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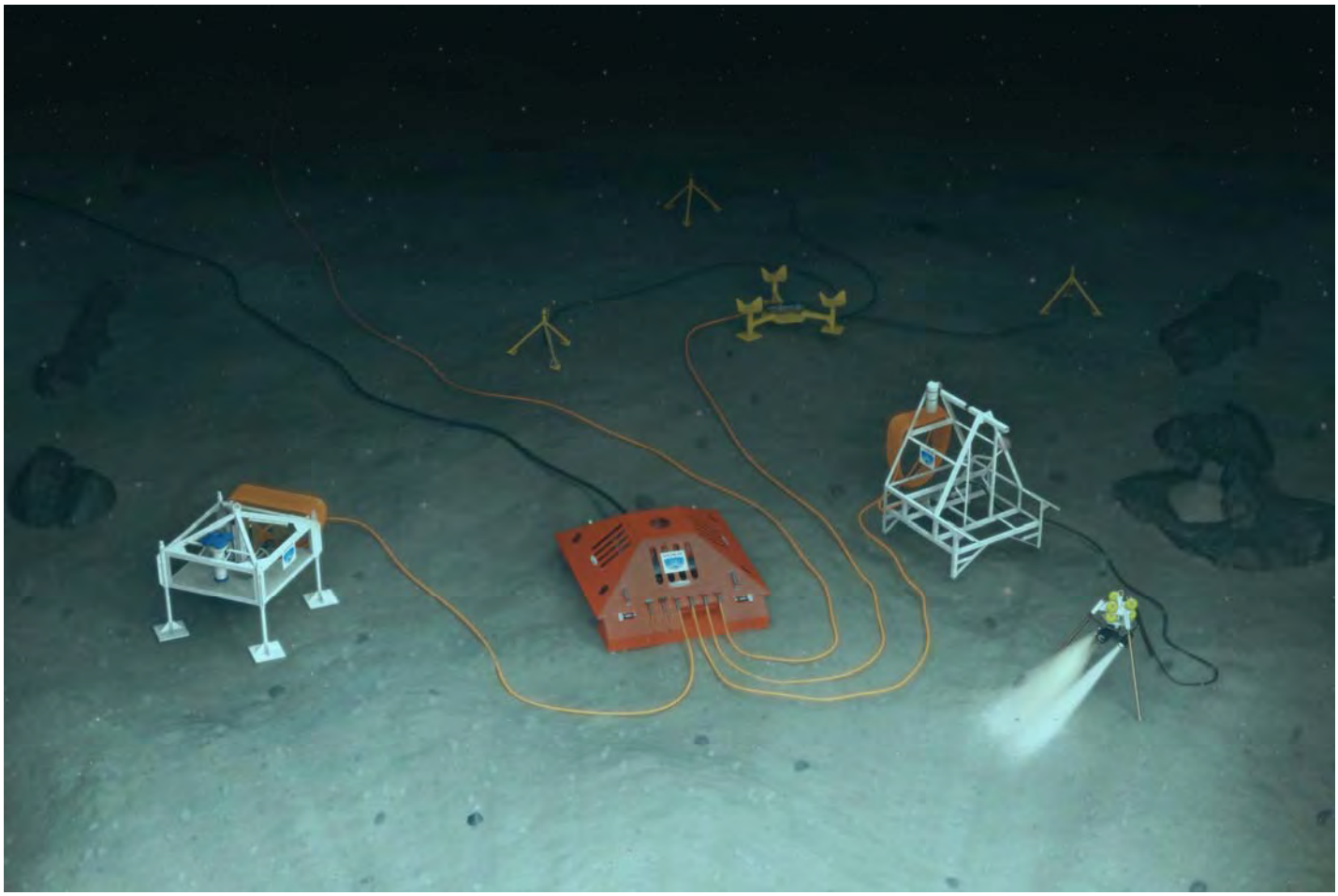

THE VENUS OCEAN OBSERVATORY
OBSERVATOIRE OCÉANIQUE VENUS

CMOS Bulletin SCMO
"at the service of its members / au service de ses membres"

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Cover page : "The VENUS Cabled Ocean Observatory". Shown on the cover is a rendition of what the VENUS cabled ocean observatory looks like on the ocean floor. Each research location has a permanent observatory Node (centre) connected to the backbone fibre optic power cable. Connected to each Node are instrument platforms and specialized marine science systems. The VENUS Instrument Platform (VIP, on the left) hosts a suite of standard oceanographic instruments such as CTDs, dissolved gas sensors, ADCPs, and an inverted echo-sounder. Also shown are the pan & tilt digital stills camera system (foreground right) and the broadband hydrophone array (background right). To learn more about VENUS, please read the article on **page 77**.

Page couverture : L'observatoire océanique câblé VENUS. On voit sur la couverture une image montrant à quoi ressemble l'observatoire déployé au fond de l'océan. Chaque poste de recherche a un noeud permanent d'observation (centre) connecté au câble optique de puissance principal. Les plate-formes d'instruments et les systèmes de science marine spécialisés sont connectés à chaque noeud. La plate-forme d'instruments VENUS (VIP, à la gauche) héberge une suite d'instruments océanographiques standards, tels que CTD, senseur d'oxygène dissout, ADCP et sondeur échographique inversé. On voit aussi le système de caméra fixe digitale panoramique verticale (avant-plan droit) ainsi que le réseau d'hydrophones à bande large (arrière-plan droit). Pour en apprendre plus au sujet de VENUS, tournez à la **page 77**.

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Canadian Meteorological and Oceanographic Society (CMOS)

Société canadienne de météorologie et d'océanographie (SCMO)

Executive / Exécutif

....from the Presidents' Desk

Andy Bush
Outgoing CMOS President / Président sortant de la SCMO

Friends and colleagues:

The past few months have seen some exciting times for us. In conjunction with the Canadian Geophysical Union (CGU) we wish to invite the Canadian Society of Soil Science (CSSS) under the umbrella of the Canadian Societies for Geophysical Sciences. The CGU and CSSS regularly have joint meetings, and I know that many CMOS members have an active interest in the CSSS. So this seems like a natural fit that CMOS has already approved and the CGU will almost certainly approve (since it was their idea) at their next executive meeting in May. Building up the number of societies and unions under the CSGS umbrella will give each one greater national exposure and will focus Canadian geophysical research into a spearhead body that can, for example, lobby with the federal government in a coordinated fashion.

