SCOR (Scientific Committee on Oceanic Research of ICSU) Working Group 106 was tasked with reviewing the geomorphic, sedimentary and oceanographic dynamics of muddy coasts, assessing the impact of sea level rise on muddy coasts, especially in estuaries, and to recommend future research pathways relating to muddy coasts.

This book addresses these questions and includes chapters on the research issues of muddy coasts, the definition of muddy coasts, sea level rise effects on muddy coasts, fundamental dynamic processes effecting muddy coast formation, the role of mangrove and salt marsh vegetation, bio-geochemistry of muddy coast deposits, storm surge effects on muddy coasts, human impacts on muddy coasts, and a detailed geographical review of muddy coasts of the world.

The volume presents examples of muddy coasts sedimentation from many different environments of the world including the broad expanse muddy coast of China, muddy coasts of continental trailing edges (the Americas), muddy coasts in seasonally ice covered environments, muddy coasts in areas of tropical coral reefs, muddy coasts from the tropics, muddy coasts resulting from large river discharges and muddy coasts of mid-latitude oceanic islands.

Contents

WG 107 Improved Global Bathymetry

Report prepared by Ron Macnab, Geological Survey of Canada (Retired).

These are the personal ideas and opinions of Ron Macnab regarding the status of the WG and speculation on prospects for follow-up action. It would be wrong to imply that they represent the collective views of the WG.

With the appearance of the WG 107 report, SCOR could resume a position of leadership on the issue by mapping out a general plan for follow-up action to ensure that at least the more significant recommendations are acted upon in an effective manner. This would entail the identification of organizations that have the interest and the resources to do the work, which in turn suggests a wide-ranging consultation process to identify the appropriate parties and to negotiate their involvement in such an undertaking.

Under the circumstances, adding a follow-up plan to the present Report would create further delay in its release, in which case I would suggest simply adding an extra recommendation, calling upon SCOR to consider a new WG that would focus upon the implementation aspects of the 107 Report. To maintain momentum and continuity, this suggested WG should include a few 107 alumni, but its composition should also reflect a mix of organizations that might be in a position to make significant contributions to the objectives articulated in the 107 Report.

Also, it may be worth mentioning a few initiatives that were barely underway during the WG's deliberations in 1996 and 1997, or which had even to be conceived. In the intervening years, some of these activities have gathered considerable momentum, so it might be appropriate to insert a paragraph near the beginning of the report (in a Preface?) that acknowledges their status, and demonstrates that the international bathymetric community has made some progress during the Report's gestation period:

1. In the section on GEBCO, the Report mentions IOC initiatives in regional mapping. The concept of an Arctic chart is mentioned here and in other parts of the document, but that project is well beyond the conceptual stage, in fact it is essentially complete, with a mechanism in place for updating and improving the chart and data base as new observations become available. Known as the International Bathymetric Chart of the Arctic Ocean (IBCAO), that project is described in its own Website at http://www.ngdc.noaa.gov/mgg/bathymetry/arctic/arctic.html

2. The South Pacific is also referred to as an example of a region that needs better mapping. Under IOC sponsorship, a Meeting took place in Valparaiso in October 2001, with a view to initiating a compilation and mapmaking project in the Southeast Pacific. This undertaking is expected to be modelled loosely after the Arctic project; it's also hoped that it will inspire a matching initiative in the Southwest Pacific.

3. The South Atlantic and the seas that surround Antarctica are also mentioned as candidate regions that are in serious need of improved mapping. Informal discussions have been initiated with investigators from various countries in the Southern and Northern Hemisphere concerning prospects for launching compilation and mapmaking projects that are analogous to the two activities outlined in paragraphs 1 and 2 above.

4. The GEBCO Gridding Group has made tremendous strides towards the construction of a Global Bathymetric Grid that is derived exclusively from sounding observations. This product will provide a framework for planning future mapping operations, and for incorporating their results into a global data base.

5. The Global Ocean Mapping Project (GOMAP) has emerged as a "big picture" approach to the issue of building a detailed map of world bathymetry. The September 11 terrorist attacks have dulled that initiative's momentum, but in its concept, it represents a realistic - and realizable - attempt to solve a problem that will require concerted international cooperation.

WG 108 Double-diffusion in the Ocean

Report of activities by Barry Ruddick barry.ruddick@dal.ca

This SCOR working group, focussed on quantifying the role of oceanic double-diffusion, held its initial meeting in May 1997 in Liege, Belgium. An e-mail list server and web-site have been set up, and continues to be maintined:

http://www.phys.ocean.dal.ca/programs/doubdiff/doublediffusion.html

This web-site contains:

- working group membership and contact emails;
- terms of reference;
- an extensive bibliographic list of journal publications on double-diffusion;
- a page containing a number of laboratory demonstrations of double-diffusive phenomena, and pointers to other laboratory demonstrations.

The goal of the working group was to consider and rank the unsolved problems that currently prevent double-diffusion from being quantitatively addressed in the ocean. A number of review articles were written covering the observational, laboratory, numerical and theoretical approaches, considering the processes of salt fingers, diffusive convection, and thermohaline intrusions. The major questions to be addressed were:

1. Why or where is this process important?
2. What are the key unsolved problems that prevent quantitative parameterizations of this process from being used?
3. What seems to be the best way of solving the problem?

These articles will be published together in a volume of Progress in Oceanography, and were expected to go to press in June, 2002. The most recent draft of each article is located on the web-site above, along with introductory comments by the editors, Ann Gargett and Barry Ruddick.

WG 112 Magnitude of Submarine Groundwater Discharge and Its Influence on Coastal Oceanographic Processes

Co-Chairs Bill Burnett, Florida State University; Evgeny Kontar, PP Shirskov Institute of Oceanology Russian Academy of Sciences.

Report by Leslie Smith, University of British Columbia lsmith@eos.ubc.ca

The overall goal of WG-112 is to define more accurately and completely the magnitude of submarine groundwater discharge (SGD) and how it may influence chemical and biological processes in the coastal ocean. The members of the working group have organized themselves into three units based on the following goals: Calculation and Modeling; Measurement, Sampling, and Experimental Design; and Typology, Integration and Globalization.

