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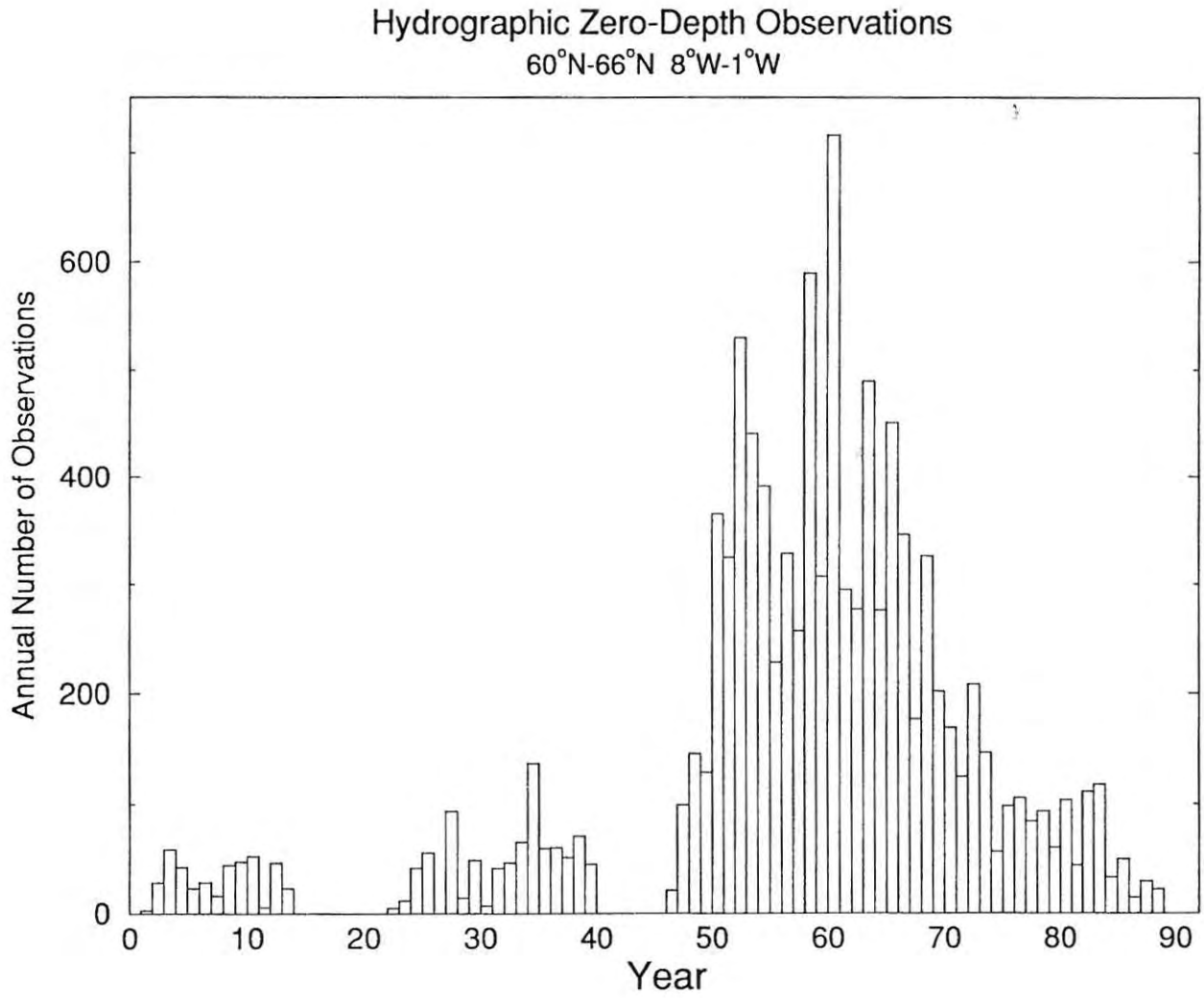

CMOS Bulletin SCMO

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Inside / En bref

EDITOR'S COLUMN

This is the time for me to leave the *Bulletin*. During the last two years the new *CMOS Bulletin* has taken an important place among the publications of the Society and hopefully will continue to evolve with the needs of CMOS members. The next volume will be edited by Mr. Paul-André Bolduc (see note on p.22).

It has been for me a stimulating challenge to assume the responsibility of Editor of the *Bulletin*. During the last two years, we have attempted to broaden the scope of the previous CMOS Newsletter. A particular effort has been placed on including short articles, summary of research, views, and other information of general interest for the Society. I would like to thank particularly all members who have contributed with well prepared texts, also Alain Trudel for his assistance in integrating contributions since last July, Neil Campbell for promoting interest in the *Bulletin*, and all the members of the Board, who in their respective regions and sector, have helped to diversify the content and to stimulate contributions to the *Bulletin*; they are: Howard Freeland (former Editor of the Newsletter, Victoria), Alex H. Paul (former Editor of the Climatological Bulletin, Regina), Les Welsh (Saskatoon) , Nathan Yakowar (Montreal), David Straub (McGill), Richard Leduc (Québec) and Susan Lally (Dartmouth).

Jean-Pierre Blanchet
CMOS Bulletin Editor

SECTION DU RÉDACTEUR

Voilà! Il est temps pour moi de quitter le *Bulletin*. Au cours des deux dernières années, le Bulletin de la SCMO a pris une position de choix dans les publications de la société et, je le pense, continuera à se développer selon les besoins des membres de la SCMO. Le prochain volume sera préparé par M. Paul-André Bolduc (voir p. 22) qui possède une grande expérience dans ce domaine.

Ce fut pour moi une expérience des plus enrichissante que d'assumer la responsabilité de rédacteur de la revue. Au cours de ces deux années, nous avons tenté d'élargir la portée du *Bulletin* en renforcissant le contenu en articles courts, chroniques, résumés de recherche, points de vu et autres informations d'intérêt général pour nos membres. Dans cette tâche, j'ai bénéficié de l'aide de plusieurs personnes. Je désire particulièrement remercier tous les membres pour leurs contributions bien préparées, Alain Trudel qui depuis juillet m'a assisté dans le traitement des textes, Neil Campbell qui a su promouvoir l'intérêt au *Bulletin*, et je remercie également tous les membres du comité du journal ce sont: Howard Freeland (rédacteur précédent du Nouvelles de la SCMO, Victoria), Alex H. Paul (Regina), Les Welsh (Saskatoon), Nathan Yakowar (Montréal), David Straub (McGill), Richard Leduc (Québec) et Susan Lally (Dartmouth).

Jean-Pierre Blanchet

Skill Measured Against Long-term Current Meters

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ABSTRACT

WOCE offers unprecedented opportunity to learn the physics of ocean circulation by comparing new datasets with increasingly powerful computer models. A challenge is to devise skill measures against which one refines growing understanding.

There are two purposes for this note. First, we explore what might be learned from a global inventory of long-term current meter records. Second, we follow up on a WOCE Notes article (October 94) about parameterizing eddy-topography forcing ("Neptune effect"). The present note assesses whether Neptune contributes measurable skill.

The Neptune parameterization, which aims to limit the enormous computing demand of resolving mesoscale eddies, relies on somewhat unfamiliar ideas. We recognize that fields computed in non-eddy-resolving models are moments of an underlying probability distribution of possible ocean states. Gradients of distribution entropy with respect to the realized moments should appear as forces acting on those moments. This leads to evolution equations qualitatively different from the equations which have guided WOCE modeling "as usual". However, rigorous procedures to estimate the entropy gradient forcing are not known. We have represented the entropy gradient term as a force proportional to departure from an approximate (ideal quasigeostrophy) entropy maximum. This may be clumsy, the only excuse for which is that "as usual" may be clumsier yet. We ask two questions. First, does this unfamiliar force have substantial impact on model results? Second, can we tell quantitatively if we are improving upon ocean modeling?

Practical applications on Neptune have included global integrations by Eby and Holloway (1994), regional studies in the Mediterranean by Alvarez et al. (1994), the Japan Sea by Holloway et al. (1995), the North Atlantic by Dengg et al. (1995) and the Caribbean by Sou et al. (1995) as well as estuarine (Fyfe and Marinone, 1995) and coastal zone (Pal and Holloway, 1995) modeling. These authors report encouraging evidences of model "improvement" including strengthened subpolar gyres, western boundary currents separating at lower latitudes, reduction of excessive surface heat and freshwater exchange, swifter continuous deep western boundary currents and marked tendency for poleward regimes along eastern boundaries. However encouraging this may be, it amounts to case-by-case comparative "validation" that admits danger of case-specific "tuning" and focuses on more "agreeable" features. More objective measures are needed.

Oceans are observed in many ways -- distributions of long-term tracers, surveys of transient tracers, drift bottles, ship drift, current meters, surface and subsurface floats, satellite altimetry, electromagnetics and acoustic methods and more. To measure performance of a global model, we considered datasets with global coverage.

The Eby and Holloway (1994) model was compared with temperature (T) and salinity (S) from the Levitus (1982) atlas, using integral measures of squared deviations. This proved inconclusive for present purposes. While the model exhibits departures from Levitus, discrepancies are due less to Neptune than to misrepresentation of mixing, stirring, convection and surface forcing. Moreover, even if a model gets T and S "right", circulation may yet be quite wrong.

Altimetry constrains estimates of mean circulation at larger scales. However, models tend to produce similar large scale gyres, while altimetry may not be decisive for smaller scale mean flow. Especially, if we expect swift narrow flows over steep slopes, geoid uncertainty is limiting except where region-specific high-definition gravimetric surveys have been performed. The use of Lagrangian data remains to be explored. For the present note, we turn to long-term current meter records.

From published results, institutional and investigators' archives and WOCE Data Assembly Center, we gathered nearly 2500 records based on minimum duration of 100 days. The distribution of sites is quite nonuniform. Moreover, any current meter, even if its duration is sufficient to sample a long-term "mean", may be quite unrepresentative of flow resolved on a model with grid spacing of 200 km (as Eby and Holloway). Long-term records obtained only a few km apart may differ markedly depending upon specifics of local topography. Is this is a fool's errand? If there is no systematic bias in the unrepresentativeness of each current meter, then a sufficiently large number of records should