After a positive meeting with Environment Minister Jim Prentice late last year, Gordon McBean and Dawn Conway were encouraged to submit a proposal for $50 million to the federal government for funding to keep CFCAS afloat. That proposal has now been sent and is in the government's hands. Given that the Minister encouraged the submission we at least have some hope that the Foundation will survive beyond March 2011.

As this report is a joint one between myself and Bill Crawford, I won't take up all Bill's space so will end things here. Over the last year I've certainly learned a lot about how things work and know that CMOS's success is due to the hardworking group of volunteers in Ottawa, as well as everybody across the country who has taken their time to serve on the Executive and the Council. The organizers of all of our annual congresses also deserve a special nod for their years of planning and execution of a very difficult task.

It's been an honour and a privilege to be President of CMOS and to have worked with all of you. I'll leave you now in the very capable hands of our incoming President, Bill Crawford.

Andy Bush, *Outgoing President / Président sortant*

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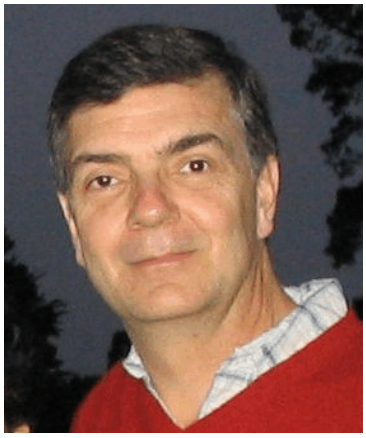
CMOS exists for the advancement of meteorology and oceanography in Canada.

Le but de la SCMO est de stimuler l'intérêt pour la météorologie et l'océanographie au Canada.

....from the Presidents' Desk (Continued)



Bill Crawford
Incoming CMOS President
Nouveau président de la SCMO

My first wish in this message is to acknowledge the achievements and efforts of Andy Bush who led CMOS as president for the past year. The president always handles new and unforeseen issues, and I have watched (actually I listened during our conference calls) as Andy has stayed ahead of all topics and guided our Society. It takes lots of time and wisdom. I will need his insight in the next year.

Three other national executive have completed their three-year terms and have passed on their duties to new executives. Ron Hopkinson is our outgoing treasurer, Bob Kochtubajda the corresponding secretary and Bill Hume the recording secretary. Although the president gets the recognition, these three really keep the Society running and I thank them for their mostly unsung efforts. We welcome Richard Pawlowicz, Jane Eert and Sophia Johannessen into these positions for the next three years.

A transition is a good time to remind members of others who run our Society. We rely on several key persons for our operations. Three are retired oceanographers and meteorologists who now fill CMOS positions for small honoraria. Our Executive Director is Ian Rutherford, who manages more than just day-to-day operations. He provides the corporate memory and advice and even updates the computer code of our software that handles our memberships and conferences. Ian served as President of CMOS in 1999, so his advice is especially valuable. Richard Asselin is Director of Publications and recently managed the transition of ATMOSPHERE-OCEAN to a new printing company and printing technique. Paul-André Bolduc oversees the Bulletin, including translations and publishing. His main concern is high-quality contributions, for which he is constantly soliciting. Our office manager is Qing Liao, who handles our membership applications, renewals, address changes, subscription enquiries and keeps our office running smoothly.

As noted always in the Bulletin, CMOS exists for **"the advancement of meteorology and oceanography in Canada**". Our biggest activity is the Annual Congress which normally attracts 400 to 500 attendees, a project usually run by one of our members. This year we thank John Parker for success of the Halifax Congress in June. Next year we will meet in Ottawa for a joint congress with the Canadian Geophysical Society (CGU). Congress committees are already working on this event. The Local Arrangements Committee is led by John Falkingham while the Scientific Program Committee is co-chaired by Dick Stoddart and Rod Blais.

Of course, members of CMOS provide the greatest efforts to advance meteorology and oceanography in Canada. I hope to serve you well in the next year.

Bill Crawford
Incoming CMOS President
Nouveau président de la SCMO

Highlights of Recent CMOS Meetings

- Council approved the inclusion of the Canadian Society of Soil Science (CSSS) into our umbrella organization, the Canadian Society for Geophysical Sciences (CSGS), pending approval by the Canadian Geophysical Union executive in May.
- The Memorandum of Understanding between CMOS and CGU for our joint congress in Ottawa, 2010, was approved by the CMOS executive.
- CMOS will contribute $500 to support the Northern Research Basins conference.
- Plans are already progressing well for our congress in Victoria, 2011.
- The executive slate for the upcoming year has been set, with a number of replacements coming in.
- The CNC-SCOR speaker for western Canada is now making his rounds.

Andy Bush, Outgoing CMOS President
Président sortant de la SCMO

Next Issue *CMOS Bulletin SCMO*

Next issue of the *CMOS Bulletin SCMO* will be published in **August 2009.** Please send your articles, notes, workshop reports or news items before **July 10, 2009** to the address given on page ii. We have an URGENT need for your written contributions.

Prochain numéro du *CMOS Bulletin SCMO*

Le prochain numéro du *CMOS Bulletin SCMO* paraîtra en **août 2009.** Prière de nous faire parvenir avant le **10 juillet 2009** vos articles, notes, rapports d'atelier ou nouvelles à l'adresse indiquée à la page ii. Nous avons un besoin URGENT de vos contributions écrites.

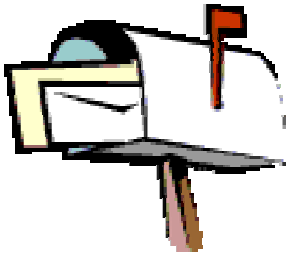
Correspondence / Correspondance

Date: Thursday, May 7, 2009

To: Canadians interested in Argo

From: Howard Freeland

Subject: Pressure measured by Argo floats



There has been some growing concern over the past few months that a new error mode has been discovered that affects Argo floats. A message has been circulated by Norge Larson (on 6th May) summarising the issue, and this message is appended below.