One of the main activities of WG112 has involved a series of SGD intercomparison experiments where a variety of measurement techniques and prediction tools have been applied to derive estimates of SGD in the near-shore environment. A trial intercomparison experiment was organized by members of the working group in August 2000 at the Florida State University Marine Lab on the Gulf of Mexico.

Results of this intercomparison are described in an article in EOS, March 12, 2002. Methods compared included direct measurement using several different types of seepage metres, isotopic methods for estimating SGD, and predictions derived from hydrogeologic models. The first SCOR-sponsored intercomparison experiment was completed in Cockburn Sound near Perth, Australia in November, 2000. This experiment was co-sponsored by LOICZ and IOC. A second experiment is planned for eastern Long Island, New York in late May, 2002.

WG 114 Transport and Reaction in Permeable Marine Sediments

Bernard P. Boudreau, Dalhousie University and Markus Huettel, MPI, Bremen, co-Chairs)

Summary by Bernie Boudreau: bpboudre@is.dal.ca

Permeable marine sediments are those sediments that are sufficiently coarse-grained as to allow measurable porewater flows when natural pressure gradients are applied, i.e., relatively clay-free sands and coarser sediments. This Working Group promotes scientific investigation of the transport and reaction of solutes and particles in such sediments, with the aim of establishing their importance to local and global bio-geochemical cycling and their influence on surrounding environments.

Evidence to date indicates that permeable sediments act like fluidized bed reactors, wherein advective transport supplies substrates and reactants at accelerated rates and removes potentially inhibitory end-products equally rapidly. This serves to maintain bio-geochemical reactions at near-optimal rates. Aquatic environments that overlie permeable bottoms are therefore likely to be unusually efficient in cycling carbon and nutrients. Additionally, the vigorous exchange of material between the water column and a range of depths within the sediment column can cause sea floor fluxes to de-couple from local reaction rates. However, the study of permeable sediments is currently hindered by important scientific and technical challenges. In particular there is an absence of techniques to study reaction rates and fluxes in these sediments.

In November 2001, the Gordon Research Conference (GRC) approved a request from SCOR WG 114 for a Gordon conference on Permeable Sediments in 2003. The conference will be interdisciplinary, including chemical, biological, physical and geological oceanography, geophysics, hydrology, engineering, environmental sciences, and benthic ecology. Further information about this WG and the GRC can be found at: http://www.mpi-bremen.de/SCOR-WG114/

WG 118 New Technologies for Observing Marine Life

Additional Details can be found at:
http://pulson.seos.uvic.ca/meeting/scor2000/scor2000.html

Introduction

The goals of the Census include the comprehensive measurement of marine life. Realistic implementation of the Census will begin with pilot projects in particular locations; detailed planning of such a project in the Gulf of Maine is already underway. While the Sloan Foundation is committed to significant financial support of the Census and this is already beginning to happen through Broad Agency Announcements in the National Oceanographic Partnership Program (NOPP), the intention is that this support be catalytic, in the sense of encouraging participation of existing fisheries monitoring and science programs, along with other research initiatives.

The larger goals of the Census of Marine Life will depend on the mobilization of international interest, the active participation of researchers from around the world and the commitment of a wide range of sponsors from organizations such as the World Bank to various national fisheries organizations and research groups.

The present moment marks an important transition from a phase during which a series of preparatory workshops were held to help establish the potential value and goals of a Census, to the planning of pilot programs and the initial funding of projects through NOPP. Although the Steering Committee has only recently been formed, the pace is quickening and the Census will soon become a much more visible and widely noticed entity. Reaching out to the international community is essential to the success of the program and SCOR is seen as a particularly appropriate organization to facilitate this.

The implementation of new technologies for observing marine life represents only one component of Census goals and it is likely there will be other ways in which Sloan's initiative will interact with SCOR activities. However, observational technologies are a crucial part of the initiative and we believe this is an opportune time for SCOR focus.

Role and Purpose

Measurement of marine life over the range of interest discussed here is not motivated by the specific need for assessing commercial stocks, but neither can it be divorced from this important requirement. Although the 'tragedy of the commons' is surely responsible for many of the collapsing fish stocks around the world, knowledge of marine life remains a crucial ingredient of successful conservation. Among marine scientists, this is a statement of the obvious. But the practical means for achieving improved knowledge of what lives in the ocean, which is an essential requirement for scientific understanding of marine ecology, involves technological challenges. We contend there are many technologies presently in researchers' hands or on the point of implementation, which are badly needed by the larger community of scientists studying and monitoring marine life, yet remain generally inaccessible. There are several reasons for this. National fisheries interests tend to be very conservative in their approach to measurement. This is understandable, since the setting of fishing quotas and regulations is highly political: consistency in measurement technique from one year to the next is seen as an essential virtue. But such an approach does not always favour development of innovative techniques. For example, the application of acoustic technology to stock assessment remains patchy around the world. Commitment to innovative developments is not just a matter of technological development or economic importance of fish but often has historical, jurisdictional or other reasons.

New techniques, or improved ways of using existing techniques, often arise in research groups that do not have traditional commitment to the measurement of marine life, but depend on innovative application of concepts developed for different reasons. To cite just one example, the development of optical sensing of fish using airborne lidar evolved in a group that was developing optical techniques for atmospheric measurement. Subsequent collaboration with fisheries scientists demonstrated the remarkable potential of this method and its future success will be based on this interdisciplinary link. At present the technology remains largely inaccessible and probably largely unknown to the vast majority of scientists who could benefit from it. But there is no reason why this should remain so, and wider knowledge and discussion of such approaches will almost certainly lead to wider use.

Several emerging measurement approaches were discussed at a CoML-funded workshop held at Scripps in 1997 under the chairmanship of Dr Jules Jaffe. These included the use of acoustic, optical and statistical methods, as well as new deployment approaches such as the use of autonomous vehicles and drifters communicating their results by satellite, DNA sequencing, behavioural approaches such as relating seabird activity to fish populations, concentration of sparsely distributed fish by night-time illumination to facilitate assessment and passive detection through bioluminescence stimulated by high fish concentrations.