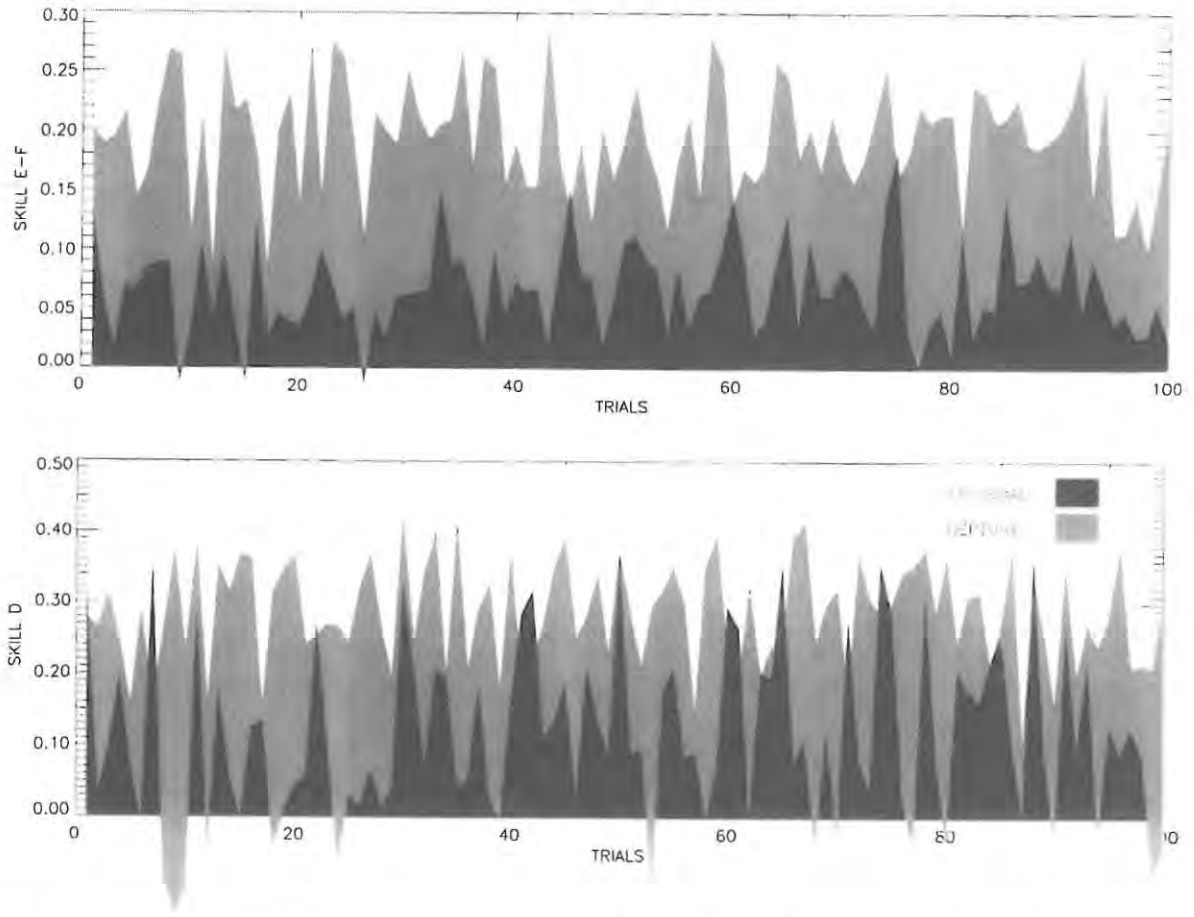

Fig. 1. Evaluation of skills E-F and D for 100 trials and two cases "AsUsual" and "Neptune" (see table bellow).

provide useful measure. A key question is if the number of records is sufficient for this purpose.

For each current meter we obtain mean flow $d_i=(u,v)_i$, where "mean" is time-average over the duration of the i-th record, ranging from 100 days to more than 1000 days. The total variance of departures from d_i is s^2_i. In many cases variances of the u- and v-components, and the uv-correlation, or principle axes of a variance ellipse, are available. Some investigators estimate number of temporal degrees of freedom, admitting possibility to compute standard error on confidence in d_i. Other records do not contain this information. To provide uniformity over as large a global dataset as possible, we use only s^2_i as calculated by each original investigator using various sampling rates, smoothings or de-tidings.

Eby and Holloway made two runs using the GFDL model (MOM 1.1) in global domain on a grid 1.875° longitude by 1.856° latitude by 31 levels. The runs were integrated for 800 years under mean wind from Hellerman and Rosenstein (1983) with surface relaxation of T and S to Levitus (1982) One run (AsUsual) was done in a conventional manner; the other run (Neptune) centered the lateral viscosity operator about a non-zero flow field U*. Model velocities were interpolated to current meter locations to yield velocity m_i. Because of coarseness of grid and the "staircase" topography of the GFDL model, some current meters which might be near steep topography occurred below the model bottom. Ad hoc rules were applied to "rescue" current meters where possible, for example by applying the deepest model velocity at the current meter location when a current meter occurred "not too far" below the model bottom.

Two estimates of the skill of m_i against d_i are evaluated. First, consider energy of the difference m-d, i.e., error kinetic energy $e_{KE} = 0.5(m-d)|V-1|(m-d)$ where V is a diagonal matrix of elements s^2_i normalized to trace V=1. One may compare e_{KE} with the weighted KE of the data themselves, i.e., $d_{KE} = 0.5d|V-1|d$. It is convenient to form a ratio we call "skillE" (for "Energy"):

$$skillE = (d_{KE} - e_{KE}) / (d_{KE} + e_{KE})$$

such that an error-free model (eKE=0) yields skillE=1 whereas a model with huge e_{KE} yields skillE approaching -1.

Within the range -1 < skillE < 1, consider the skill of a completely skill-less model whose flows m are randomly unrelated to d. Denoting the weighted kinetic energy of the model at the data locations by $m_{KE} = .5m|V-1|m$, the value of skillE for the skill-less model is called "skillF" (for "Floor"):

$$skillF = - m_{KE} / (2d_{KE} + m_{KE})$$

The first estimate is achieved energetic skill, i.e., the excess skillE - skillF.

A second estimate is simpler but insightful. From unit vectors $d_i=d_i/|d_i|$ and $m_i=m_i/|m_i|$, we form the weighted inner product "skillD" (for "Direction"):

$$skillD = d|V-1|m$$

SkillD asks if the model knows which way the water goes, regardless of speed. SkillD also falls within bounds $-1 < \text{skillD} < 1$.

Because individual current meters are unrepresentative of a coarse resolution model, one asks how skills E, F and D may vary depending on which particular current meters are included in the database. We found that with several hundred records in the database, results tended to stabilize. With more than 1000 records, similar results were obtained, consistent with results shown here using nearly 2000 records. To further assess stability, we performed 100 trials utilizing the full inventory but randomly rejecting half the dataset for each trial so that we don't know which current meters influence skill.

Results from the entire dataset (Fig. 1) are given in the table below with standard deviations of skills E-F and D from the 100 random discard trials reported "+/-".

	skillE	skillF	skillE-skillF	skillD
AsUsual	.004	-.065	.069 ± .038	.110 ± .122
Neptune	.093	-.098	.191 ± .048	.292 ± .074
U* only	.086	-.077	.163 ± .037	.282 ± .094

None of the skills are very large. This reflects unfaithful model dynamics and imperfect applied forcing. It also reflects the disparity between pointwise current meter records and a model representation on vastly coarser scale.

Although skills are small, some results emerge. All of the E-F and D are positive by more than one standard deviation across the random-rejection trials. It may be encouraging that AsUsual shows some skill (if only barely!) Then we see something that may be exciting -- the skill increment from AsUsual to Neptune is roughly twice as great as the skill of AsUsual. The increment is substantially larger than the standard deviation across the 100 trials. This quantitative gain agrees with the more qualitative comparisons reported by the authors mentioned above.

Results suggest that statistical dynamical forcing plays a major role in ocean dynamics. Previously this force was omitted in non-eddy-resolving models and likely corrupted by marginally eddy-resolving ("eddy-admitting") models. The specific parameterization employed by Eby and Holloway approximately triples the skill of this model against the current meter inventory. While optimally tuning the parameterization is possible, it may not be warranted given the uncertain fundamental basis for the parameterization.

A third line in the table adds a chilling footnote. We have asked if Neptune improves upon conventional modeling. For fun we "turn the table" and ask if all the conventional physics (AsUsual) contributes measurable skill over U*, i.e., the flow field which would be achieved if the ocean could evolve to near-zero gradient of entropy. With respect to D, Neptune (including all of conventional physics) offers no gain over U*. With respect to E-F, there is only slight gain by less than a standard deviation across the 100 trials. Thus, once U* is taken into account, further increment of model skill (measured against current meters) is inadequate to tell "which way the wind blows" (or where buoyancy forcing occurs). Although this may depend in part on the incomplete description of the ocean given by current meters, we still find it distressing.

Cautions apply. Here we considered skill measures based upon the particular model output from Eby and Holloway. That output depends upon the specific architecture of the GFDL ocean model, the resolution used, the choice of external forcing, and numerous internal parameters such as mixing coefficients. By design, all of these choices were as conventional as possible. If another model is used, configured with different forcings and choices for internal parameters, then different results will be obtained. Model outputs are disturbingly sensitive to changes of internal parameters and external forcing, with details of topography, and with respect to underlying model formulation. We cannot know how well results reported here may generalize. The danger of "right" answers for wrong reasons remains.

Caveats notwithstanding, we think this report is "good news", encouraging for WOCE modelers. It is too early to draw conclusions about such a "green" idea as entropy gradients forcing ocean circulation. What may be exciting is the possibility of understanding the role of eddies better (in some ways) than we can model them. This is a crucial issue for accomplishing WOCE Goal One, bearing on the unknown cost of otherwise attempting truly "eddy-resolving" (not "eddy-admitting") global ocean integrations over time scales of ocean-climate relevance.

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Do Historical "Zero Depth" Hydrographic Data Contain Useful Information on Climate Trends?

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1. Introduction

One of the most significant challenges in climate research is the characterization and explanation of the long term-trends seen in the historical instrumental record. An important variable to consider is the sea surface temperature (SST). Some observations of SST from ships are available at least back into the mid-19th century, and these rather extensive data (mainly from ships-of-opportunity) have been incorporated into the well known Cooperative Ocean-Atmosphere Data Set (COADS). However, important questions have been raised concerning the consistency of the SST observations in the COADS. It is known that the large majority of ocean temperature observations are now obtained with thermometers placed in the ship water intake line ("injection temperatures") or by lowering a specially insulated container over the side of the ship hauling back on deck and inserting a thermometer ("insulated bucket temperatures"). In the distant past virtually all measurements were presumably obtained with an ordinary wooden or canvas bucket ("uninsulated bucket temperatures"). There is considerable evidence that the uninsulated bucket temperatures can be colder (perhaps by ~0.5°C) than the injection temperatures (e.g., Roll, 1965), and the uninsulated bucket temperatures are also expected to be colder than insulated bucket temperatures (e.g., Folland et al., 1984). Thus any SST trends seen in the COADS data may be contaminated by the changes in the observing procedures over time. Unfortunately, the expected magnitude of this contamination is difficult to determine in any direct fashion. The detailed history of the relative numbers of uninsulated bucket, insulated bucket and injection temperatures is apparently not known. There is also no obvious way to determine the precise bias of a particular historical bucket observation relative to what would have been obtained as an injection temperature. This bias could depend on the weather conditions and on the exact procedure used in the taking the bucket measurement.

This problem has led researchers to consider alternative approaches to determining long-term SST trends. Barnett (1984) suggested using shipboard observations of air surface air temperature (SAT) as a proxy for the SST. He was able to show that (at least when large numbers of observations are averaged) the difference between COADS SAT and SST observations was apparently negative (i.e. SST colder than SAT) before World War II (WWII) and positive after WWII. There is some noise in this determination (see his Fig. 7), but basically Barnett's results are consistent with the view the SST observations are relatively homogeneous within each of the pre-WWII and post-WWII periods, and that the earlier SSTs are biased colder by ~0.3-0.4°C relative to the later observations. This would make sense if the older uninsulated bucket observations were dominant before WWII and were rapidly replaced by newer methods around the time of WWII. Folland et al. (1984) found essentially the same result in a similar comparison of SAT and SST.

While the comparison of SST and ship-board SAT observations has produced a reasonable scenario for the bias introduced, it is still of interest to determine the SST trends using only SST observations. There are at least two sources of SST observations that are independent of the COADS ships-of-opportunity data, and that extend over long periods in both the pre-WWII and post-WWII eras. One of these is the set of observations taken at coastal locations (see, for example, Emery and Hamilton, 1985, for a discussion of some features in these data from the Pacific coast of Canada). The author tried some years ago to find a consistent bias between the monthly mean values of coastal SST data from North America and the COADS SST from adjacent waters. The result was quite unsuccessful, with no clear spatial or temporal pattern to the differences emerging.