In summary, all Argo floats, irrespective of manufacturer carry SeaBird CTDs. The CTDs can vary slightly but all of them measure pressure using a pressure sensor made by a company called "Druck". There have been some serious problems with this sensor in the past and it appears that this sensor is the source of a new problem. The issue concerns a faulty glass-to-metal bond that can leak very slowly. The so-called microleak can cause a negative pressure offset that some floats will correct and some will not. APEX floats comprise 60% of the Argo fleet, and most of those (at a guess I'd imagine 80%) use the apf8 controller board which corrects positive offsets, but not negative offsets.

As the offset develops, a faulty float can be identified and when the offset becomes sufficiently large the float suffers a catastrophic failure, and we cease to hear from the float; this occurs after a substantial amount of time and likely more than 20 profiles. Data from PROVOR and SOLO floats will be correct even if the pressure sensor is suffering from the microleak. Data from APEX floats using the apf8 controller board will be incorrect if the float carries a Druck pressure sensor that is exhibiting the microleak problem.

It is extremely unsure what fraction of floats exhibit the microleak problem. At least 10% and possibly as high as 30% of the Druck pressure sensors will exhibit this fault. If the microleak is occurring then catastrophic failure will eventually occur. If a float is currently supplying its Nth profile and N>50 then almost certainly it is not suffering from the microleak problem.

The manufacturers are exploring options to correct floats and at the moment they recommend a moratorium on float deployments. They expect to have recommendations for repairing floats within 90 days.

The Canadian float deployers are re-assessing the need to deploy individual floats and trying to balance the value of ship time against the failure statistics. We are making different assessments on the east and west coasts as the availability of ship time is very different. I should add that evidence from the University of Washington suggests that microleaks are not a new problem. They have always occurred but at a level that was quite tolerable until some time in 2007.

Howard Freeland,
Ross Hendry,
Denis Gilbert,
and
Igor Yashayaev

Dear Argo colleagues,

We have been working to understand the details of a problem with the Druck pressure sensors used in SBE-41 and SBE-41CP CTDs on Argo floats.

The problem is called "Druck microleaks" because, in 3 cases over the last two years where sensors were recovered, it was determined that oil was leaking out of a sealed inner sensor chamber through microcracks in glass-to-metal seals at the back of the sensor. The oil leak rate is very slow, just a few microlitres per month. As oil leaks, a flexible titanium diaphragm, that transmits ocean pressure to the oil chamber, deflects into the sensor chamber to make up for the oil loss, and as a consequence, the sensor develops a progressive negative offset in measured pressure. This becomes evident in Argo data as a negative surface pressure. With enough oil loss, the diaphragm deflects inward far enough to contact and short out the pressure sensing element. There is evidence that the diaphragm bottoms out and does not result in a further leak of oil or ocean water through the sensor.

In early March 2009 an expanded analysis of Argo surface pressures, done by Dana Swift of University of Washington, revealed an increase in the occurrence rate of floats exhibiting negative surface pressure offsets from units deployed in 2007 and later. The jump in occurrence rate is alarming; from low 3% of floats pre-2007 to about 12% of the floats analyzed from the 2007 deployment. Now, more than 500 floats have been analyzed. The best recent statistics are that floats deployed in 2008 are showing an even higher occurrence rate, exceeding 10% and perhaps approaching 30%.

It can take up to 500 days after deployment for the negative surface pressures from sensors with microleaks to exceed the normal variation in healthy sensors. So reliable statistics for floats deployed in 2008 and early 2009 take some time to establish.

Regardless of exact statistics, the pressure problem and its consequences are severe. All non-deployed CTDs need to be tested and bad pressure sensors replaced.

We have stopped shipping Argo CTDs from Sea-Bird until we have a method to identify good reliable pressure sensors.

We strongly recommend that float manufacturers stop shipping floats to customers, and return CTDs to Sea-Bird for evaluation and repair.

We strongly recommend that the Argo community stop deploying floats, and consult with the float manufacturers about the logistics for getting CTDs returned and repaired.

The urgency to stop deploying CTDs (floats) and get them repaired is high. However, the urgency to get CTDs returned to Sea-Bird is not as high for two reasons:

a) We do not yet have a reliable method to identify the good pressure sensors from Druck to use as replacements. Verifying a reliable screening method and establishing a stock of good sensors may take a month or more.

b) Among the screening methods we are testing, there is a possibility that a method could be found that float groups could apply at their location. If this were the case, it could be more time-efficient and quickly identify the 70%?? of floats with good pressure sensors that would then be immediately available to deploy.

We are working on 3 solutions:

1) Create a test procedure in the laboratory that can accelerate the microleak failure and consequently separate Druck sensors into the two distinct categories observed in Argo float data: the bad sensors (microleakers) and the good sensors that don't drift at all for 5+ years. Despite very focused effort at Druck Ltd, in the UK and at Sea-Bird we have not been able to develop a reliable test yet. We are working on several test methods, and one test that could potentially be done by Argo scientists at their own facility, saving time and allowing good sensors to be identified and those floats available to be deployed without further delay or a return to the US.

2) We have a stock of about 100 pressure transducers from Paine that could be used for programs that must deploy floats soon. The Sea-Bird SBE-41 and 41CP CTDs were equipped with Paine pressure sensors until early 2000. The Paine sensors exhibit a positive drift with time but less than +10 dbars over the life of a float. Paine sensors that drift typically exhibit a span change as well (slope in pressure calibration) that has a magnitude of about 10% of the offset drift.

3) Finally, we have been working with a Swiss company, Kistler, to develop an alternative to the Druck sensor. Five years of development have produced a very promising sensor. That sensor is in the final stages of testing at Sea-Bird, but has passed all the design criteria in testing at the Kistler facility and the first production batch of 100 sensors suitable for Argo floats is in the pipeline. First production sensors should be available within 90 days.