Inevitably acoustic concepts become an important and generally dominant part of such discussions, since the ocean is relatively transparent to acoustical energy in contrast to electromagnetic radiation. Particularly important advances can be expected from the collaboration of marine biologists and fisheries scientists with specialists in underwater acoustics. At the CoML workshop there were presentations on the study of benthic habitats, 3-d underwater imaging, the use of low frequency attenuation of sound over longer ranges by fish, and horizontally imaging sonars that can identify individual fish at ranges of several km. Acoustical methods show particular promise in overcoming one of the most severe difficulties of measurement: the limited sampling volume achieved by traditional approaches.

Species identification is one of the most challenging aspects of remote fish detection. Multiple frequency sonars have proved highly effective at providing size and other information about zoo-plankton, larval and adult fish. Since fish recruitment is one of the most perplexing fisheries estimation problems, there seems to be special opportunity for developing this approach and making it more readily available. In acoustic measurement, the development of adequate scattering models is just as important as development of measurement hardware, and just as neglected. The combination of better models with new instruments will lead to the greatest advances. This will be especially true with the introduction of low frequency parametric systems that exploit the swim bladder resonance to distinguish size and species.

Innovative deployment technologies will be essential for many of the applications envisaged in the Census. Autonomous underwater vehicles, whether powered or drifting, are becoming available. How will marine biologists use these new platforms? Systems that can maintain a constant height over the sea-floor, allowing the accumulation of high resolution photography, are already being tested and will add immeasurably to our knowledge of benthic communities. Powered vehicles with multi-beam sonars developed for mine detection have obvious application in the study of marine life, and are already available for this use. In summary, there are a great many new concepts and technologies that have become available, but they remain untried and largely unknown by the community of marine biologists who could take advantage of them. Acceptance will only come from detailed assessment of their strengths and weaknesses relative to traditional approaches.

Often the newer approaches will prove complementary to established methods. A goal of the Working Group will be to develop assessments of these new technologies and to make them more widely known to the community of scientists who could benefit from their use.

WG 119 Quantitative Ecosystem Indicators for Fisheries Management

by Philippe Cury[1] & Villy Christensen[2]

An international network of scientists has joined forces in order to develop and test properties of ecosystem indicators for fisheries management through the SCOR/IOC Working Group 119 on 'Quantitative Ecosystem Indicators for Fisheries Management'. The general objective of the Working Group is to develop theory to evaluate changes in marine ecosystems (both states and processes) from environmental, ecological, social and fisheries perspectives. It is the intention during a period of four years (2001-2004) to define generic indicators that can be used for marine ecosystems, to test them, and to apply them to a variety of ecosystems in order to evaluate their usefulness. This is expected to lead to new and refreshing insights, which will be of use for defining and evaluating new ecosystem management goals.

Present day fisheries are managed on population dynamics theory derived for the single species population level. There is some theory at the community level of biological organization, but very little at the ecosystem level; yet, this is needed if ecosystem considerations are to play a role in future fisheries management. Indeed, the need for precautionary management of marine resources is both obvious and crucial for fisheries. Given the practical and theoretical difficulties involved in such management, the conventional procedures focusing on single species have been a sensible initial approach. However, it is becoming clear that attention to broader ecosystem aspects is required. A recent book entitled "Reinventing Fisheries Management" (Pitcher et al., 1998) emphasized the need to consider ecosystem restoration as a new objective for the management of marine resources. An international SCOR/ICES/IRD conference, held in Montpellier in 1999, on 'Ecosystem Effects of Fishing' emphasized the need for considering a more global approach for fisheries sustainability at the level of the ecosystem (Gislason et al., 2000). The FAO Code of Conduct for responsible fisheries and the precautionary approach to fisheries are in favour of sustainable, well-managed fisheries that respect ecosystems and the whole environment.

The recent Reykjavik-FAO conference in September 2001 addressed how responsible fisheries could function in harmony with the environment. For this to become a reality, scientific research must play an important role by formulating and addressing relevant questions. This is indeed a new challenge that offers an opportunity to develop an ecosystem framework for the exploitation of marine resources. The ecosystem level should be viewed as an integrative level – as was described by the SCOR/WG73 entitled 'Ecosystem theory for biological oceanography' in the 1980s (Platt et al., 1985). However, the ecosystem scale has not received much attention in scientific studies even though an ecosystem strategy for the assessment and management of international coastal ocean waters now exists with the GEF/LME (Large Marine Ecosystems) initiative (Sherman and Duda, 1999).

The definition of quantitative indicators for marine ecosystems from an environmental, ecological and fisheries perspective could provide a comprehensive bridge between the different scientific disciplines themselves, but also could constitute an efficient way to communicate those results for management purposes. The exploitation of renewable resources must respect marine diversity and ecosystems and we must direct our efforts, as scientists, toward reconciling long-term environmental, ecological, economical and social objectives.

The aim of the IOC/SCOR Working Group 119 is to promote a sound theory to underpin 'Ecologically Sustained Fisheries' and to develop a scientific approach for defining indicators to assess the state of marine ecosystems. This will, hopefully, lead to new and refreshing insights, which will be essential for achieving political and management goals.

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The general objectives of WG 119 are to develop theory to evaluate changes in marine ecosystems (both states and processes) from environmental, ecological and fisheries perspectives. This includes:

- definition of generic indicators that can be used in marine environments, fisheries or for assemblage of exploited fish populations or marine ecosystems;
- formulation of these indicators in mathematical or statistical terms;
- assessing when values of an indicator are meaningful both statistically and/or ecologically (i.e. to test null hypothesis, sensitivity analysis ...);
- applying these indicators to specific data sets or using specific multispecies models in order to evaluate their usefulness.

To address these objectives an international network of scientists interested in developing ecosystem indicators in different fields and disciplines for the marine environment has been established. The scientists represent a variety of disciplines in order to provide a wide coverage of topics and geographic distribution, see Appendix 1.