Another source of SST data comes from hydrographic surveys. A significant fraction of recorded oceanic temperature and salinity soundings include data for "0 m" depth. The precise meaning of this value is not obvious. In some cases it may be that the observer tripped a reversing thermometer just below the surface. Or the 0 m values could represent bucket measurements taken simultaneously with a Nansen cast. Or they could simply be some extrapolation from the reversing thermometer values lower down. There seems to be no readily available record of the procedures used for the many cruises represented in the digitized archives of hydrographic data. Despite this ignorance of the details of the measurement techniques, Barnett (1984) examined the implications of an assumption that there is no systematic trend in the possible bias in the 0 m hydrographic temperature data. Then the differences between these data and the COADS SST should provide a measure of the trend in the bias in the COADS data. In particular Barnett computed 5-year average SSTs for large ocean areas from COADS data and the available

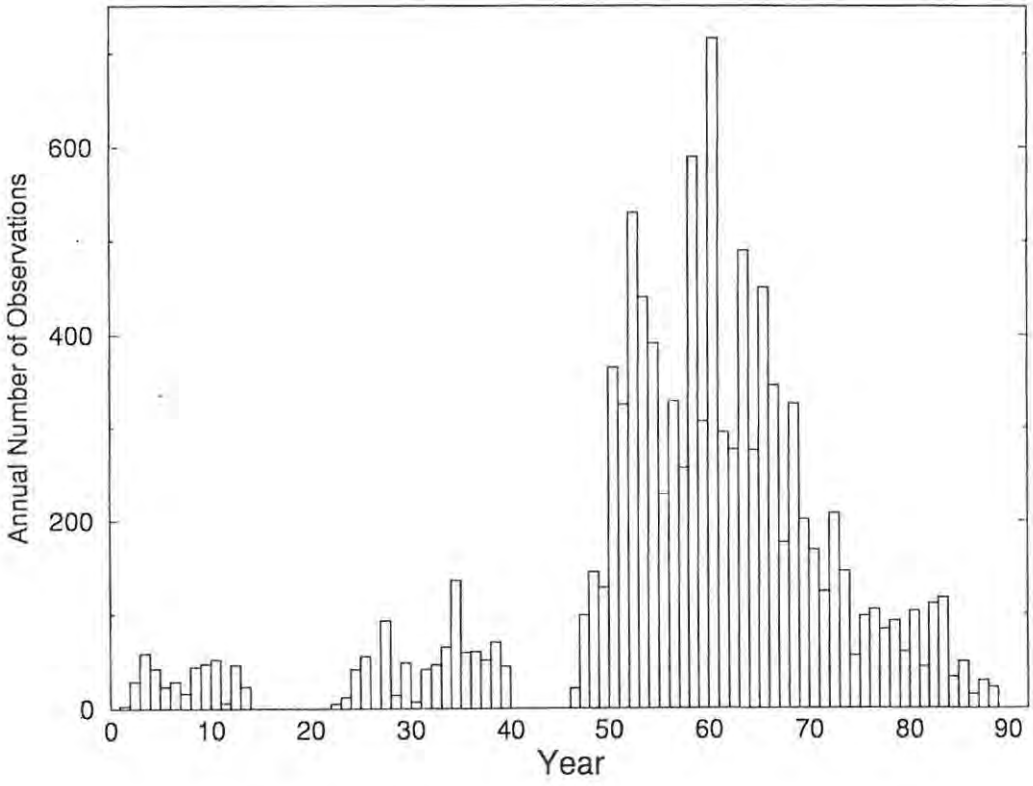

Fig. 1. The number of observations of temperature recorded on the NODC-20 CD-ROM with zero depth each year in the region 60°-66°N, 1°-8°W .

hydrographic observations. The results were not very impressive, with the time series of 5-year means of the hydrogaphic data appearing quite noisy (see Barnett's Fig. 4).

2. Data and Analysis

The present note reports on a new attempt to see how useful the zero depth hydrographic data may be for determining the bias in the COADS SST observations. Rather than combining observations over large geographical regions, this study focuses on small regions with significant hydrographic data available over long periods both pre and post-WWII. The data source employed is the NODC-20 "Oceanographic Station Profile Time Series: Temperature, Salinity and Nutrient Data from Repetitive Samples over Long Time Periods" distributed on CDROM by the US National Oceanic Data Center. This seems to include data mostly from fairly extensive oceanic cruises (and from weather ships). Only some limited regions in the North Atlantic have significant coverage before WWII in this data set. Fig. 1 shows the yearly number of profiles with 0 m temperature values available in the data set in the region 60°-66°N, 1°-8°W (note that only data labeled as Nansen casts in the data set are employed in this study). This is the best region in terms of having pre-WWII zero depth data. Fig. 1 shows that there are gaps during and after both WWI and WWII, but otherwise there are a reasonable number of observations available in most years since the beginning of the century.

The comparison of these data with the COADS SSTs is made using the objective gridded analysis of the COADS SST produced at GFDL by A.H. Oort (Oort et al., 1987). This provides a smoother and more continuous SST record than use of the raw COADS data. For each 0 m temperature report in the NODC-20 dataset, the difference, D, is computed between the hydrographic value and Oort's analysis for the same month interpolated to exactly the same location as the hydrographic sounding. The values of D can then be averaged for a given time period and region. The advantage of this approach - as opposed to making long term means for a given area using COADS and the hydrographic data separately - is that it minimizes the error in the area mean introduced by the limited sampling in the hydrographic data. The present preliminary study will focus on the limited question of whether the hydrographic data can be used to determine the change in bias in the ships-of-opportunity SST data between the pre-WWII and post-WWII periods.

3. Results and Discussion

The results for the 60°-66°N, 1°-8°W region are shown by calendar month for the pre-WWII and post-WWII eras in Table 1. The first two columns give the total number of 0 m hydrographic temperatures that are available. Note that results are shown only for calendar months in which there were more than 50 pre-WWII observations. The third and fourth columns show the mean of D for the pre and post-WWII observations, while the fifth and sixth columns show the standard deviation of the values of D about these mean values. There is a consistently negative bias (i.e. hydrographic temperatures are lower than the analyzed COADS temperatures). This bias is a significant fraction of a degree C, and appears to vary among the calendar months. If the scenario suggested by the SAT-SST comparisons of Barnett (1984) and Folland et al. (1984) were correct, one would expect the bias post-WWII to be less negative by ~0.3-0.4°C, reflecting the supposed rapid change to the injection and insulated bucket temperatures during WWII. While this appears to be the case for the July, August and September

Table 1:

	Number Pre-1940	Number Post-1945	Mean SST Difference Pre-1940	Mean SST Difference Post-1945	Standard Deviation Pre-1940	Standard Deviation Post-1950
April	74	510	-0.42	-0.68	0.74	1.15
May	326	770	-0.28	-0.53	0.92	1.16
June	287	2073	-0.47	-0.45	0.85	0.95
July	201	1422	-0.78	-0.45	1.12	1.02
August	257	631	-0.54	-0.38	0.84	0.91

Results of the present analysis for the area bounded by 60°N-66°N and 1°W-8°W. The number of available hydrographic surface observations for each calendar month in the pre-1940 and post-1945 periods are shown, together with the mean difference (°C) in each case between the hydrographic observations and the corresponding results from Oort's analysis of the COADS data. The final two columns show the standard deviation (°C) of the differences about the mean difference. Results shown only for those months with >50 observations pre-1940.

Table 2:

	Number Pre-1940	Number Post-1950	Mean SST Difference Pre-1940	Mean SST Difference Post-1950	Standard Deviation Pre-1940	Standard Deviation Post-1950
February	53	193	-1.10	-2.03	0.58	0.72
March	160	395	-1.23	-2.34	0.74	0.89
April	154	138	-1.14	-2.10	0.73	0.89

As in Table 1, but for the region bounded by 67°N-69°N and 12°E-18°E.

values, the opposite change is seen in April and May, and almost no change is found in June.

Both the mean values of D and the standard deviation seem quite large. The large standard deviation might be explained if the objective analysis of the COADS data was subject to errors (due to insufficient data coverage) to the extent that the SST estimates for a particular month and location would typically be wrong by ~1°C. If this were the dominant contribution to the spread in D values, then one would expect the standard deviation of D to decrease in the post-WWII period when more COADS observations are available. In fact there is no evidence for a decrease in the standard deviation post-WWII.

This leads to consideration of whether there are problems with the 0 m hydrographic data. The overall cold bias (even relative to the uninsulated bucket temperatures that presumably dominate the COADS data pre-WWII) may lead one to suspect that the hydrographic 0 m values could in some instances be more appropriate for the water at some depth below the surface. This could result from some simple extrapolation procedures. If such very cold values were combined with some more nearly representative of the surface then the large standard deviation in D could also be explained.

The present analysis was repeated for the two other compact regions with significant pre-WWII coverage in NODC-20. Table 2 shows the results for 67°N-69°N, 12°E-18°E. Here the cold bias is even larger than in Table 1, and is considerably greater (>2°C) after WWII. Such a large bias can only be reasonably explained by assuming that the a large fraction of the zero depth hydrographic temperatures are in fact quite unrepresentative of the actual SST. Results for 43°N-48°N, 43°W-54°W (not shown) reveal similarly large biases (and even larger standard deviations of D).

4. Conclusion

The present results have highlighted the possible difficulties in interpreting the archive of 0 m hydrogaphic temperature observations. It is speculated that the value of such observations for determining long term trends in SST may be compromised by inconsistencies in observing procedures employed, notably the possibility that significant numbers of extrapolated temperatures may be included. This does not rule out the possible use of the hydrographic data in estimating long-term mean SST trends, but suggests that the rather indeterminate results obtained by Barnett (1984) will only be improved by the labour-intensive examination of observations in individual cruises to discard suspect data.

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Acknowledging The Weather-health Link

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ABSTRACT / RÉSUMÉ

The impact of weather on health is generally overlooked by physicians. Possible reasons for this include lack of training and insufficient awareness of the significant body of research on human biometeorology. The authors argue that, in the absence of clearly demonstrable causal connections, statistical associations between weather phenomena and health problems should be enough to influence clinical practice. Physicians in Germany make use of daily bulletins from the national weather service to advise patients on the management of common health problems that seem to be exacerbated by certain weather conditions. The authors urge Canadian doctors to follow the lead of their European colleagues by increasing their awareness of the relation between weather and health.

Les médecins oublient généralement l'incidence du climat sur la santé. C'est peut-être, notamment, à cause d'un manque de formation et de connaissance de la masse importante de résultats de recherche qui existent sur la biométéorologie humaine. Les auteurs soutiennent qu'en l'absence de liens de cause à effet clairs, les liens statistiques entre les phénomènes atmosphériques et les problèmes de santé devraient suffire pour orienter la pratique clinique. Des médecins d'Allemagne utilisent les bulletins quotidiens du service national de météorologie pour donner à leurs patients des conseils sur le traitement de problèmes de santé ordinaires que certaines conditions atmosphériques semblent exacerber. Les auteurs exhortent les médecins canadiens à suivre l'exemple de leurs collègues européens en se mettant davantage au fait du lien entre le climat et la santé.

Introduction

We are bottom dwellers in a gaseous ocean that stretches from the earth's surface to the limits of our atmosphere. Logically, we must be affected by changes in this part of our environment; the question is, How and to what extent?

Many Canadian physicians are well versed on the link between air pollution and respiratory ailments, and between ultraviolet radiation and skin cancer. Relatively few, however, consider the influence of the weather on migraine, arthritis, heart disease, mood or behaviour. Whereas patients often make such associations, physicians rarely have insight into them, investigate them or apply them. Few physicians in North America are even aware of the putative association between transient atmospheric changes and changes in blood chemistry (Tromp and Bouma, 1974). Perhaps physicians are reluctant to consider such associations because the weather is beyond our control. Nevertheless, understanding the relation between weather and health can help physicians to care for their patients.

Unlike many people employed in sectors such as farming, fishing, shipping, travel and recreation, health care professionals make little use of the government's considerable investment in the provision of weather information.

Perhaps this is because they work indoors in controlled environments protected from the elements, where any connection between weather conditions and the problems that patients present is not always apparent. Interestingly, however, patients who are sensitive to the weather need not be outdoors to be affected (Driscoll, 1993).

Perhaps another reason why most physicians are unaware of a relation between weather and health is that they have been trained to seek clear causes for disease. Weather sensitivities are not always straightforward and are often identified as precipitating or catalytic factors rather than as causal ones.