A report with more details of the microleak problem, field units, lab testing, etc is being prepared. We are also developing the details of the warranty relief that Sea-Bird will offer for this situation. The Argo community can expect these two reports very soon.

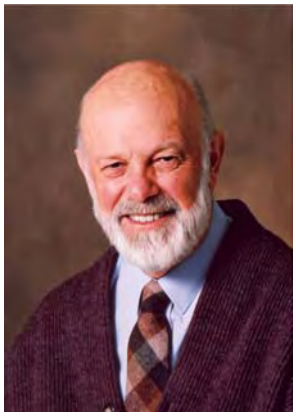
While we are still in the initial phases of understanding the problem and the potential remedies, we welcome your questions and will do our best to answer them completely.

Norge Larson
President
Sea-Bird Electronics, Inc

Timothy R. Oke, O.C.

Vancouver, British Columbia

Officer of the Order of Canada


Dr. Timohty Oke

Timothy Oke is an internationally recognized expert on urban microclimates. Professor emeritus in the Department of Geography at the University of British Columbia, he has studied how urban development affects weather patterns. He has developed scientific techniques to measure localized changes in atmospheric conditions and has contributed to meteorological organizations nationally and internationally. He is the author of the seminal book Boundary Layer Climates and the founder of the International Association of Urban Climate. Over the years, he has been a role model for several generations of young geographers and a respected mentor.

His investiture as an Officer of the Order of Canada took place on May 15, 2009 in the presence of the Governor General of Canada, Michaëlle Jean.

Dr. Oke is a a Fellow of the Royal Society of Canada. He is a Fellow of CMOS, and Accredited Consultant Meteorologist, past editor-in-chief of ATMOSPHERE-OCEAN, a winner of the CMOS President's Prize and both the Patterson and Massey Medals.

Congratulations to Dr. Oke from the CMOS community.

MediCLim™ - The Birth of a New Weather-Driven Health Index for Individuals

by Denis A. Bourque[1] and John L. Bart[2]

Abstract: On 5 January 2009, a new Internet-based health index and service was launched with the release of a notice to the Press (MediClim, 2009). By merging weather-health science with Web site and e-mail technologies, MediClim.com can deliver to subscribers 24-hour advance notice of the potential aggravation of five ailments. The science supporting MediClim™ is founded on years of published research, but MediClim.com has taken this knowledge one step further to provide weather-sensitive individuals with a new tool to better manage their ailments on those difficult days when their ailments could be incapacitating. We describe here how MediClim.com came to be.

Résumé: Le 5 janvier 2009, un nouvel index et service basés sur Internet ont été lancés par un communiqué de presse (MediClim, 2009). En fusionnant les sciences météorologique et de la santé avec les technologies du site Internet et du courriel, MediClim.com peut envoyer aux abonnés un avis sur l'aggravation possible de cinq affections 24 heures à l'avance. La science soutenant MediClim™ est fondée sur des années de recherches publiées, mais MediClim.com a amené ces connaissances un peu plus loin pour fournir aux individus sensibles à la température un nouvel outil afin de mieux gérer leurs maux durant ces journées difficiles lorsque leurs affections pourraient être incapacitantes. Nous décrivons ici comment s'est développé MediClim.com.

Introduction

Human biometeorology is "the study of the influence of weather and climate both on healthy man and on diseased subjects" (Tromp, 1980). Biometeorologists classify human biometeorology into three categories:

> i) *Physiological biometeorology* – the study of the influence of the weather and climate on the physiological processes in healthy subjects;
>
> ii) *Sociological biometeorology* - the study of the social significance of both favourable and unfavourable meteorological conditions on the health, behaviour and cultural activities of population groups; and
>
> iii) *Pathological biometeorology* - the study of the influence of the weather and climate on various physiological and pathological phenomena associated with the human diseases (Tromp, 1980).

Biometeorology is an ancient science, dating back to Hippocrates. However, most of today's knowledge comes from the past 80 years. Major works by Petersen (1938), Huntington (1945), Burton and Edholm (1955), Tromp (1963), Licht (1964), Tromp and Bouma (1974, 1977) and Sargent (1982) attest to the large and varied body of research in the field. It is estimated that Tromp's reviews contain more than 10,000 references.

These works provide clear evidence that weather affects health. One can find relationships between the atmosphere and most human systems including the neurological, endocrine, circulatory, cardiological, respiratory, digestive, and musculo-skeletal systems. But the age-old quest to forecast health conditions remained elusive.

German work – A Predictive Scheme is Developed

One German researcher, however, was optimistic. The late Dr. H. Brezowsky devoted much of his career to this quest (Weihe, 1969). In 1965, he published a peer-reviewed paper describing essential features of the biotropy of weather and showing how to use the "Bad Toelz" method to link changes in the weather with biological responses (Brezowsky, 1965). In the paper, he presents examples of the effect of weather on blood pressure, pulse rate, pain threshold, body temperature and reaction time in humans. This was not work he had done in isolation. Two years earlier, he had assembled a compilation of 16 years' worth of weather-health research that had been conducted by the German national weather service between 1946 and 1962, listing 359 entries (Weihe and Brezowsky, 1963).

Brezowsky's approach related areas on a weather map, such as the leading edge of a warm front or the middle of a warm sector, to health conditions. His technique was not based on single parameters, such as temperature or barometric pressure, but implicitly integrated meteorological conditions. The technique was innovative and useful. The difficulty was the amount of labour required.

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Toronto, Ontario, Canada

[2] General Practitioner in Family Practice, Toronto
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Toronto, Ontario, Canada

However, in 1985, Dr. K. Bücher also with the German national weather service, developed an algorithm which could compute the various meteorotropic areas of a weather map, thereby relieving the labour-intensive task. This provided an opportunity for the German national weather service to pilot a weather-health forecast system. The result of that effort, conducted in cooperation with the General Medical Council of the state of Hessen and an advisory team of medical doctors, was positive. The evaluation showed that non-acceptance by the medical profession was low, specifically 14%. In fact, 78% of the physicians involved in the pilot supported the introduction of this service. In addition, more than 85% of the patients who used the service during the pilot stated that it was at least partially helpful (Jendritsky, 1987). We first became aware of this work in 1988, several years after we had begun our active investigation of this topic. Since then, the Germans have continued with their predictive work. As described later, we have modelled our MediClim™ index on the German work.