The terms of references for the Working Group are:

- To review the current state of knowledge in different marine and terrestrial disciplines relevant to the development of indicators for marine ecosystems;
- To review theories and indicators that have been developed in terrestrial ecology and to assess their utility for marine ecosystems;
- To develop new indicators to study the functional role of species in ecosystems, exploitation and environment;
- To apply these indicators in a comparative way to characterize ecosystem states, changes and functioning;
- To assess the utility of these indicators for management purposes and for the sustainable utilization of renewable resources.

The working group started its work in mid-2001 and will continue over a four-year period. Its first activity was a meeting held in Reykjavik, Iceland 5-6 October 2001 in connection with the FAO/Iceland Conference referred to above. The first meeting was to plan the activities of the working group, and led to establishment of a series of task forces, each of which is to prepare a session for the international conference that will be the major event of the working group. This conference, tentatively scheduled for the spring of 2004, and to be held at IOC Headquarters, Paris, is expected to become a major event, highlighting both current status of ecosystem indicators and their potential, and documented in form of a special issue of an international journal. In preparation for the conference the working group will meet 4-6 December 2002 at University of Cape Town to review progress and plan the work leading to the conference in 2004.

Information about the SCOR/IOC WG-119 is available at www.ecosystemindicators.org

Acknowledgements

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Appendix 1. Members of SCOR/IOC WG 119

Philippe Cury, co-chair, contact person, France (South Africa); Villy Christensen, co-chair Canada; Keith Brander, Denmark; Ratana Chuenpagdee, Thailand/USA; Kevern Cochrane, Italy; Robert Costanza, USA; Steven Cousins, UK; Henrik Gislason, Denmark; Sherry Heileman, Kenya; Simon Jennings, UK; Renato Quinones, Chile; IOC Nominee IOC - Paris; Lynne Shannon, South Africa; Tony Smith, Australia; John Steele; USA; Gabriela Bianchi; Norway; Pierre Chavance; Sénégal; Gueorgi Daskalov; Bulgaria; Serge Garcia; Italy; Astrid Jarre; Greenland; Kwame Koranteng; Ghana; Raymond Lae; Sénégal; Steven Murawski; USA; Daniel Pauly; Canada; Tony Pitcher; Canada; Jake Rice; Canada; Marie Joelle Rochet; France; Keith Sainsbury; Australia; Patricia Sunye; Brazil; Shin Yunne; France; Kees Zwanenburg; Canada.

Correct Affiliation

In the CMOS Annual Review for 2001, Dr. Bjorn Sundby was incorrectly affiliated with McGill University in the SCOR report. The correct affiliation for Dr. Bjorn Sundby is ISMER (Institut des Sciences de la Mer) which is based in Rimouski and is part of UQAR (Université du Québec à Rimouski). Our apologies to Dr. Sundby for any inconvenience this may has caused him personally and to ISMER.

Call for Papers

CMOS 37th Annual Congress
Ottawa, Ontario, Canada

2 - 5 June 2003

The Ottawa Centre of the Canadian Meteorological and Oceanographic Society will host the Society's 37th Annual Congress at the Crowne Plaza Hotel, Ottawa, Ontario, Canada, from 2 to 5 June 2003. The theme, **"Atmosphere-Ocean Science: Impacts and Innovation"** is forward-looking and deliberately inclusive.

Papers are solicited on all aspects of atmospheric, oceanographic and related sciences. Major sessions will be organized on:

- Climate and Climate Change;
- Impacts (on society, economy, health, etc.);
- Operational Meteorology and Oceanography;
- Remote Sensing (of ocean, ice and land surfaces and of the atmosphere);

with other sessions on topics such as:

- Air Quality and Atmospheric Chemistry, Cloud Physics;
- Radar Meteorology and Lightning, Icing, Road Weather;
- Numerical Weather Prediction, Boundary-Layers;
- The Mackenzie GEWEX Study;
- Cryospheric Issues, Arctic Oceanography and Meteorology;
- Air-Sea Interaction (including SOLAS), Waves and Currents;
- GLOBEC (Global Ocean Ecosystem Dynamics).

Abstracts should indicate innovative aspects of the studies reported, and how the findings impact on the science and/or society.

Titles, authors, affiliations and abstracts (1 page, no figures) are to be sent electronically to the Scientific Program Committee at: cmos03@yorku.ca by **Friday, February 28, 2003.**

Oral and poster presentations are planned; please indicate your preference. You should also indicate session topic preferences. Late submissions may be considered if space allows.

There will be a prize (offered by Campbell Scientific) for the best student poster (First author must be a student and have been primarily responsible for the research and poster preparation). Please indicate if you wish to be in this competition.

E-mail message subject must state "Abstract Submission".

Abstracts will be accepted in English or French, in most word processing languages, but preferably as plain ASCII text.

For further information on the Congress see the web pages at www.cmos.ca or contact Bruce Ramsay, Chair, Local Arrangements Committee, at: Bruce.Ramsay@ec.gc.ca

For information on commercial exhibit opportunities contact Oscar Koren at: Oscar.Koren@ec.gc.ca

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Appel de communications scientifiques

37ième Congrès annuel de la SCMO
Ottawa, Ontarion, Canada

2 au 5 juin 2003

Le Centre d'Ottawa de la Société canadienne de météorologie et d'océanographie sera l'hôte du 37ième Congrès annuel de la Société, qui sera tenu à l'hôtel Crowne Plaza d'Ottawa (Ontario), Canada du 2 au 5 juin 2003. Le thème choisi pour le congrès, **Science de l'Atmosphère-Océan: Impacts et Innovation,** se veut progressif et englobant.

Les communications scientifiques que nous sollicitons peuvent porter sur tout sujet lié aux sciences atmosphériques, océanographiques ou connexes. Les sessions principales porteront sur:

- climat et changements climatiques;
- impacts (sur la société, l'économie, la santé, etc.);
- météorologie et océanographie opérationnelles;
- télédétection (de l'océan, des surfaces terrestres, des zones glaciales et de l'atmosphère;

tandis que d'autres porteront sur des sujets tels:

- qualité de l'air et chimie atmosphérique, physique des nuages;
- radar météorologique et foudre, givrage, météorologie routière;
- prévision numérique du temps, couches limites;
- Mackenzie étude GEWEX;
- questions cryosphériques, océanographie et météorologie arctiques;
- interaction air-mer (incluant SOLAS), vagues et courants;

□ GLOBEC (dynamiques des écosystèmes océaniques mondiaux).