Physicians who do not see a purely causal relationship between changes in the weather and a patient's health may be at a loss to envisage appropriate interventions. None the less, if physicians could overcome these stumbling blocks, they might have a means of understanding or even anticipating many disease presentations.

Weather is a major component of our physical environment. Information about the weather's rapid changes, which can be accurately forecast and easily measured, can help physicians to understand their patients, interpret their complaints and make more effective use of health care resources. Perhaps Canadian physicians will one day follow the lead of their colleagues in Europe by applying this information to the prevention and treatment of health problems (Jendritzky and Bucher, 1993).

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[1] Cofounders of the Canadian Medical Meteorological Network

The literature

Although there is ample evidence of the influence of weather on health, the frequent MEDLINE searches that we have conducted over the last 8 years have generally been unproductive. Terms such as "weather," "weather fronts," "storms," "ambient temperature" and so on are not included among the medical subject headings used to index the MEDLINE database. We have been more successful with searches in Biological Abstracts. A search of material published in 1992 alone yielded 130 articles from 70 journals in which weather and climate were identified as factors contributing to health problems. This number does not include the sizable literature on seasonal affective disorder, ultraviolet radiation and air pollution.

The following synopses of research findings give some indication of the scope of the literature on the relation between weather and health. Breast cancer survival rates in major urban areas in the United States were found to be inversely proportional to the intensity of local sunlight (Garland et al, 1990).

- An abnormal reduction of serum melatonin levels in winter was suspected to promote growth of breast neoplasms (Holdaway et al., 1991)
- The incidence of acute myocardial infarction was found to increase during certain types of weather fronts and to decrease during others (Kveton, 1991).
- White blood cell counts were found to vary seasonally, the highest levels occurring in the autumn (Friedman et al., 1990).
- A correlation was found between increased exposure to sunlight and protection against coronary artery disease (Scraag et al., 1990).
- A correlation was found between blood pressure levels of hypertensive patients and mean daily temperatures as well as daily temperatures at noon (Kunes et al., 1991).
- Rates of admission for acute exacerbation of bronchial asthma in childhood were found to be linked to afternoon weather gradients (Beer et al., 1991).
- The volume of emergency-department visits for asthma was found to show seasonal variation, the lowest rates occurring in July and the highest in March (Rossi et al., 1991).
- Levels of neurotransmitter markers in cerebrospinal fluid appeared to show seasonal variation (Hartikainen et al., 1991).
- A strong association was found between the amount of sunshine in a given month and the number of admissions for mania one month later (Peck, 1990).
- Vitamin D supplementation during winter was found likely to reduce overall bone loss in women (Dawson et al., 1991).
- Aggressive behaviour in elderly psychiatric patients was found to increase in winter and to be less frequent in the fall (Meyer et al., 1991).
- Triplet births in the United States were found to exhibit seasonal patterns (Elster and Bleyl, 1991).

Altogether there are some 10,000 references in the scientific literature on the relation between weather and health. Possibly the largest collections of research on human biometeorology are the volumes edited by Tromp (1963, 1980) and Tromp and Bouma (1977). Other large works include Sargent (1982), Petersen (1938) and Licht (1964).

Clinical implications

Faced with the diversity and quantity of biometeorologic research, physicians may wonder how its findings can be incorporated into everyday clinical practice. We provide three simple examples of how associations between weather and health can be given practical application.

Gijsenbergh and associates (1989) studied the relation between carbon monoxide poisonings and weather in Belgium. They found that on days with strong atmospheric thermal inversions the normal dispersion of the gas from wood stoves was reduced. These stoves were used extensively by older people in the study area. The resulting increase in indoor concentration of gas during thermal inversions caused a significant number of poisonings. Their paper called for public health nurses to alert at-risk patients when this particular weather pattern was forecast and advise them to open a window. This simple procedure promised to reduce both morbidity and health care costs.

Nursall and Phillips (1980) investigated the relation between migraine attacks and weather conditions in southwestern Ontario. Using the method developed by Brezowsky (1960) they categorized weather patterns according to typical movements of weather fronts. The clearly predictable weather situations associated with warm, humid weather were found to be associated with an increase in frequency and severity of migraine attacks. Physicians could use this information to alleviate their patients' anxiety about their migraine attacks and to help them to cope with their ailment.

Trapasso and Yurchisin (1989) examined the relation between changes in barometric pressure and the onset of labour. Data collected for 12 months from the medical centre at Bowling Green, Ky., were analysed along with charts produced at the local weather station using standard statistical analyses. A rise in barometric pressure followed by a sudden fall was associated with the initiation of labour. The authors postulated that there is an association between the stretching (under pressure) of the amniotic membrane and the production of prostaglandins. Assuming that these findings are reproducible, this information could be incorporated into the planning of labour-ward staffing.

The results of similar analyses in other areas could be taken into account in planning staffing levels for emergency departments and coronary care units (Gall, 1993) and in determining requirements for equipment in operating rooms and radiology departments during particular weather patterns.

Implications for research

Many Canadian physicians would likely require that any association that prompts a change in clinical practice be demonstrably causal and not merely statistical. They would argue that the association should affect a significant number of people and that any reasonable intervention should be effective and acceptable and offer a clearly defined improvement in public health (Smith, 1992). We do not entirely accept this argument.

Insistence on formal causality is a hard taskmaster. Moreover, in many clinical situations it may not be necessary. In Germany, for instance, where physicians and meteorologists

issue a national daily weather and health bulletin through electronic and print media, less importance is assigned to demonstrated causality; instead, the existence of a statistical association is accepted[3]. We may feel that this approach does not suit us in Canada, but it is worth examining. Floto, Flassl and Reinke (1991) describe the culmination of biometeorologic research conducted for some years by the German national weather service, the Deutscher Wetterdienst. Weather-based health bulletins had been produced daily for medical professionals for some 15 years when, in 1985, they were adapted for public consumption. This step was undertaken in cooperation with medical authorities, and more than 1000 general practitioners participated in the pilot study. By 1989 bulletins were available for the entire former West Germany. In January 1994 distribution was expanded to print media and radio and television, where bulletins are now broadcast as part of normal programming.

Whatever importance we attribute to demonstrated causality in making decisions about public health policy or clinical interventions, such causality is not needed to justify the investigation of a phenomenon. As Susser (1986) has outlined, the criteria that sustain the momentum of research are quite different. The criteria for verification or refutation of hypotheses include probability, sequence, strength of association, specificity, consistency, predictive performance and theoretic, biologic, factual and statistical coherence.

It is time to apply the criteria outlined by Susser to the considerable body of literature on the weather and health and to give credence to good research. Critics of the European attitude warn that this could instigate large-scale hypochondriasis. Canadian physicians can deal with such criticism only if they have accurate data upon which to rely – and such data should be homegrown, given the importance of local factors in this field. Medical advice must be founded on accurate research. In biometeorology the collection of information requires strict attention to epidemiological and statistical methodology. Academic rigour is not, however, expensive in the context of today's research, and it promises to produce relatively large savings for a low outlay – ever the cry of public health care reform.

Conclusion

Relations between weather and human health have been evident for centuries. Yet these associations are neglected in modern medical practice, particularly in North America. Physicians fail to realize that knowledge of these relations can help patients to cope with their ailments. Like most people, physicians yield to the view that since we cannot do anything about the weather, there is no point in dwelling on its effects. This view is reinforced by the fact that information is not readily accessible through medical-literature databases. However, we can predict the weather, and this might help us predict changes in our patients' health and cause us to adjust our advice accordingly.

Human biometeorology is applicable to the health of individuals and to that of the public as a whole. It is a branch of environmental medicine that promises to yield a good return on investment by improving the quality of patients' lives and containing – if not reducing – health care costs. Its time has come, but no real advances can be made without the input of physicians from every field of medicine. We urge each expert group to consider the weather when dealing with their research subject. We believe that the benefits will be considerable and the results of such research of great interest.

We thank Mrs. Glory Wortzman and Mrs. Roberta McCarthy for their invaluable expertise and patience and Ms. Sophie Bart for her help with the preparation of the manuscript.

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Call for Papers
CMOS Thirtieth Annual Congress

The 30th Annual Congress of the Canadian Meteorological and Oceanographic Society will be held at the University of Toronto, Toronto, Ontario, Canada from May 26 to May 31, 1996.

Oral and poster papers, and commercial exhibits in all areas of meteorology, oceanography and limnology are invited. Special interdisciplinary sessions will be held on: Arctic research, surface processes, remote sounding, mesoscale processes, and radiation and climate. A special session is also planned on the Climate Research Network.

Abstracts of papers must be received by the Scientific Program Committee (Chair, Dr. T.G. Shepherd) by 5:00pm, Monday, February 26th, 1996. Authors are strongly urged to submit abstracts by electronic mail. A template for sending an electronic abstract can be obtained by sending a (blank) e-mail message to: cmos_form@atmosp.physics. utoronto.ca or by anonymous ftp from chinook.physics. utoronto.ca (128.100.80.27), file pub/cmos/abstracts/form. The committee would greatly appreciate all efforts to submit abstracts electronically using the template as this will accelerate the approval and printing process and therefore reduce our costs. If you cannot submit by e-mail, please contact Dr. Shepherd for information on other methods of submitting abstracts.

List of Sessions (Preliminary):

1. Air Quality
2. Arctic Research
3. Aviation Meteorology
4. Atmospheric Chemistry
5. Atmospheric Dynamics
6. Atmospheric Modelling
7. Atmospheric and Oceanic Waves
8. Boundary Layer Meteorology
9. Chemical Oceanography and Limnology
10. Client and Commercial Services
11. Climate and Paleoclimate
12. Climate Research Network
13. Cloud and Precipitation Dynamics
14. Coastal Ocean and Inland Waters
15. Data Assimilation
16. Deep-Sea Research
17. Fisheries and Biological Oceanography
18. Geophysical Fluid Dynamics
19. GEWEX
20. Hydrology
21. Interannual Variability
22. JGOFS
23. Long-Range Forecasting
24. Mesoscale Processes
25. Middle Atmosphere
26. Ocean Circulation
27. Radar Meteorology
28. Radiation and Climate
29. Remote Sensing
30. Remote Sounding
31. Sea Ice
32. Surface Processes
33. Weather Forecasting
34. WOCE
35. Other

The scientific program is expected to run from May 27-30 inclusive: Sunday, May 26 will be set aside for committee meetings, and Friday, May 31 will be set aside for special workshops.

For further information on the scientific program, contact: Dr. T.G. Shepherd, Scientific Program Committee, Department of Physics, University of Toronto, 60 St. George Street, Toronto, Ontario, M5S 1A7, Fax: (416)-978-8905, e-mail: cmos_science@atmosp.physics.utoronto.ca

For further information on registration, accommodation and commercial exhibits, contact: Dr. D. Hudak, Local Arrangements Committee, Department of Physics, University of Toronto, 60 St. George Street, Toronto, Ontario, M5S 1A7, Fax: (416)-978-8905, e-mail: cmos_arrangements@atmosp.physics.utoronto.ca

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Invitation à présenter des communications - Trentième congrès annuel de la SCMO

Le 30^{e} Congrès annuel de la Société canadienne de météorologie et d'océanographie se tiendra à l'Université de Toronto, Toronto, Ontario, Canada du 26 au 31 mai 1996.

Les présentations orales et écrites ainsi que les expositions commerciales sur les thèmes de la météorologie, de l'océanographie et de la limnologie. Des sessions spéciales interdisciplinaires se tiendront sur la recherche arctique, les processus de surfaces, le télésondage, les processus à mésoéchelle et le rayonnement et le climat. Une session spéciale est également prévue sur le Réseau de recherche climatique (Climate Research Network).