North America – Our Endeavours to Educate

The German work was not replicated in North America, despite the fact that most of the major works cited earlier were from the U.S.A. When we started investigating this topic in the early 1980s, we encountered a lot of scepticism in the North American health community. The suggestion that weather could affect health was relegated to the realm of "old wives' tales" and folklore. We were usually, at best, politely dismissed whenever we suggested that health research and health practitioners should incorporate weather information in patient diagnosis and treatment.

Undaunted, and following the success of the German pilot forecast system, we became convinced that more should be done in North America. In 1992, we founded the Canadian Medical Meteorology Network to promote a better understanding in the Canadian health community of the relationship between weather and personal health and weather and the delivery of health services. Our principal instrument was a quarterly newsletter. Over the next few years, our subscriber list grew to the point where mailing costs alone became burdensome. It was at this time that the Internet entered the scene and we made the transition to the electronic world.

Our education efforts met with some success. As we continued to scour the peer-reviewed journals for articles on weather and health and to inform the community of their existence, we found that the scepticism encountered in our early years was softening. A greater number of persons were now willing to consider the possibility that weather could influence health, albeit with some reservation.

In 1995, faced with the need for a practical example, we decided to develop our own Index. Our intent was to develop a software package which used actual meteorological conditions to illustrate the principles we were promoting. Poring over the German literature, we opted to model our index on the German experience (Jendritzky and Bucher, 1993). By 1996, MediClim™ was born and a 14-day case study was created.

The Last Decade – Progress in Research

During these same years, we continued our literature research and advocacy, encouraged by the acceptance of Bart and Bourque (1995) by the Journal of the Canadian Medical Association and the appearance of more and more research in peer-reviewed medical literature such as the following:

- Donaldson and Keating (1997) reported on an increase in ischemic heart disease and respiratory mortality within days of cold weather spells.
- Danet et al. (1999) reported the existence of a link between myocardial infarctions, atmospheric temperature and barometric pressure.
- Jansen et al. (2001) reported on a link between blood pressure and ambient temperature.
- Prince et al. (2004) reported on the sensitivity of headache sufferers to weather factors.
- Tsai et al. (2006) reported the influence of abrupt temperature cooling on joint pain.
- Mukamal et al. (2009) reported on a link between ambient temperature, barometric pressure and emergency room presentations for headache.

We also carried out studies of our own. In Villeneuve et al. (2005), we analyzed the association of childhood asthma visits to an emergency room with respect to precipitation types while, in Villeneuve et al. (2006), we studied presentations of migraine complaints to an emergency room.

Until 2005, the MediClim™ Index had never been involved in any study. This was resolved in 2007, with the release of the results of a two-year study analyzing the presentation patterns at five Ontario hospitals (McBean et al., 2007).

The results of this research project showed that we could state with 95% to 99% confidence that the overall presentations at the emergency rooms of three Ontario general hospitals (the Civic campus of the Ottawa Hospital, Sunnybrook Health Sciences Centre (Toronto) and North York General Hospital - Branson site (Toronto)) varied with statistical significance according to the MediClim™ category on the day of presentation. The study examined all 440,000 presentations at the emergency rooms of these three hospitals between June 2000 and December 2004. In addition, when analyzing sub-groups of presentations, the team also found that similar conclusions could be stated, with the same statistical confidence, for 170,000 presentations at the emergency rooms of the Children's Hospital of Eastern Ontario (Ottawa) and the Children's Hospital of Western Ontario (London).

The Decision: Producing and Launching the MediClim™ Service

Following the very promising results from this last study regarding MediCLim™, we decided that there was sufficient value in MediClim™ to warrant issuing it publicly. We also believed so strongly in its worth that we decided to undertake this venture on our own.

The development of an operational service available seven days a week, all year, is not an easy endeavour. It took nearly 24 months from the time of our decision until our official launch on 5 January 2009. Using personal resources and with understanding spouses, we set out to convert our MediClim™ software into a robust, automated package. We acquired the necessary hardware, developed the meteorological data access and download routines, created a user interface within a new Web site, contracted the programming skills we could not provide ourselves and linked everything with control and reporting procedures. The meteorological data are acquired from NOAA servers.

We chose to launch our information service for five ailments: migraine, asthma, arthritis, diabetes and heart disease. Our service is predictive; it notifies the user via e-mail whenever an ailment is likely to be aggravated by weather conditions in the 24 hours following receipt of our Alerts. This is fundamental to the value of MediClim™, because it allows the recipients time to plan their activities accordingly or to prepare themselves to mitigate the potential aggravation of their symptoms. We do not provide health advice, rather the individuals are directed to their health care advisor.

We do not promise that each Alert is a guarantee that the specific ailments will be aggravated in each individual. Our information is based on statistical studies which suggest that the problem exists in the population at large. Individuals need to ascertain the degree to which the MediClim™ forecast applies to them, using it as a guide.

Fundamental to our program is our service delivery strategy. Contrary to many Internet-based services which require that the user regularly access a Web site to verify its content, we have undertaken to deliver an e-mail to the subscriber whenever their selected ailment(s) could be aggravated. Our reasoning is simple; at any one location, an ailment could only be triggered a few times a month. Requiring a user to access the Web site each and every day to find those few days would be frustrating, impractical and unlikely to be done regularly. On the other hand, receiving an e-mail only when the conditions could be triggered is convenient.

The service is currently available in Canada (south of 60°N), the United States of America (except Hawaii and Alaska), the United Kingdom and Ireland. Plans are under way to expand to other European countries.

Access to the service is available by signing up at MediClim.com. Subscribers need only provide an e-mail address, their postal code and the ailment(s) about which they wish to receive Alerts.