Les résumés devraient faire ressortir les aspects novateurs des études rapportées et souligner les incidences prévues des découvertes sur la science et/ou la société.

Ces résumés ainsi que le titre de la communication, son ou ses auteurs, son ou leur affiliation (le tout sur une seule page, aucun diagramme) doivent être acheminés par voie électronique au comité du programme scientifique à: cmos03@yorku.ca au plus tard le **vendredi 28 février 2003.**

Puisqu'il y aura possibilité de faire des présentations orales ou sur affiches, prière de faire connaître votre préférence à cet égard. Vous devriez également faire connaître votre préférence quant à la session à laquelle vous voudriez participer.

Les communications qui seront soumises après la date limite indiquée pourront être acceptées s'il y a encore de la place.

Un prix (offert par Campbell Scientific) sera décerné pour la meilleure communication sur affiche par un(e) étudiant(e) (l'auteur principal doit être étudiant(e) et être responsable autant du travail de recherche que du montage de l'affiche). Veuillez indiquer si vous souhaitez participer à cette compétition.

Les courriels devront avoir pour sujet "Soumission de résumé". Nous accepterons les résumés écrits en français ou en anglais, dans le langage informatique de votre choix, mais de préférence en simple texte ASCII.

Pour tout renseignement additionnel à propos du Congrès, veuillez consulter le site web www.scmo.ca ou contactez le président du comité organisateur, Bruce Ramsay, à l'adresse: Bruce.Ramsay@ec.gc.ca

Pour des renseignement à propos des dispositions relatives aux exposants commerciaux, veuillez contacter Oscar Koren à: Oscar.Koren@ec.gc.ca

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CMOS CONGRESS 2003

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Air-Sea Interaction: Laws and Mechanisms

G T Csanady

Cambridge University Press, UK and USA
239 pp. ISBN # 0-521-79680-6

Book Reviewed by Ted Munn[1]

I haven't seen or heard of Gabe Csanady since the 1970s. But in the previous decade when Gabe was at the University of Windsor and then at the University of Waterloo, we had many stimulating discussions about the surface boundary layer. So it was a pleasure to renew acquaintances indirectly through Gabe's fourth book, written while he was Professor Emeritus at the Old Dominion University in Norfolk, Virginia.

According to the publisher's blurb, *Air-Sea Interaction* provides a "comprehensive account of how the atmosphere and the ocean interact to control the global climate, what physical laws govern this interaction, and what are its prominent mechanisms. In recent years air-sea interaction has emerged as a subject in its own right, encompassing small-scale and large-scale processes in air and sea." ..... "The book will be of value in entry-level courses in meteorology and oceanography, and to the broader physics community interested in the transfer laws and thermodynamics of the atmosphere and ocean." Fair enough, and the author has been largely successful in achieving his goal. But I would like to have seen an additional chapter discussing the role of the oceans in the climate-change debate.

The book contains five chapters, beginning with a valuable overview of the transfer laws for momentum, heat and water vapour at the air-sea interface. Then follows a chapter on the properties of wind waves. The remaining three chapters broaden the discussion in space and time to "Mixed layers in contact" (chapter 3), "Hot towers" (chapter 4) and "The Ocean's warm watersphere" (chapter 5). The book is attractively put together, and I didn't find any typos.

A few additional but minor comments:

1) In the title, why *Interaction* in the singular, rather than *Interactions* in the plural? Because there are several kinds of air-sea interactions, it has been customary amongst the workers in this field to use the plural form.

2) The index on pages 237-239 does not contain any mention of the effect of monomolecular films (of biological origin) on evaporation from the ocean. Other topics that might have been referenced include sea spray, salinity, carbon dioxide fluxes and ENSO.

3) The reference list is very complete, 12 pages in length, but I miss an important recent publication in this field: Liss, P.S. and Duce, R.A. (eds.) 1997, The Sea Surface and Global Change, 519 pp, Cambridge University Press, Cambridge, UK.

[1] Institute for Environmental Studies
University of Toronto

Polarimetric Doppler Weather Radar, Principles and Applications

V.N. Bringi and V. Chandrasekar

Cambridge University Press
Hardback, 0-521-62384-7, US$130.

Book reviewed by Terry W. Krauss[2]

This book provides a detailed introduction to the principles of Doppler and polarimetric radar. The physical and experimental basis for the application of radar polarimetry to the study of precipitation is the main subject of this book. The design features and operations of practical radar systems are highlighted throughout the book in order to illustrate important theoretical foundations.

The authors begin by discussing background topics such as electromagnetic scattering, polarization and wave propagation (Chapters 1-4). Doppler radar theory, signal statistics, and signal processing are covered in Chapter 5 in a rigorous manner. Chapters 6-8, form nearly 50% of the book, deal with dual-polarized radar systems and applications to meteorology, and would be of most relevance to professionals in the field. Chapter 6 describes how different polarization diversity radar systems are configured. Chapter 7 deals with the polarimetric basis for characterizing precipitation and describes methods used to infer hydrometeor types and amounts. A large number of examples are used to illustrate different methods and approaches. Correction of measured reflectivity and differential reflectivity for attenuation and differential attenuation due to rain along the propagation path are treated in detail. This chapter ends with a description of fuzzy logic methods applied to the problem of hydrometeor classification, and several examples are provided. Chapter 8 treats the radar rainfall measurement problem from the viewpoint of both physically based and statistical/engineering-based approaches. Five appendices are provided: Three are reviews of electrostatics, spherical harmonics, and the Transition-matrix method. Appendix 4 derives the transmission matrix, and Appendix 5 details

[2] Weather Modification Inc., Alberta

procedures for calculating the variance of the magnitude and phase of correlation functions.