Les résumés de présentation doivent parvenir au Comité du programme scientifique (président, Dr. T.G. Shepherd) avant 17h00 le lundi 26 février 1996. Nous recommendons fortement aux auteurs de soumettre leur résumé par courrier électronique. Un modèle pour transmettre un résumé électronique peut être obtenu automatiquement en envoyant un message (blanc) électronique à cmos_form @atmosp.physics.utoronto.ca ou par protocole de transfert de fichier anonyme à chinook. physics.utoronto.ca (128.100.80.27), fichier pub/cmos/ abstracts/ form. Le comité apprécierait grandement que tous les efforts possibles soient déployés pour soumettre vos résumés par courrier électronique en utilisant le modèle puisque cela accélérera le processus d'acceptation et d'impression et ainsi réduira les coûts. Si vous ne pouvez utiliser le courrier électronique, veuillez contacter le Dr. Shepherd qui vous donnera les renseignements nécessaires pour soumettre votre résumé d'une autre façon.

Liste préliminaire des sessions:

1. Qualité de l'air
2. Recherche arctique
3. Météorologie aéronautique
4. Chimie de l'atmosphère
5. Dynamique de l'atmosphère
6. Modélisation de l'atmosphère
7. Vagues océaniques et atmosphériques
8. Météorologie de la couche limite
9. Océanographie chimique et limnologie
10. Services aux clients et commerciaux
11. Climat et paléoclimat
12. Réseau de recherche climatique
13. Dynamique des nuages et des précipitations
14. Océan côtier et eaux intérieures
15. Assimilation des données
16. Recherche au haute mer
17. Océanographie biologique et des pêches
18. Dynamique géophysique des fluides.
19. GEWEX
20. Hydrologie
21. Variabilité interannuelle
22. JOGFS
23. Prévisions à long terme
24. Processus à mésoéchelle
25. Atmosphère moyenne
26. Circulation océanique
27. Météorologie radar
28. Rayonnement et climat
29. Télédétection
30. Télésondage
31. Glaces de mer
32. Processus de surface
33. Prévision météorologique
34. WOCE
35. Autre

Le programme scientifique doit avoir lieu du 27 au 30 mai inclusivement. Les réunions du comité auront lieu le dimanche 26 mai et les ateliers spéciaux auront lieu le vendredi 31 mai.

Pour plus de renseignements sur le programme scientifique, veuillez contacter: Dr. D. Hudak, Comité des arrangements locaux, Département de physique, Université de Toronto, 60 St. George Street, Toronto, ON, M5S 1A7, Téléc.: (416) 978-8905, cour. élec.: cmos_arrangements@atmosp .physics.utoronto.ca.

CALL FOR PAPERS

International Symposium on Representation of the Cryosphere in Climate and Hydrological Models

12-15 August 1996, Victoria, Canada.

The International Glaciological Society International Symposium on Representation of the Cryosphere in Climate and Hydrological models, jointly sponsored by the Atmospheric Environment Service, the Institute of Ocean Sciences, University of Victoria Centre for Earth and Ocean Research, and the Canadian Meteorological and Oceanographic Society, will be held 12-15 August 1996 in Victoria, British Columbia.

The symposium will focus on how cryospheric processes, cryosphere/atmosphere/ocean coupling and cryosphere/terrestrial interactions are represented in climate and hydrological models. The emphasis will be on large-scale cryospheric components such as snow cover (including snowfall), sea ice, large ice sheets and permafrost. Of particular interest are the results of model experiments that identify the sensitivity of the climate system to cryospheric processes and/or parameters.

Suggested topics include:

1) **representation of the cryosphere in models**: parameterization, scaling, validation and identification of knowledge gaps;
2) **coupling of cryosphere/atmosphere/ocean/ terrestrial processes**;
3) **uses of models**: sensitivity assessments of various cryospheric processes; data assimilation; prioritizing cryospheric observations and field measurements; and
4) **validation of cryospheric components in models**: remote sensing, conventional observations and process studies - including the accuracy, reliability, errors and availability of these data.

The deadline for abstracts is **1 February 1996**. First or corresponding authors will be notified of the status of their papers by 31 March 1996. Final papers are required by 15 June 1996.

Titles and abstracts should be written in English, and must contain sufficient detail to judge the scientific merit and relevance of the proposed paper. Abstracts should not exceed one page of typescript on international size A4 paper (210 by 297 mm). The title and authors' names and addresses should be placed at the top of the abstract. Indicate at the bottom which of the four Symposium topics the paper intends to address, and whether a poster presentation is preferred. When selecting material, authors should bear in mind that final versions of papers should not normally exceed 5 printed pages of the Annals of Glaciology. Send abstracts by mail, fax or e-mail to: Secretary General, International Glaciological Society, Lensfield Road, Cambridge CB2 1ER, UK, Local Fax: 01223 336543, Intl. Fax: +441 223 336543, e-mail: 100751.1667@compuserve.com

The deadline for Symposium preregistration is 15 May 1996. For information on Symposium registration and accommodations, copies of the Second Circular can be obtained over the Internet at http://www.dow.on.doe.ca/CRYSYS/igs96.htm or by e-mailing a request to Ross Brown (rbrown@cmc.doe.ca).(10/95)

APPEL DE COMMUNICATIONS

Colloque international sur la représentation de la cryosphère dans les modèles climatiques et hydrologiques

Du 12 au 15 août 1996, à Victoria, au Canada.

Le Colloque international de la Société internationale de glaciologie sur la représentation de la cryosphère dans les modèles climatiques et hydrologiques, parrainé en commun par le Service de l'environnement atmosphérique, l'Institut des sciences océaniques, le Centre de recherche terrestre et océanique de l'Université de Victoria et la Société canadienne de météorologie et d'océanographie, se tiendra du 12 au 15 août 1996 à Victoria (Colombie-Britannique).

Ce colloque portera sur la façon dont les modèles climatiques et hydrologiques représentent les processus cryosphériques, le couplage cryosphère/atmosphère/océan et les interactions cryosphère/terre. On insistera sur les éléments cryosphériques à grande échelle comme l'enneigement (y compris la hauteur de neige), la glace de mer, les grandes plaques de glace et le pergélisol. On notera en particulier les résultats des expériences par modèles qui déterminent la sensibilité du système climatique aux processus ou aux paramètres cryosphériques.

Parmi les sujets proposés, citons:

1) la représentation de la cryosphère dans les modèles : établissement des paramètres, mise à l'échelle, validation et détermination des lacunes dans les connaissances;

2) le couplage des processus cryosphère/atmosphère/océan/terre;

3) l'utilisation des modèles : évaluation de sensibilité de divers processus cryosphériques; assimilation des données; établissement des priorités pour les observations cryosphériques et les mesures sur le terrain; et

4) la validation des éléments cryosphériques des modèles : télédétection, observations classiques et études de processus - y compris, l'exactitude, la fiabilité, les erreurs et la disponibilité de ces données.

La date limite de soumission des résumés est le 1er février 1996. D'ici au 31 mars 1996, on informera de la situation de leur communication les premiers auteurs ou les auteurs correspondants. Les communications définitives sont voulues pour le 15 juin 1996 au plus tard.

C'est en anglais qu'il faut rédiger les titres, qui doivent renfermer assez de détails pour permettre de juger de la valeur et de la pertinence scientifiques de la communication proposée. Les résumés ne doivent pas dépasser une page de caractères imprimés sur du papier A4 de format international (210 x 297 mm). Il faut placer le titre et les noms et adresses des auteurs en haut du résumé, signaler en bas lequel des quatre sujets du Colloque la communication vise traiter et si l'on préfère une présentation par avis. Pour la sélection des documents, les auteurs doivent se rappeler que les versions définitives des communications ne doivent pas, en principe, dépasser 5 pages imprimées des Annals of Glaciology. Veuillez envoyer les résumés par la poste, par télécopieur ou par courrier électronique à : Secrétaire général de la Société internationale de glaciologie, Lensfield Road, Cambridge CB2 1ER, UK, télécopieur local : 01223 336543, télécopieur international : +441 223 336543, courrier électronique : 100751.1667@compuserve.com

La date limite de l'enregistrement préliminaire au Colloque est le 15 mai 1996. Pour se renseigner sur l'inscription au Colloque et l'hébergement, on peut se procurer des exemplaires de la seconde circulaire à l'Internet, à http://www.dow.on.doe.ca/CRYSYS/igs96.htm, ou, par courrier électronique, en s'adressant à Ross Brown (rbrown@cmc.doe.ca).(10/95)

Coastal Zone Canada `96

This International Conference is the second in the continuing interdisciplinary series begun in 1994 in Halifax, Nova Scotia. We invite you to participate in Coastal Zone Canada `96 (CZC'96) to be held in Rimouski, Québec, Canada, on 12-17 August 1996. The theme of the conference is `Integrated Management and Sustainable Development in Coastal Zones'. The conference will have the following **objectives**:

1. **To Review Current Knowledge**. To review the development of knowledge - both theoretical and practical - of the coastal zones including the scientific, managerial, social and economic aspects, since the CZC'94 Conference held in Halifax in September 1994.

2. **To Provide a Forum**. To achieve this review by bringing together representatives of governmental, academic, business and coastal communities and other interest groups involved in the management, development and use of coastal zones. Understanding each other's priorities, sharing experiences and learning to work together effectively will be a benefit to all.

3. **To Frame Recommendations**. To frarne recommendations arising from the deliberations of the conference and to outline new research and management directions. Such advice will be forwarded to governments to contribute to the formation of strategies for the integrated management and sustainable developments of coastal zones under their national jurisdiction.

Papers and Case Study Presentations are invited from national and international coastal zone stakeholders, community-based organizations, scientists and engineers, governments and primary resource users, industry and business. This international conference will feature oral and poster presentations, plenary panel sessions at round-table discussions in the following subject areas:

- Scientific Tools for Monitoring, Classification, Surveillance and Management of Coastal Environments.

- Environmental Quality, Pollution Impacts and Coastal Oceanography
- Climate Change, Sea Level Rise and Natural Disaster Impacts
- Cultural-Socio-economic and Political Considerations in Coastal Development
- Legal Issues and Problem Solving in a Multi-use Environment
- Conservation and Protection of the Coastal Zone
- Survival and Development of Coastal Communities
- Public and Formal Education in Coastal Zone Management
- Promotion of Environmentally Sound Technology
- Management and Development of Coastal Zone Resources
- Coastal Zone Policy and Institutional Arrangements
- Regional and International Issues
- Agenda 21: A Vehicle for Action?

Other coastal subjects are encouraged. Proposals for round-table sessions are also invited. Individuals wishing to submit a paper or poster for CZC'96 should send an abstract of no more than 3 words in either English or French to the Chair of the Scientific Committee, no later than 1 February 1996. Please ensure that your complete address, telephone and fax numbers are included. A diskette copy (WordPerfect, Word or ASCII format) of the abstract would be much appreciated. Notification of acceptauce will sent in February-March 1996

A Major Trade Show and Exhibition is planned to allow private companies and public organizations involved in coastal or marine activities to meet with attendees and discuss innovative technologies, approaches and business opportunities. Write to the Coastal Zone Canada `96 Secretariat for details.

General Information. The CZC'96 Conference will be held at the Université du Quebec A Rimouski Cantipi. Rimouski is well known for its coastal and marine sciences research and famous for its hospitality. The Conference is organized by the Groupe de Recherche en Environnement Côtier (GREC), Université du Québec jointly with the Coastal Zone Canada Association.

For more information or in order to receive the second announcement, please write to Professor Mohamm El-Sabh, Coordinator Coastal Zone Canada `96 International Conference, Groupe de recherche en environement côtier, (GREC). Université du Québec, 310, Allée des Ursulines, Rimouski, Québec, Canada GSL 3AI

Sea Breeze and Local Wind

John E. Simpson. 1994. 220pp. approximately $60.
Hardbound. Cambridge University Press.
JSBN 0-521-45211-2.

by

Douw Steyn

This is a book which should have been published many years ago. I say this because the sea breeze is an atmospheric phenomenon that embodies all that is fascinating about the atmosphere.