Concluding Remarks

There are many reasons why a service such as MediClim™ has value including cost savings for health institutions and governments. But we feel that the strongest argument in favour of this service, and the argument that has held us steadfast in our resolve for more than 25 years, is that the information delivered by MediClim™ can help the individual. It is our belief that introducing meteorology into the diagnosis and treatment of ailments for weather-sensitive individuals simply makes sense. Ultimately, MediClim.com can help individuals manage their ailment(s) during aggravating weather conditions, thereby improving their quality of life. Launching, on our own, MediCLim.com is an indication of how strongly we hold that belief.

Favourable comments have already been received from elated users.

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Événements météorologiques marquants par région pour 2008

par David Phillips

Québec: Un mois de mars qui ressemble plus à l'hiver qu'au printemps

En mars, 143,8 cm de neige sont tombés à Mont-Joli, soit plus du double de la moyenne des chutes de neige pour le mois. Depuis 1943, il s'agit du mois de mars le plus enneigé à Mont-Joli. De plus, puisqu'au total 152 cm de neige sont tombés à l'aéroport international Jean-Lesage de Québec et 109 cm sont tombés à Bagotville, le mois de mars arrive au deuxième rang des mois ayant reçu le plus de neige en 65 ans pour ces deux endroits.

VENUS: The Victoria Experimental Network Under the Sea

by Richard Dewey[1], Verena Tunnicliffe[1], Adrian Round[1], Paul Macoun[1] and Jaklyn Vervynck[1]

Abstract: The Victoria Experimental Network Under the Sea, VENUS is a fully operational coastal cabled observatory installed in Saanich Inlet on Vancouver Island and in the Strait of Georgia, adjacent to Vancouver. The observatory consists of two arrays, each with a shore station that provides power and Ethernet backhaul, a telecommunication marine fibre optic cable extending out to observatory Nodes, into which ocean science instrument systems are connected. The Saanich Inlet (SI) array consists of a single Node at a depth of 100 m, installed in February 2006, while the Strait of Georgia (SoG) array has two Nodes at depths of 300 m (Central) and 170 m (East), and was fully installed by September 2008. A standard VENUS Instrument Platform (VIP) is connected to each Node and supports a suite of permanent ocean instruments. Other specialized instrument systems, such as a pan & tilt digital stills camera, broadband echo-sounders, and a broadband hydrophone array are deployed at individual sites for specific experiments. Data stream from all instruments in real-time to an advanced Data Management and Archive System (DMAS) at the University of Victoria where data products and plots are displayed immediately on the VENUS web site: www.venus.uvic.ca. All data are available for free viewing and download via web galleries or on-line user specified data products.

Résumé: VENUS (Victoria Experimental Network Under the Sea) est un observatoire côtier câblé installé dans l'anse de Saanich, sur l'île de Vancouver, ainsi que dans le Détroit de Georgia, près de Vancouver. L'observatoire est composé de deux lignes, chacune connectée par un câble de télécommunication sous-marin à une station côtière fournissant à la fois électricité et moyens de communication numériques. Le câble s'étend jusqu'aux « noeuds » auxquels sont connectés les instruments de mesure. La ligne de l'anse de Saanich (SI) est constituée d'un seul noeud à une profondeur de 100 m et fut installée un février 2006, tandis que la ligne du Détroit de Géorgia (SoG) a deux noeuds aux profondeurs de 300 m (Central) et de 170 m (Est) respectivement. Cette dernière fut installée en septembre 2008. Une plate-forme d'instruments « standards » est connectée à chaque noeud et comporte une suite permanente d'instruments océaniques. D'autres instruments spécialisés tels qu'un appareil photographique a trépied télécommandé, des sonars à large bande ainsi qu'un ensemble d'hydrophones à large bande disposés en triangle sont installés sur des sites individuels à des fins d'expérimentation spécifiques. Les données de tous les instruments affluent en temps réel vers un système avancé de gestion et d'archivage de données (DMAS) à l'Université de Victoria où tous les produits de données tels que les graphiques sont immédiatement disponibles sur le site de VENUS: www.venus.uvic.ca. Toutes ces données sont disponibles gratuitement au travers de galeries ou par téléchargement à la demande.

Introduction

VENUS was born from an opportunity provided by the Canadian Foundation for Innovation (CFI) and the province of British Columbia to invest in science-based infrastructure and build the world's first advanced, community-based cabled ocean observatory. Workshops in early 2001 with Canadian researchers focussed the concept of a permanent facility for conducting coastal marine science that would provide continuous power and high-bandwidth communications to sub-sea laboratories for process-oriented, interdisciplinary and long-term oceanographic research. A major component would be a web-based data warehouse for accessing and facilitating scientific inquiries. Initially, three sites were discussed, including Saanich Inlet, the central Strait of Georgia, and the eastern reaches of Juan de Fuca Strait. However, once funded and the final implementation costs determined, the Juan de Fuca leg was abandoned. NEPTUNE Canada (www.neptunecanada.ca), also a University of Victoria cabled ocean observatory initiative, followed in VENUS' footsteps and will reach west of Vancouver Island out over the Juan de Fuca tectonic plate down to depths of 2700 m.

An initial set of general research objectives for VENUS included:

- integrated interdisciplinary oceanographic studies of the coastal benthic ecosystems in both Saanich Inlet and the Strait of Georgia;
- ambient sound and marine mammal vocalization monitoring;
- fish and zooplankton tracking and monitoring;
- sediment transport and slope dynamics along the Fraser River foreshore;
- research into deep-water renewal, mixing and exchange circulation processes;
- long-term climate and ecosystem adaptation monitoring;
- advanced marine engineering and observing system development.

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This initial list has grown and expanded as the capabilities of a permanent, interactive marine research facility gained traction to include forensics, computer-aided information identification from streaming data sources, and education and public outreach opportunities.