The authors have attempted to select and organize the material in order to provide a good balance between theoretical rigor and practical applications. However, this book assumes the reader has a thorough mathematical and physical background normally acquired in an undergraduate program in physics, atmospheric science, or electrical engineering.

One feature of this book I particularly liked is the Notes section provided at the end of each chapter that provides suggestions for further reading, websites for description of specialized instruments, and examples of data not usually available in the archival journals. It's good to see that the pioneering work done in this field by the National Research Council of Canada and Alberta Research Council receives recognition in several sections. There is even a website for this book at www.engr.colostate.edu/ece/radar_education where examples of specialized software demos and homework assignments are available. The book could have benefited from the use of color photos; however, I'm certain that these were omitted in an attempt to keep the cost down for an already quite expensive book. This book is a good reference source for use by graduate students of electrical engineering and atmospheric science, as well as practitioners involved in the meteorological application of radar systems.

Nonlinear and Nonstationary Signal Processing:

Edited by W.J. Fitzgerald, R.L. Smith, A. T. Walden and P.C. Young.

CUP. March 2001., p471.
ISBN 0 521 80044 7 Hardback Cover

Book Reviewed by Dr. Brenda J. Topliss[3]

Given the need to find tools to tackle complex ocean-atmosphere systems, the back-cover on this book would encourage many CMOS readers to delve into this book. However, most CMOS members might find chapters less helpful than the PR suggests. The book is a collection of papers from a workshop, yet few of us will have attended such a workshop as was used to develop this book. The workshop ran for 6 months in the academic environment of Cambridge, England. Some participants arrived for the entire summer; others flew in, talked and then flew out, others made multiple visits. The fields in which nonlinear and nonstationary techniques are applicable, are so diverse it would have been fascinating to have been a "fly on the wall" to observe how they found any common ground at these meetings.

Every chapter tackles different methodologies and statistical techniques and there are no solutions or recommendations for those looking to apply such techniques. Many chapter authors pull no punches in condemning "other" techniques as wrong, only for the reader to find another chapter happily using such techniques. This is clearly not a textbook, it contains no index for cross-relating any technique applied in different areas (this might have been the most useful editorial addition). The title of one chapter "*Useful Lies: Dynamics from Data*" might entice CMOS readers but they would find that it largely relates to parametric techniques, information theory, string compression and context trees. That chapter also concluded by reminding the reader that "*the methods described in this article are only relevant for systems that are stationary and autonomous*".

Two chapters cover techniques used in the field of finance. For CMOS readers, one chapter, "*The Use of Generalised Likelihood Measures for Uncertainty Estimation in High-Order Models of Environmental Systems*", covers hydrological applications including modelling of land surfaces to atmospheric fluxes. Other chapters include "*Spatial Statistics in Environmental Science*" with applications to global temperatures and US sulphur dioxide measurements. Two chapters study different uses of wavelet analysis.

As a scientist, who is frequently "accused" of "data-exploring", I took enormous delight in reading David Thomson's (of Bell Laboratories) opinion (p. 325) on how most of the time spent on simulations would be better spent on exploratory data analysis. (Interestingly, Tukey the inventor of the term exploratory data analysis, also spent time at the Bell Laboratories). Thomson's chapter on his "*Multitaper Analysis*" is one of the few to use long-term climate data (though all too briefly). Thomson is also the only author to use colour plates, although there appeared to be no particular benefit over the grey-shade plates used in the rest of the book.

Finally, readers might take comfort in the fact that if, after reading the book, they still remain confused on how to tell when a series is nonlinear and/or nonstationary and/or even non-normal then so is the field itself. It will be interesting to see if either future clarity or significant breakthroughs come via the digital music industry or field of speech analysis. Neither field appears to have contributed to this book (or perhaps the workshop). However, as the book's PR says, "*Most currently employed methods.....of data analysis, are based on rather simplistic assumptions about the linearity and stationarity of the underlying process, and are hence suboptimal in many situations*". Given we are often dealing with complex environments, this book is worth stocking as a reference in most CMOS-linked libraries.

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[3] Ocean Sciences Division
Bedford Institute of Oceanography

El Niño and the Southern Oscillation: Multiscale variability and global and regional impacts

Edited by H.F. Diaz and V. Markgraf
CUP, 2000, 496 pp.

Book reviewed by William W. Hsieh[4]

This is a well edited book on El Niño-Southern Oscillation (ENSO), in that the thirteen chapters written by various authors did blend together to give a broad coherent review on our knowledge of ENSO up to the end of the 1990s. With equations essentially confined to one chapter by Sun, this book can easily be read by the general scientist.

The basic characteristics of ENSO and extra-tropical teleconnections are laid out in the first four chapters. In Chapter 1, Allan reviewed the climate variability of the last 150 years, examining mainly the sea surface temperatures (SST) and sea level pressure data variability at selected frequency bands using linear multivariate techniques. Chapter 2 by Hoerling and Kumar looks at understanding and predicting extratropical teleconnections related to ENSO. Teleconnections in both the northern and southern hemispheres were presented, as well as decadal variations in the N. Hemisphere teleconnections. Chapter 3 by Enfeld and Mestas-Nuñez mainly looks at complex (Hilbert) empirical orthogonal function (EOF) modes of global SST, where the first four leading modes are respectively related to ENSO, global warming, Pacific Decadal Oscillation and North Atlantic Oscillation. Chapter 4 by Dettinger et al. examines streamflow and ENSO, analyzing mainly the North and South American streamflow data by rotated EOFs.

The next two chapters survey the effects of ENSO on other phenomena: Chapter 5 by Landsea looks at the predictability of the frequency and the location of tropical cyclones, where ENSO and the tropical stratospheric quasi-biennial oscillation are useful predictors. Chapter 6 by Poveda et al. examines the increase in malaria outbreak in Columbia during the warmer, drier El Niño conditions.