- Sea breezes have a profound effect on human and other life.
- Sea breezes are technically fascinating because of an interesting interplay between free and forced dynanucs.
- while sea breezes are inherently nonlinear, they have yielded many of their secrets to linear analyses.
- Where linear analyses have failed, powerhil nonlinear modelling techniques have been used with great success.
- Studies of sea breezes have a fascinating history, starting with Francis Bacon's work in 1664 (Jehn, 1973). these studies compass a wide range of observational and theoretical works, and have been conducted for both applied and theoretical reasons.
- Scale model (tank) studies of sea breezes have provided useflil insights into the circulation and its scales.

Given these chacteristics, it is not surprising that John Simpson, with his wide ranging interests, should have written a book on sea breezes.

The book contains 12 chapters, the first four being broadly introductory. The fifth chapter seems redundant, as it deals superficially with Olber local it'irids. I would have preferred to see the book focus solely on sea breezes, halving the title, and losing only 15 pages. The sixth chapter is a concise account of sea breeze effects on regional air quality in coastal zones. The seventh chapter is an oddly titled (Sea breeze interactions) but usefill collection of work on the effects of external conditions on sea breezes. The eighth chapter examines the importance of sea breezes to insect and animal life. The subsection on human life contains a marvellous essay on wind catchers (architectural features in hot lands) and the sea breeze. The ninth chapter deals with sports (gliding, balloon and sailing) that are affected by sea breezes. Chapters 10 and 11 deal with field- and laboratory measurement of sea breezes. Chapter 11 is particularly authoritative as it is a topic on which Simpson himself has worked. The most disappointing chapter of the book is the last, which deals with theoretical models. This chapter is a woelully incomplete treatment of a style of research which dominates studies of sea breezes today. The topic deserves more than the sparse 13 pages allocated to it. In summary of the contents, Simpson gives a good to excellent account of all aspects of the sea breeze in a readable and easily accessible volume with many interesting illustrations.

The book has a number of flaws which should be pointed out. The heuristic model for sea breeze generation given on page 6 is incomplete, and probably wrong. It certainly does not explain the dynamics as satisfactorily as the accepted model presented by Atkinson (1981) for example. There appears to be a degree of sloppiness in preparation (and proofing) of the book. For example, the Kinloss hodograph is presented in both Figures 2.9 and 9.10. Inexplicably, the data are mirror imaged before being plotted on the grid in figure 9.10. A more serious flaw is the selective nature of references. Geographically, the literature cited in this book is almost blind to sea breezes in the Western Hemisphere The literature cited appears also to be predominantly drawn from work done before the late l980s.

Its flaws notwithstanding, this will remain the most complete and wide ranging book on sea breezes for quite some time to come. I am delighted to have it in my collection, and recommend it without hesitation to anyone with an interest in the meteorology of the coastal zone.

References

Atkinson, B.W., 1981: Mesoscale Atmospheric Circulations. Academic Press, 495p.

Thin, K.H., 1973: A Sea Breeze Bibliography. Atmospheric Sciences Group, The

University of Texas at Austin. Report No. 37. Sip.

Statistical Data Analysis for Ocean and Atmospheric Sciences

Jean Thiebaux
Academic Press, 1994. 247pp.

by

Francis Zwier

This is a highly readable introduction to probability and statistics which covers the standard material that is taught in most half year introductory courses. To take full advantage of the book, students should have calculus and linear algebra as prerequisites. The book restricts itself primarily to classical parametric framework which is centered on the Gaussian distribution. In additions, there is a short chapter at the end of the book that discusses some of the Monte Carlo methods that have become popular in climate studies. However, contrary to the book's title, it is not primarily about oceanic and atmospheric data analysis but is rather an introduction to statistical theory and thinking. It does not discuss climate system data (observed or simulated) or the pattern and time series analysis methods which are popularly used in climate research to analyse data.

There are some interesting twists in this book that are not generally seen in standard texts. The most important of these is that the author attempts to avoid a lot of computational detail and focuses instead on the structure of statistical reasoning and on the subtle way in which statistics often enters into research in a subject matter discipline. While it puts forward a good effort in this regard important points are missed. For example, the book does not clearly distinguish between exploratory data analysis (in which a data set is studied using a broad statistical arsenal to formulate physical hypotheses) and confirmatory data analysis (in which formal statistical inference procedures are applied to an independent data set to confirm the theories developed by exploring the first data set) . It also does not teach students to be sufficiently critical of the robustness off the classical parametric methods it describes.

These methods are often sensitive to problems in the data or departures from their underlying assumptions. This is a serious shortcoming in a book that purports to discuss methods for ocean and atmospheric data analysis.

The author avoids computational detail by arguing that the mechanics can be left to modern statistical computing packages. Indeed, another of this book's twists is that it includes, at intervals, pedagogical examples with an atmospheric or ocean science twist that can be worked with a simple statistical package like MINITAB (Ryan, at xl., 1992) . It also includes a floppy disk (DOS format) containing the data sets that are employed in these examples and in the problems at the end of each chapter. While the examples are well executed, the inclusion of specific instructions pertaining to the use of MINITAR is on intrusion. It would have been better to leave the specific choice of statistical package to the student and his or her instructor.

A third "twist" is that the book includes formal proofs of many important statistical results. The proofs are always clear and are often elegantly executed with the characteristic function (the Fourier transform of a probability distribution or probability density function) . The point. which I think is well illustrated in the hook, is that the fundamental ideas of probability theory are not difficult and that the analytic methods that transform these simple ideas into useful models for the analysis of data are elegant. tractable and satisfying to contemplate and understand.

In summary, this is an interesting, if not perfect introduction to probability and statistics which is aimed primarily at the beginning student in atmospheric or oceanic science. It makes a laudable attempt to clearly explain the the concepts used in statistical reasoning and to illustrate the simplicity and elegance of some of the models used in statistical data analysis. Concepts are generally well illustrated with pedagogical examples that use real atmospheric and (some) oceanic data.

Stull Joins Geography Faculty at UBC

Roland B. Stull has joined the Geography faculty at the University of British Columbia, Vancouver, Canada, as professor in the Atmospheric Science Programme. He replaced Professor Gordon McBean, who left to direct the Atmospheric Environment Service in Canada.

Stull, who has a keen interest in atmospheric boundary layers and turbulence, moved to this new post in July 1995. There he joined seven other core faculty in the Atmospheric Science Programme: Tim Oke (urban micrometeorology), Douw Steyn (air pollution & boundary layers), Phil Austin (cloud physics & boundary layers), Ian McKendry (air pollution & mesoscale), Susan Allen (ocean dynamics), William Hsieh (coupled ocean-atmospheric models), and Lionel Pandolfo (global climate modeling). Closely associated with this programme are Andy Black (forest and agricultural meteorology), Ian Gartshore (wind engineering), Paul LeBlond (ocean waves), Mike Novak (surface & soil processes), and Steve Pond (ocean turbulence), yielding a strong and active interdisciplinary group.

Author of many papers and one software product, Stull is perhaps best known for his comprehensive graduate textbook "An Introduction to Boundary Layer Meteorology", (Kluwer Academic Publ.). In 1995 he wrote a new general-meteorology textbook for first and second-year undergraduates, entitled Meteorology Today for Scientists and Engineers (West Publ. Co.).

As member of the American Meteorological Society, Stull is associate editor of the Journal of Applied Meteorology, member of the Board of Meteorological and Oceanographic Education in Universities (BMOEU), chairman of the committee on Boundary Layers and Turbulence, and a Glossary of Meteorology editor for Boundary Layers and Atmospheric Interactions. He serves as member of the US Weather Research Program (USWRP) Science Advisory Panel, is a member of IUGG/IAMAP Commission on Dynamic Meteorology (ICDM) Working Group A on Boundary Layer Dynamics and Air-Sea Interaction, and is associate editor of the Romanian Journal of Meteorology. In the recent past he has served on the Advisory Panels for COMET and the Lake Michigan Air Directors Consortium, and has consulted for the US Army, US Air Force, Battelle, ENSR Consulting and Engineering, and SAI Corp.

Stull is a Certified Consulting Meteorologist (CCM) and a Certified Flight Instructor (CFII) in the USA. He is also a member of the Royal Meteorological Society, the European Geophysical Society, and the Canadian Meteorological and Oceanographic Society. He has been a visiting scientist at the Royal Netherlands Meteorological Institute (KNMI) in 1986, at the German Aerospace Research Establishment (DLR) near Munich in 1988, and the IBM Environment Sciences and Solutions Centre in Bergen, Norway, in 1992.

After a B.S. degree in Chemical Engineering in 1971 and a Ph.D. in Atmospheric Sciences in 1975 from the University of Washington, Stull served four years as a weather officer in the US Air Force. For the past 16 years he has been a professor in the Department of Atmospheric and Oceanic Sciences at the University of Wisconsin-Madison. His current research interests include nonlocal turbulence theories, cloud-topped mixed layers, mesoscale weather forecasting, pollutant dispersion, surface-flux parameterizations, boundary-layer parameterization, and aviation meteorology.

Tribute to Ed J. Truhlar

Ed Truhlar has retired as Director of CMOS Publications and Technical Editor of ATMOSPHERE-OCEAN after many years of dedicated service to the Society. Ed has a natural talent for turning a rough manuscript into beautiful English. His knowledge of the fine points of English grammar, sentence structure and spelling, is vast, and he can spot a typo faster than anybody else that I know. More importantly, his long experience in the meteorological publication scene in Canada made him an important human resource for the Society.

Ed was Editor-in-Chief of ATMOSPHERE for four years in its early days and later became Technical Editor of ATMOSPHERE-OCEAN. He was also Technical Editor of CHINOOK from 1985 until that publication was discontinued. He was Editor of the CMOS Annual Review and of the Congress Program and Abstracts for several years, and he chaired meetings of the Publications Committee at the Annual Congresses of the Society. Ed retired from the Atmospheric Environment Service in 1991, but he continued to come to Downsview three days a week on behalf of CMOS.

I first knew Ed in the early 1960s when he was in the Atmospheric Radiation Section of the AES Research and Training Division. Later, he helped me as a member of the Editorial Board of BOUNDARY-LAYER METEOROLOGY, often keeping the "editorial office" running for periods as long as a month while I was away. In 1975, Ed carried out a special four-month assignment in Geneva for the WMO, clearing up a backlog of WMO Technical Notes awaiting final editing.

In conclusion, I quote from a letter to the Society dated May 9, 1989 from Dave Phillips regarding the Proceedings (a 483-page tome) of the Toronto Conference on the Changing Atmosphere:

> *In my view there is one person who deserves the most redit for the quality of these Proceedings - Ed Truhlar. Mr. Truhlar edited the papers, researched references, and contributed his ideas on the design and contents of the volume. There is nothing surprising here. Over the years I've come to expect this high quality effort from Ed. The work is usually done on time and with no complaining; and one is usually rewarded with a clever witticism or pun to go along with the edited copy.*

Well done, Ed Truhlar!

Ted Munn, Toronto

Recent Elections to The Academy Of Science Of The RSC

Lawrence A. Mysak, FRSC,
President, Academy of Science

It is a great pleasure to inform you that two members of CMOS were elected this spring by the Academy of Science as Fellows of the Royal Society of Canada. Professor Anthony J. Bowen, from the Department of Oceanography, Dalhousie University, Halifax, N.S., and Dr. Richard E. Thomson, from the Institute of Ocean Sciences, Sidney, B.C. will be inducted into the Society at Rideau Hall on November 24, 1995 in the presence of the Governor General The Honourable Romeo LeBlanc. Also elected this spring as Foreign Fellow was Dr. Syukuro Manabe, from the Geophysical Fluid Dynamics Laboratory, NOAA, Princeton, N.J. The citations for these New Fellows is given at the end of this note.