In February 2006 the first array in Saanich Inlet was installed. The *CS Wave Venture*, a Global Marine Systems telecommunications cable ship based in Victoria, was employed to deploy the first observatory Node at 100 m depth and lay the 3 km fibre optic armored cable to the shore station located on the foreshore of the Institute of Ocean Sciences, in Patricia Bay (Figure 1). The shore station, Node, and science instrument interface modules, were designed and built by the project's prime contractor, Ocean Works International of Vancouver. By early March, data was flowing from a VENUS Instrument Platform (VIP) hosting a variety of ocean sensors, a broad-band hydrophone array, and our first "interactive" users were collecting imagery with a high-resolution pan & tilt digital stills camera. All observatory operations are coordinated using the Canadian Scientific Submersible Facility's Remotely Operated Platform for Ocean Sciences (www.ROPOS.com), deployed from an oceanographic research vessel.

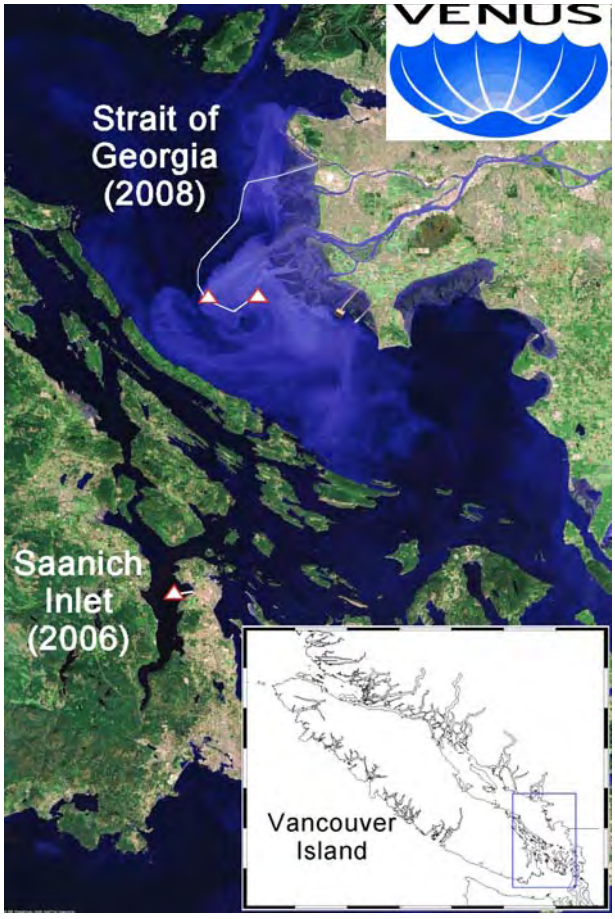


Figure 1: (satellite image) The VENUS Saanich Inlet and Strait of Georgia cabled arrays extend from shore stations that provide power and Internet access to observatory Nodes and experiments at: 100 m (Saanich Inlet), 170 m (East) and 300 m (Central) in the Strait of Georgia.

The official launch of the project's web site (www.venus.uvic.ca), with image and plot galleries and free raw data download went online in June 2006. Since that time several Terabytes of data have been collected and downloaded with a typical data rate of approximately 10 GB a day. Research users, interested arm-chair oceanographers, and the general public can visit the web site, see live data feeds from the three main Node areas, browse galleries of plots for the last day through the entire record, and register to download any and all data types.

In May of 2007 through September 2008 the second and larger array was laid in the Strait of Georgia, including two observatory Nodes: an in-line Node at 300 m depth (Central Node, September 2008) in the southern central Strait, and a second terminus Node (Eastern Node, February 2008) south of the Fraser River mouth in 170 m of water (Figure 1). Connected to each Node is a heavily instrumented VENUS Instrument Platform. From the Eastern Node, a secondary 6 km fibre optic extension cable was laid in February 2008 northward to the mouth of the Fraser River, where a Delta Dynamics Laboratory platform was deployed at 40 m depth. Unfortunately, due to excessive sedimentation during the spring freshet of 2008, both our DDL platform and extension cable became buried and were recovered in September 2008 and February 2009, respectively. Plans are under way to re-lay the extension cable to reach this area in support of our Delta Slope Stability studies, while maintaining a serviceable installation. Data from the Eastern (170 m) Node in the Strait of Georgia started in February 2008, while data from the Central (300 m) Node started in September 2008.

The Infrastructure

The VENUS cabled observatory consists of a few key components, designed with the goals of functionality, maintainability and durability. Working from the sensors to the end user, standard oceanographic instruments are typically connected through a Science Instrument Interface Module (SIIM), which can support a half dozen instruments, typically either through serial (RS-232/422/485) or Ethernet protocols. Power from a SIIM is available at either 24 or 360 VDC, with added components to reach intermediate voltages if required. Each SIIM can support up to 1.2 kilowatts of power. The VIP installations host a variety of instruments with one or daisy-chained SIIMs. An instrumented platform then connects to one of the Node science ports (Figure 2) through an advanced ODI wet-mateable connector, providing both 360 VDC at up to 10 amps and 100 BaseT Ethernet connectivity to the SIIM and oceanographic instruments. The Nodes, consisting of a permanent base and a recoverable electronics pod, use dedicated high-voltage and fibre optic wet-mate connectors to attach to the back-bone telecommunications cable (left two connectors in Figure 2). At the shore station, a standard fibre optic network provides communications to all sub-sea network components, and up to kilovolt power is

supplied down a single copper conductor. A sea-water return closes the power circuit with each Node hosting a cathode and each shore station a local anode. Apart from the instruments and fibre optic cable assemblies, all observatory components were designed and built by Ocean Works International (www.oceanworks.com). The systems have been designed to last at least 25 years, the expected operating life of the observatory.

Figure 2: (Photo of black Node) The VENUS Saanich Inlet Node on deck before deployment in 2006. The upper Node pod (which can be recovered for servicing), contains the control systems and is connected to the back-bone cable with two wet-mate connects, one each for power and fibres, and hosts four side panel science ports with electrical wet-mate connectors.