The next four chapters deal with extending the ENSO record in time. A long and rather tedious Chapter 7 by Ortlieb reexamines the documented historical record of El Niño events in Peru since 1525, making corrections on the earlier work by W.H. Quinn and co-workers, who tried to infer the occurrence of El Niño events based on anomalous meteorological and hydrological phenomena observed around Peru. Chapter 8 by Cook et al. covers the use of tree-ring records to construct ENSO indices (with their latest downloadable annual Niño 3 index now dating back to 1408). Chapter 9 by Thompson et al. looks at the manifestation of ENSO signals in tropical ice core data, though the correlation with ENSO appears weaker than the tree-ring data. A unifying Chapter 10 by Mann et al. combines the numerous long records and proxy data records (incl. ice core, tree rings, coral) to reconstruct several climate signals, including ENSO, back several centuries.

The next pair of chapters focus on the dynamical aspects of ENSO: Chapter 11 by Kleeman and Power examines the modulation of ENSO on decadal and longer time scales, with emphasis on dynamical model studies. Chapter 12 by Sun strips the ENSO dynamics down to a simple but very illuminating box model.

The final chapter written by Markgraf and Diaz examines past records from the glacial interval to the Holocene for evidence of ENSO being switched on and off. Overall, this is a very enjoyable book to read.

An Introduction to Atmospheric Thermodynamics

Anastasios A. Tsonis
Cambridge University Press, 2002, 171 pp.,
Softcover ($28 US), Hardcover ($75 US)

Book reviewed by John M. Hanesiak[5]

An understanding of atmospheric thermodynamics is essential to anyone studying or predicting the behaviour of planetary atmospheres. In my opinion, this text is well suited toward that goal by providing a concise but somewhat rigorous treatment of atmospheric thermodynamics. The cost is also attractive from a student's perspective. The mathematical and theoretical attributes of the text are very thorough and presented in an understandable way, for the most part. I say for the most part because in some instances, the author does not provide adequate physical explanation (and application) to several thermodynamic variables (e.g. pseudo-equivalent potential temperature). The use of illustrations and examples are provided throughout the text; however, I felt that more are warranted (given that the text is relatively short) to provide greater insight into more difficult concepts for students. In this regard, I would suggest that Chapter 9 (Thermodynamic Diagrams) be expanded to include a more rigorous treatment of stability indices and applied real-world problems using the various thermodynamic variables presented in previous chapters. At the end of each chapter, examples and sample problems are provided. Many of the examples and problems are very

[4] Department of Earth & Ocean Sciences, University of British Columbia

[5] Centre for Earth Observation Science University of Manitoba

good, however, several are also not very practical and do not provide the student with an enhanced understanding, in my view.

Chapter 1 (Basic Definitions) provides a short but useful description of basic definitions relevant to the remainder of the text, e.g. definitions of thermodynamics, state(s) of a system, equilibrium and energy.

Chapter 2 (Some Useful Mathematical and Physical Topics) describes a brief review of required mathematics to be used in the text, e.g. exact differentials, partial derivatives and the kinetic theory of heat (derivation of the Ideal Gas Law). This is a good primer for concepts used in following chapters.

Chapter 3 (Early Experiments and Laws) continues with thermodynamic physical theory, e.g. Gay-Lussac laws, meaning of absolute temperature, Boyle's Law, Avogadro's Hypothesis, Dalton's Law, and further useful mathematical variations of the Ideal Gas Law. Many derivations provide the reader with a thorough physical treatment of the subjects that are used throughout the text.

Chapter 4 (The First Law of Thermodynamics) describes the first law of thermodynamics through discussions of work, definition of energy, relationship between heat and work, thermal capacities and their relationship to the Ideal Gas Law and Joule's Law. The chapter provides a nice table of the various mathematical forms of the First Law. It also discusses the various consequences of the First Law (i.e. isothermal, isobaric and adiabatic transformations, etc.) and concludes with the derivation of the adiabatic lapse rate and potential temperature.

Chapter 5 (The Second Law of Thermodynamics) begins with an introductory paragraph that nicely describes the relationship between the First and Second Laws. It continues with a classic example of the Carnot cycle and lessons learned by it (reversible versus non-reversible processes, derivation of entropy, efficiency of energy transformations, and the relation between potential temperature and entropy). The author includes a brief discussion of the combined use of the First and Second Laws toward pragmatic use. He also discusses the maximization of entropy in the atmosphere and how it is related to the main mechanism of heat exchange in the atmosphere (i.e. convection) as well as potential temperature relations to stability. He concludes the chapter with a very nice example of how upper air horizontal motions can lead to vertical motions due to non-reversible thermodynamic processes. Although some use of examples are presented here, more illustrations and pragmatic examples could have been developed in this chapter to assist the student in grasping more difficult concepts (e.g. top paragraph on Page 65).

Chapter 6 (Water and its Transformations) opens with a very useful paragraph that sets the stage for the remainder of the book by briefly outlining why the addition of water (liquid, vapour and solid states) requires refinement of the basic thermodynamic equations in the Earth's atmosphere. The author continues with discussions on the thermodynamic properties of water (i.e. phase transitions) and latent heating with practical explanations of each. This is a natural lead into the derivation of the Clausius-Clapeyron (CC) equation with additional very useful practical approximations to the CC-equation and its consequences (e.g. dependence of saturation vapor pressure and latent heats of vaporization, sublimation and fusion to temperature).

Chapter 7 (Moist Air) once again begins with useful opening comments relating previous chapters knowledge and what's to come in the current chapter. The author starts with a discussion of the measures of moist air (i.e. humidity variables) and their theoretical functional relations to other variables describing a moist atmosphere (e.g. virtual temperature, moist specific heat capacities and Ideal Gas constant). This leads into a thorough explanation and derivations of dew/frost point temperature, wet-bulb temperature, isobaric equivalent temperature, lifted condensation level (LCL), equivalent potential temperature, pseudo-equivalent temperature, pseudo-equivalent potential temperature, and the saturated adiabatic lapse rate. Although the author gives *some* examples of how these various parameters can be used, it is my opinion that more explanation as to the physical meaning and practical use of many more should have been given (possibly devoted to another chapter or an existing chapter such as Chapter 8 or 9).