The Royal Society of Canada is a national academy whose objective is the promotion of learning and research in the arts and sciences. It recognizes distinguished accomplishments and provides timely information and advice to governments and the public. As an organization of eminent scholars and scientists, it forges vigorous partnerships to seek solutions to urgent and complex challenges of the day. The Society is comprised of three Academies: Académie des lettres et des sciences humaines; the Academy of Humanities and Social Sciences; and the Academy of Science/Académie des sciences, which have approximately 200, 400 and 850 Fellows respectively. Election to the Society is an honour and a recognition of professional excellence. Each of the approximately 1450 Fellows of the Society has been elected to one of the academies on the basis of distinguished contributions to scholarship, as recognized by their peers within each of the academies. Election to the Royal Society of Canada involves personal commitment to its objectives. The Society represents a unique network of expertise within Canada and Fellows volunteer their expert advice.

Besides Drs. Bowen and Thomson, there were four other new Fellows elected to the Academy of Science's Division of Earth, Ocean and Atmospheric Sciences:

- Prof. Paul J. Harrison Dept. of Oceanography, UBC
- Prof. Andrew D. Miall Dept. of Geology, U of Toronto
- Prof. Gordon Rostoker Dept. of Physics, U of Alberta
- Prof. W.A.S. Sarjeant Dept. of Geol. Sc., U of Saskat.

Citations for Drs. Bowen, Thomson and Manabe

A.J. Bowen:

Anthony J. Bowen is a world leader in quantitative studies of nearshore hydrodynamics and sediment transport. In particular, his comprehensive theoretical, laboratory and field studies have demonstrated the key role of edge waves in generating previously unexplained features such as rip currents, beach cusps and even the basic shape of beaches. His work is of great scientific interest, but also leads to improved answers to many coastal management problems.

R.E. Thomson

Richard E. Thomson is a leading Canadian physical oceanographer, who is internationally renowned for his incisive studies of coastal and deep-sea currents, his energetic planning of sea-going expeditions, and his skill at interdisciplinary endeavours. He is also a successful popular expositor of oceanographic knowledge and the author of the best-selling book Oceanography of the B.C. Coast.

S. Manabe

Syukuro Manabe is without peer among scientists seeking to understand the global climate system through the application of detailed physical-mathematical models solved numerically. A pioneer in the development of atmosphere-ocean general circulation models and their application in the analysis of the climate perturbations to be expected from increasing concentrations of "greenhouse" gases, in the analysis of the interplay between dynamics and chemistry that controls the distribution of stratospheric ozone, and in understanding the role of the oceans in determining climate stability, he continues to lead scientific advances. His personal research has provided a primary intellectual underpinning for the increasing concern of all human society for the future of its natural environment.

Weather Research House Students Win Provincial and National Awards

Elise Fear and Janeen Tang, two University of Waterloo students in Systems Design Engineering, recently won first prize in the Corporate Design Category at the Ontario Engineering Competition, and then won the National Award for Technical Excellence at the Canadian Engineering Competition at the University of Alberta. Both awards were based on their work on the development of the *Quicklimate II* software program which they carried out as Co-op students with Weather Research House. Their demonstration of highly innovative data base handling techniques resulted in a series of break-throughs that now make a general analysis of the AES hourly archive feasible in real-time.

The students began with a series of very demanding specifications that were previously developed following a series of interviews with forecasters in Canadian weather offices. Then, under the direction of Dr. Ambury Stuart, they proceeded to develop the "data base engine" which will form the heart of the new software. Their success in this project went well beyond our wildest expectations, and resulted in a truly unique accomplishment that was recognized in the Ontario and Canadian awards.

Weather Research House is grateful to the National Science and Engineering Research Council who supported the students with Undergraduate Industrial Fellowships, to the Department of National Defense and Mr. Lou Ranahan for their support in developing the original specifications for the software, and to the University of Waterloo for their continuing cooperation and support of this project.

News from the Canadian National Committee (CNC)

by Louis Hobson

The annual meeting of the Canadian National Committee (CNC) for the Scientific Committee on Oceanic Research (SCOR) was held on 29 May, 1995, at Okanagan University College, Kelowna, B.C. in conjunction with the annual CMOS Congress. I (Lou Hobson, UVictoria, Chair, CNC-SCOR) here report some of the highlights of the meeting.

Annual reports describing progress in the Canadian portions of JGOFS, WOCE and GLOBEC were received from Kim Juniper (UQAM), Barry Ruddick (Dalhousie) and Dave Mackas (DFO, Sidney), respectively. The emphasis of phase II of JGOFS will be on modeling and data syntheses, as well as a major field program in the northeastern Pacific Ocean, presuming that funding is received from NSERC and DFO. Canadian participation in WOCE after mid-1996 will be concentrated on research in the north Atlantic Ocean with the ultimate goal of providing a model of the north Atlantic Ocean for use by the oceanographic community. Planning for the scientific agenda of the Canadian portion of GLOBEC is underway and will be initiated presuming funding is forthcoming from NSERC and DFO. Matters concerning other programs in which Canada is involved, including Land-Ocean Interaction in the Coastal Zone (LOICZ), the Global Ocean Observing System (GOOS), the Climate Variability and Predictability Research Program (CLIVAR) and the Global Ocean Euphotic Zone Study (GOEZS) were discussed.

Results of the 1994 SCOR general meeting, held in Victoria, B.C., were discussed. It was noted that Professors S. Krishnaswami (India) and W. Pinxian (P.R. China) were elected to positions as Vice Presidents of SCOR. A major contribution of SCOR to international oceanographic research is the sponsorship of working groups (W.G.). One proposal, "The impact of world fisheries harvest on the stability and biodiversity of marine ecosystems" authored by Tim Parsons (UBC), was introduced by CNC-SCOR and was adopted as W.G. #105, which will be chaired by Mike Sinclair (DFO, Dartmouth). The SCOR executive will meet in November, 1995, at Cape Town, South Africa, and two proposals, "Coupling winds, waves and currents in coastal models" and "Coupling ocean circulation and ecosystem development in models", will be considered. Our representative to this meeting is Alan Clarke (DFO, Dartmouth).

A Week in Qingdao.

by Paul H. LeBlond, Dept. Oceanography, UBC

This is where they brew the famous Tsingtao beer, a product which figures prominently in the local tourist industry. This is also where the North Pacific Marine Science Organization held its fourth annual meeting during the week of October 16-22, 1995. Yours truly was there as a member of the Canadian delegation.

The North Pacific Marine Science Organization is a treaty organization which brings together Canada, China, Japan, Korea, Russia and the USA in a forum dedicated to marine science in the North Pacific north of 30oN. Because the organization was inspired by the International Council for the Exploration of the Sea (ICES), with focus on the Pacific, it goes under the name of PICES. PICES annual meetings have been held so far in Victoria, Seattle, Nemuro (Japan) and Qingdao.

The promotion of international collaboration figures prominently on the PICES agenda. National delegates sit on four permanent committees (Physical Oceanography and Climate, Biological Oceanography, Marine Environmental Quality, and Fisheries Science) which organize symposia and working groups under the supervision of a Science Council. Recent working groups have focused on the Sea of Okhotsk, the Bering Sea, Numerical Models of the Subarctic Pacific Circulation, and Monitoring.

This year's Conference featured symposia on: Marine Carrying Capacity: Fact or Fiction?; Circulation in the Subarctic North Pacific and its Marginal Seas, and its Impact on Climate; Density Dependence in Population Dynamics; Sources Transport and Impact of Chemical Constituents; Foodweb Alternation in Coastal and Oceanic Ecosystems; and an interdiciplinary symposium on the Oceanography and Fisheries of the Bering Sea.

Qingdao is a booming city of many millions, built on a series of small hills near a protected harbour on the Yellow Sea, on the south side of the Shantung peninsula. The older part of town still carries architectural traces of its days as a German commercial port and navy base. New office towers and hotels are sprouting up everywhere and the traffic is already intense and hurried. Chimneys and cranes shimmer in the thick air of the heavy industrial zones growing on the periphery. People are very friendly and relaxed; the food is delicious and inexpensive. The most visible danger to one's health is crossing the street.

I visited the Institute of Oceanology of the Chinese Academy of Science, where the air-sea interaction laboratory, led by Prof. Dunxin Hu, carries active work on the Yellow Sea shelf. Their earlier work on the Mindanao Current is now interrupted because of lack of funding. Their ships have to be rented out to the oil industry to be kept afloat. At the Ocean University of Qingdao, where Prof. Fu Sun leads the Institute for Physical Oceanography and Environmental Science, I looked at an impressive wind-wave tank facility and toured the campus. There are 7,000 students at the Ocean University, majoring in a variety of subjects in and beyond ocean science. All students live in residence, within the walled campus. While enjoying the warm hospitality of Chinese colleagues, I also picked up expressions of frustration at the low level of funding available for fundamental science. Such complaints will seem a familiar refrain to Canadian academics. A greater difficulty, also alluded to in conversations, is the fact that scientific salaries have not kept up with everyone else's or with the cost of living. Nevertheless, there is great enthusiasm in every quarter, and the breakneck development visible everywhere is already penetrating and transforming Chinese scientific research. Next year's PICES meeting will be held on our side of the Pacific, in Nanaimo, B.C.

THANK YOU
Jean-Pierre Blanchet

As the New Year approaches changes will be taking place in the editorial rooms of the CMOS Bulletin SCMO; Jean-Pierre is stepping down and André Bolduc is stepping in. Jean-Pierre, the guy that cannot say "no" to more work has been under a great deal of pressure in putting out the Bulletin. He somehow managed to do it on weekends and many long hours of dedication after lectures and teaching at UQAM. His task was not a simple one in that we as members let him down by not providing all the material he could have used for publication.

Jean-Pierre has done much for us by his use of and insistence on electronic communication and publishing; it is our intent to carry on in this way and gain more experience in this new environment. On behalf of members of the Society, Council and this office, I would like to extend our thanks to Jean-Pierre for a job well done. Although he is stepping down as our editor of the Bulletin he can be assured that this is not good-bye. He will be involved in one way or another with our publication and communication program.

Thanks again, Jean-Pierre, for all your hard work and dedication to the Bulletin.

Neil J. Campbell
Executive Director

MERCI
Jean-Pierre Blanchet

A l'approche du Nouvel An, des changements auront lieu dans la salle de rédaction du CMOS Bulletin SCMO. Jean-Pierre laisse sa place à André Bolduc. Jean-Pierre, le gars qui ne sait pas dire «non» lorsqu'il s'agit de plus de travail a été sous une énorme pression dans l'échéancier du Bulletin. Il réussissait d'une manière ou d'une autre le compléter durant les fins de semaine et par de longues heures de dévouement après les cours qu'il enseigne à l'UQAM. Sa tâche n'a pas été simple puisque nous, les membres, ne lui avons pas fourni tout le matériel qu'il aurait pu utiliser dans la publication.

Jean-Pierre nous a beaucoup aidé en utilisant, et en insistant que soient utilisé, les communications et l'édition électronique. Il est de notre intention de poursuivre cette voie et d'acquérir plus d'expérience dans ce nouvel environnement. De la part des membres de la Société, du Conseil et de ce bureau, j'aimerais remercier Jean-Pierre pour son travail bien fait. Bien qu'il laisse sa place en tant que rédacteur du Bulletin, ce n'est pas un au revoir. Il sera impliqué d'une manière ou d'une autre dans notre publication et dans le programme de communication.

Je te remercie encore une fois, Jean-Pierre, pour tout le travail acharné et le dévouement au Bulletin.

Neil J. Campbell
Directeur exécutif

New CMOS Bulletin SCMO Editor

Mr. Paul-André Bolduc, our new Editor of the CMOS Bulletin SCMO, has already filled this position in 1983-1986 when he edited the CMOS Newsletter. During that time, electronic word processors were slowly phasing-out typewriters, but by today's standards, they looked like dinosaurs! E-mail was not yet dreamed of. André works presently for the Marine Environmental Data Service under the Department of Fisheries and Oceans where he is responsible for Policy, Planning and Special Projects.

André has been an active member of the Ottawa Chapter of the Society for many years. He has served as Secretary and Vice-Chairman on the Executive Committee of this chapter. Lately, he has been a member of the LAC for the CMOS Congress held in Ottawa in 1994. He was then responsible for the correspondence of the LAC and also for the publicity of the Congress.