Chapter 8 (Vertical Stability in the Atmosphere) is devoted to a thorough explanation of the theoretical foundations behind vertical stability (and the associated measures) and what assumptions are made in so doing. I found that more use of figures and diagrams could have been made showing examples of how the various measures of stability are used in real-world situations (e.g. how cross-sections of vertical profiles of θ_e through weather systems can be used to assess vertical stability). Many of the parameters highlighted in this chapter (and Chapter 7) are not intuitive concepts to most students, but the use of more practical examples, figures and diagrams can highly illuminate these concepts in future edits of the text.

Chapter 9 (Thermodynamic Diagrams) describes various well-known types of thermodynamic diagrams (tephigram, emagram, and skew emagram (skew T-ln p)) and how to obtain several thermodynamic variables from them including the estimation of CINE (convective inhibition energy) and CAPE (convective available potential energy). The discussion is quite good in this regard, however, the physical meaning of many variables (such as the pseudo-equivalent potential temperature) and their practical use was not provided. No mention of other important (and highly used) convective indices is made, such as the lifted index (LI). Seeing as this chapter is only 12 pages long, more effort into this type of analysis is warranted in my opinion.

Chapter 10 (Beyond this Book) is a crude attempt to introduce the student to the basic predictive equations of the atmosphere with the inclusion of moist processes (seeing it is only two-and-a-half pages long!). I appreciate what the author is trying to portray; however, I found this chapter to be of little value (and should be considered for deletion in future edits) unless it is expanded to some degree.

My overall impression of the book is quite good and I highly recommend its use for undergraduate and graduate level instruction despite some shortcomings. I particularly like that the text *directly* links classic physics courses in thermodynamics with its application to the Earth's atmosphere. Overall, this text has the potential to be a future classic for atmospheric thermodynamics.

SHORT NEWS / NOUVELLES BRÈVES

40-Year Celebrations at BIO

The Bedford Institute of Oceanography (BIO), located in Dartmouth, Nova Scotia, is Canada's largest ocean research institute. To celebrate its 40th anniversary, BIO held Open Houses on Saturday and Sunday, 27-28 April, 2002. Activities included displays of marine life, tours of research ships and informative talks.

Canada's Third National Report on Climate Change

Canada, along with other signatories to the UN Framework Convention on Climate Change (UNFCCC), is obligated to submit to the UNFCCC Secretariat periodic national communications (reports). Canada's Third National Report on Climate Change includes an overview of Canada's National Implementation Strategy on Climate Change and resulting key policies and measures; a summary of Canada's national greenhouse gas inventory and projections of emissions to 2020; and an overview of the science, impacts and adaptation issues facing Canada in the future. The report is available at http://www.climatechange.gc.ca/english/3nr/index.html

CHS Online Web Catalogue

The interactive Canadian Hydrographic Service On-Line Chart Catalogue was designed to give a graphical representation of CHS products and to provide up-to-date information about the products in the form of reports. The Catalogue and plug-in software are available at http://webcat.charts.gc.ca/en/

Beyond 2000

"Beyond 2000", the report of the Coastal Zone Canada 2000 Conference held in Saint John, New Brunswick, is available in PDF format at http://www.unbsj.ca/coastal/

Canada's Contributions to Addressing Climate Change

The Government of Canada has established two conditions before deciding how Canada should meet its climate change commitments: first, there must be a workable plan and second, such a plan must be developed in consultation with the Provinces, Territories, stakeholders and Canadians. The Discussion Paper on Canada's Contribution to Addressing Climate Change explains what is known about climate change and presents four options for addressing Canada's climate change commitments. To download the paper and to provide comments, access http://www.climatechange.gc.ca/discussionpaper/

UN Atlas of the Oceans

After more than 2.5 years of development and a decade of planning, the UN Atlas of the Oceans was launched on World Environment Day. The Atlas provides users with continuously updated strategic data on the state of the world's oceans, maps, development trends and threats to human health from the deteriorating marine environment. The Atlas is available online at http://www.oceansatlas.org/index.jsp

UNEP Launches Global Environment Outlook-3

The UNEP study takes a look at the policies and environmental impacts of the past 30 years. It then outlines four policy approaches for the next three decades and compares and contrasts the likely impacts on people and the natural world. The report says the planet is at a crucial cross-roads with the choices made today critical for the forests, oceans, rivers, mountains, wildlife and other life support systems upon which current and future generations depend. GEO-3 and its predecessors are available at http://www.unep.org/geo/

Madhav Khandekar, a longstanding CMOS member of over 30 years, gave a series of lectures on Global Warming, Climate Change and Extreme Weather at the University of Alberta and to the Climate Change Research Users Group of Alberta Environment in Edmonton, during the last week of March 2002. Khandekar who is a Consulting Meteorologist, has recently completed a report (to be published soon) for the Alberta Government on "*Trends and Changes in extreme weather: An assessment with a focus on Alberta and the Canadian prairies*". This report is a follow-up of an earlier report entitled "Uncertainties in green-house-gas-induced climate change" prepared by Khandekar and published as an Alberta Environment report in March 2000.

In his lectures, Khandekar reviewed the science of global warming and climate change and presented some of his recent findings on extreme weather trends and changes in Canada and over the Canadian prairies.

According to Khandekar, extreme weather events like extreme cold/hot spells, winter blizzards, thunderstorms/tornadoes are not increasing on the prairies or anywhere else in Canada. Khandekar further emphasized that some of the extreme weather events of the last five years like the Saguenay (Québec) flood of July 1996, the Red River flood in Manitoba in April 1997 and the Ice Storm in Ottawa/Montréal in January 1998 were part of natural climate variability and were not in any way connected with global warming as suggested in several news media and informal scientific writings.

Khandekar also discussed the precipitation and temperature trends over the prairies and concluded that the precipitation has increased over the prairies by about 12% in the last fifty years but this increase is primarily due to low and moderate precipitation events; further, the hottest summers on the prairies were during the dust bowl years of the 1930s and not during the 1990s which have been adjudged as the 'warmest' years by the IPCC (Intergovernmental Panel on Climate Change).

To obtain more information and a copy of the report, contact Dr. Raymond Wong, Climate Specialist, Alberta Environment; Phone: 780-427-0820: E-mail: Raymond.Wong@gov.ab.ca

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