André looks forward receiving many articles, CMOS news and other material from CMOS Bulletin SCMO readers, as in the past on diskette or by electronic mail. His E-mail address is bolduc@ottmed.meds.dfo.ca. His street address is:

Marine Environmental Data Service
Department of Fisheries and Oceans
1202, 200 Kent Street
Ottawa, Ontario K1A 0E6
Telephone: (613) 990-0231; Fax: (613) 993-4658

We wish him good luck in this new endeavour as editor of the CMOS Bulletin SCMO!

Neil Campbell, Executive Director

Nouveau rédacteur du CMOS Bulletin SCMO

M. Paul-André Bolduc, notre nouveau rédacteur en chef du CMOS Bulletin SCMO, a déjà rempli cette fonction durant les années 1983-86 lorsqu'il était éditeur du "Newsletter" de la SCMO. Durant cette période, les éditeurs de textes électroniques faisaient tranquillement leur entrée sur le marché du travail, remplaçant lentement les vieux dactylos! Comparés avec les logiciels que nous connaissons aujourd'hui, ils nous apparaissent maintenant comme des dinosaures! Le courrier électronique n'était alors qu'un rêve! André travaille présentement pour le Service des données sur le milieu marin du Ministère des Pêches et Océans où il est responsable de la politique, de la planification et des projets spéciaux.

André est un membre actif du Centre d'Ottawa de la Société depuis plusieurs années. Il a servi comme secrétaire et vice-président du comité exécutif local. Dernièrement il a participé à la préparation du Congrès de la SCMO tenu à Ottawa en 1994. Il était alors responsable du secrétariat et de la publicité. André désire recevoir des lecteurs du CMOS Bulletin SCMO plusieurs articles, des nouvelles de la SCMO ainsi que d'autres articles d'intérêt général sur disquette ou par courrier électronique. Son adresse électronique est bolduc@ottmed .meds.dfo.ca. Par courrier à l'adresse ci-haut.

Nous lui souhaitons la meilleure des chances dans ses nouvelles fonctions comme rédacteur en chef du CMOS Bulletin SCMO!

Neil Campbell.
Directeur exécutif.

The Manning Awards

Back in 1869,
it took a great deal of ingenuity
to get your picture in the paper.

Before 1869, it was literally impossible to get your picture in the paper no matter how famous, infamous, or accomplished you were. It was then that Canadian Georges-Edouard Desbarats (ironically, not shown here) invented the revolutionary halftone photographic printing process, still being used today.

It is this sort of ingenuity and innovation that the Manning Awards have been recognizing and honouring for over 14 years. Awards range from the $5,000 Innovation Award to the $100,000 Principal Award.

So regardless of how big or small your innovations are (the IMAX film system was invented by a Canadian, as was the zipper), we encourage you to submit them. And who knows, you may even get your picture in the paper.

To receive a nomination form or further information, please call, write or visit us on the internet.

The Manning Awards, 3900, 421 - 7 Avenue S.W., Calgary, Alberta T2P 4K9. Telephone: (403) 266-7571, Fax: (403) 266-8154. Internet: http://www.manningawards.ca

Nominations close February 15 of each year.

Postdoctoral Position at the University of Alberta

Are you looking for an exiting oppertunity to conduct research on severe convective storms and cloud/precipitation processes? The postdoctoral position at the Department of Earth and Atmospheric Sciences of the University of Alberta provides such a oppertunity under guidance of Dr. Gerhard Reuter. You will live in the city of Edmonton, known for its safety, cheap housing expenses, and zero provincial sales tax.

We seek candidates with a Ph.D. degree in the Atmospheric Sciences, preferable in one of the following fields: numerical storm modelling, mesoscale meteorology, radar meteorology, or cloud dynamics. Initial appointment will be for one year. Candidates should send a curriculum vitae, a statement of research interests, a list of publications, and arrange to have two letters of reference sent to Dr. Gerhard Reuter, Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, Alberta, T6G 2E3 or e-mail to: Gerhard.Reuter@UAlberta.CA. The starting date is negotiable.

Positions Available for Ph.D Studies in Atmospheric and Oceanic Sciences at McGill University

During the 1994/95 academic year, we are pleased to report that nine students completed the Ph.D. program in the Department of Atmospheric and Oceanic Sciences. Their theses covered a wide variety of topics including atmospheric, oceanic and climate dynamics, cloud physics, physical oceanography and remote sensing. As a consequence, there are now a number of positions open for highly qualified students with backgrounds in physics, applied mathematics, geophysics, engineering and computer science. Also, recent M.Sc. graduates in atmospheric science and ocean physics are welcome to apply for these positions. The fields of current research activity include atmospheric physics and chemistry, synoptic meteorology, dynamic meteorology, air-sea interaction, air-ice-sea interaction,coupled atmosphere-ocean modelling, paleoclimates, climate variability, ocean circulation and coastal oceanography.

Entering graduate students in need of financial support are provided with support that generally covers tuition and living costs. Also a number of teaching research assistantships are available. McGill also offers a limited number of merit and tuition waver scholarships for outstanding students without regard to nationality.

In addition to the facilities within the Department of Atmospheric and Oceanic Sciences, students can work in radar meteorology at the J. Stewart Marshall Observatory, interact with members in the Centre for Climate and Global Change Research, and also conduct research with staff at the Numerical Weather Prediction Centre in Dorval. There are also opportunities to work with marine scientists at L'Université Laval and the Department of Fisheries and Oceans.

For further information, please write to the Graduate Studies Co-ordinator, Department of Atmospheric and Oceanic Sciences, McGill University, 805 Sherbrooke Street West. Montreal, Quebec H3A 2K6, Canada, or send an e-mail to: gradinfo@zephyr.meteo.mcgill.ca.

Lawrence A. Mysak
Chair
Recruitment Committee
Department of Atmosphere and Oceanic Sciences

CMOS On Internet

Since our last Congress in Kelowna this year, and the successful use of Internet for the Congress Program, we have been busy designing and setting up a CMOS HOME PAGE.

We hope to be up and running by the New Year. Stay tuned to see what we can offer, it will be available for your use and hopefully will prove beneficial in bringing members of the Society together. The Royal Meteorological and American

Meteorological Societies are also newcomers to the WWW, so we are not far behind.

Once we are up - get in touch! You will be able to reach us at: http://192.139.141.69/CMOS

Neil Campbell
Peter Zwack
Langley Muir
Hank Jones

La SCMO sur Internet

Depuis notre dernier Congrès à Kelowna cette année, et l'utilisation fructueuse d'Internet pour le programme du Congrès, nous avons été très occupé à mettre sur pied une PAGE D'ACCUEIL SCMO.

Nous espérons être en opération au Nouvel An. Restez branché pour voir ce que nous pouvons offrir. Elle sera à votre disponibilité et espérons qu'elle réussira réunir les membres de la Société. La Royal Meteorological Society et la American Meteorological Society sont aussi des nouveaux arrivants au WWW, nous ne sommes donc pas très en retard.

Dès que nous serons là, contactez nous! Vous pourrez nous rejoindre au: http://192.139.141.69/CMOS

Neil Campbell
Peter Zwack
Langley Muir
Hank Jones

Book Announcement

CMOS is pleased to participate in the promotion of a new and hopefully successful book launch "Policy Making in an Era of Global Environmental Change"

Editors

R.E. Munn, Institute for Environmental Studies, The University of Toronto, Canada and J.W.M. la Rivière, International Institute for Infrastructural, Hydraulic & Environmental Engineering, Delft, The Netherlands.

Sponsors

The book is being sponsored by seven learned societies and fourteen major industries in the Netherlands, in cooperation with the International Council of Scientific Unions, Paris, France.

Purpose of the Book

The book contributes in a unique manner to the mutual understanding of global change science and policy-making by governments, business and industry. It gives an overview of the ongoing relevant research focusing on the two major international programs, the International Geosphere-Biosphere Program and the World Climate Research Programme. These are described in terms understandable to the interested lay reader. This is followed by an analysis of the response process that is in progress with respect to governments - singly and multilaterally - by business and industry and by public interest groups. This process is leading to interactive structures, assessment procedures and legislation, nationally and internationally. Business and industry are changing from mere watchfulness to recognition of new opportunities for products and processes.

Distribution in the U.S.A. Canada and Mexico
KLUWER ACADEMIC PUBLISHERS GROUP
Order Dept., P.O. Box 358
Accord Station, Hingham MA 02018-0358 U.S.A.
Fax (617) 871-6528 Tel. (617) 871-6600
e-mail:kluwer@wkap.com

ATMOSPHERE-OCEAN
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ACCREDITED CONSULTANTS / EXPERTS CONSEIL ACCRÉEDITÉS

Entries on the following pages are restricted to CMOS Accredited Consultants. The accreditation process started in December, 1986. A complete list of CMOS accredited consultants can be obtained from the CMOS Business Office.

Individuals interested in applying for accreditation may contact the CMOS Business Office at the Society's Ottawa address for a copy of the guidelines and an application form.

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

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

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

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

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

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

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

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

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

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

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

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

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

   (iii) trois années d'expérience de travail en météorologie ou en océanographie.

(3) Une fois les exigences d'éducation et formation complétées, l'applicant doit avoir au moins deux années de travail, avec performance satisfaisante, dans un champ de spécialisation mentionné dans ce document. Une certaine expérience d'expert-conseil est nécessaire.

ACCREDITED CONSULTANTS
EXPERTS-CONSEILS ACCRÉDITÉS

1994 MEMBERSHIP APPLICATION FORM-DEMANDE D'ADHESION 1994

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

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

Name/Nom _____

Address/Adresse _____

_____

_____

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

Occupation/Emploi _____

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

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

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

Regular Régulier	☐	$45.00/45,00$
Student Étudiant	☐	$20.00/20,00$
Retired Retraité	☐	$30.00/30,00$
Sustaining De soutien	☐	$170.00/170,00$ (minimum)
Corporate Moral	☐	$225.00/225,00$ (minimum)

PUBLICATION SUBSCRIPTIONS - ABONNEMENT AUX PERIODIQUES

ANNUAL RATES - FRAIS D'ABONNEMENT ANNUEL

		Members Membres	Non-members Non-membres	Institutions Institutions
ATMOSPHERE-OCEAN ATMOSPHERE-OCEAN	☐	$30.00 30,00$	$40.00 40,00$	$85.00 85,00$
CMOS Bulletin Bulletin SCMO	☐	$0.00 0,00$	$45.00 45.00$	$45.00 45,00$
Annual Congress Program and Abstracts Programme et résumés du congrès annuel	☐	$0.00 0,00$	$20.00 20,00$	$25.00 25,00$

NOTE: Students receive Atmosphere-Ocean free in their annual fee. All regular Society publications are sent to Corporate and Sustaining Members. Members resident in Canada please add 7% GST to annual rates

NOTE: Les membres étudiants reçoivent Atmosphère-Ocean gratuitement de la SCMO. Tous les périodiques réguliers de la Société sont envoyés aux membres moraux et de soutiens. Les membres résidant au Canada, veuillez SVP ajouter 7% (TPS) aux frais d'abonnement annuel.

PRIMARY FIELD OF INTEREST - SPHERE D'INTERET PRINCIPALE

Meteorology / Météorologie ☐ Oceanography / Océanographie ☐

SPECIAL INTEREST GROUP - GROUPE D'INTERET SPECIAL

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

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

See over/voir au verso

CMOS-SCMO
Suite 903, 151 Slater Street
Ottawa, Ontario
K1P 5H3

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

☐ The Society's Development Fund

☐ Other (specify) _____

_____ _____
(Signature) (Date)

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

_____ _____
(Signature) (Date)

Mail completed form to CMOS at the address above.

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

☐ Le fonds de développement de la Société

☐ Autre (spécifiez) _____

_____ _____
(Signature) (Date)

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

_____ _____
(Signature) (Date)

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