From the shore station servers, all observatory components can be monitored and controlled. Each Node science port can be activated individually, as can each SIIM instrument port. Voltage, current, and simple differential ground-fault telemetry for each port is logged continuously by the observatory control system. Each component, including each instrument, is assigned a local IP network address, with serial devices passing through Serial to Ethernet converters. Data from an instrument flow without in situ buffering to the shore station (latency ~1 ms), where they are time stamped, temporally buffered for redundancy, and then sent over the Internet backhaul to the data archive at the University of Victoria. Data values are available over the web site within seconds, while interactive components (i.e. the pan & tilt digital stills camera) can be reached via secure Virtual Network Protocol (VPN) access for live control from anywhere on the Internet.

Under construction this year (2009) is a specialized engineering extension to the Saanich Inlet system, the Ocean Technology Test-bed (OTTB). VENUS supplied 4 fibres and 360 VDC power to the OTTB that will allow rapid and easy deployment and testing of advanced marine systems. Some of the initial systems under development include an HDTV video platform, an under-water geospatial acoustic positioning system for navigating AUVs, observatory docked AUVs and tethered crawler systems. While most of the VENUS observatory relies heavily on ROV intervention, the OTTB will be accessible from a surface platform.

Sensors, Platforms and Experiments

At the heart of the observatory are a suite of oceanographic sensors, providing continuous data to the archive and out over the Internet. Although new and specialized instruments have and are being developed, the core data streams for the moment are from standard, robust instruments providing information on key ocean parameters. Each VIP (Figure 3) is equipped with a pumped SeaBird CTD producing pressure, temperature, and salinity measurements at one-minute intervals. Piggy-backed to the CTDs are dissolved Oxygen sensors, both Aanderaa Optode and SBE 43 sensors are used. Our VIPs are also equipped with either a Transmissometer or Turbidity sensors for measuring suspended particulate. Finally, each VIP is equipped with an inverted high-frequency echo-sounder for mapping out the vertical and temporal variations in both fish and zooplankton populations. The two VIPs in the Strait of Georgia (Central and East) are also equipped with RDI 150 kHz Acoustic Doppler Current Profilers for measuring the sheared tidal currents. Each VIP is typically configured with one SIIM to accommodate all of these instruments and occupies a single Node science port.

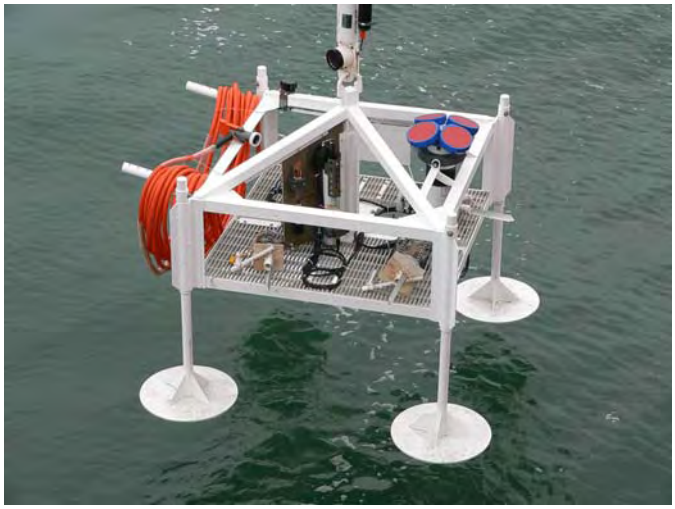


Figure 3: (Photo of VIP) A VENUS Instrument Platform (VIP), hosting a SBE CTD, an Aanderaa Optode, an RDI ADCP, and an ASL Zooplankton Acoustic Profiler. The wet-mate connector is attached to a 70m oil-filled orange hose and the Science Instrument Interface Module (SIIM, under the plate), which connects the VIP to a Node science port.

A number of other specialized platforms and instrument systems have been designed for VENUS. They include a pan & tilt digital stills camera (DSC) system, broadband hydrophone arrays, and Seismic Liquefaction In-situ Penetrometers (SLIPs), see Figure 4. The DSC was built by C-Map Systems (www.cmapsystems.com) and is mounted on a 3 m tripod supported from a frame with a SIIM. Through a VPN, users log onto a dedicated camera server at the shore station and take direct control of the

camera, with video preview, scaling lasers, flood lights and flash. The hydrophone arrays were built by the Ocean Acoustics Group of the Department of Fisheries and Oceans, Institute of Ocean Sciences, in Patricia Bay, and include multiple broadband ambient sound hydrophones logged by a central unit for accurate timing and phased directional tuning. The hydrophone arrays do not require a SIIM, and connect directly to one of the Node science ports. Finally, in support of the Delta slope stability research, VENUS has deployed a real-time seismic liquefaction in situ penetrometer (SLIP) that logs both the surface and subsurface pressure and temperature conditions down to 5 m to monitor the pour-pressure variations in the loosely compacted sediments along the Fraser River Delta slope.

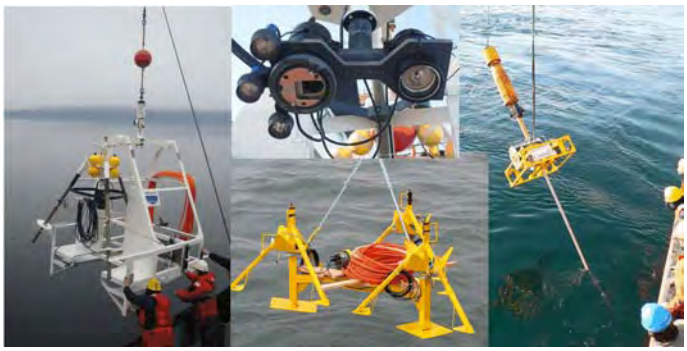


Figure 4: (Photo montage of camera, hydrophone, and SLIP) Specialized instrument systems include (left to right) the pan & tilt digital stills camera tripod and frame (camera and lights also shown in insert), one of the broadband hydrophone arrays, and a Seismic Liquefaction In situ Penetrometer (SLIP) which is seen here during deployment with a large weight that drives the instrumented tip 4 m deep into the Fraser River Delta sediments.

Using these initial sensor systems, a broad range of marine research is being supported. Key experiments already under way include:

- benthic ecology under varying dissolved oxygen conditions;
- seasonal variations in the sediment and water borne microbial communities in Saanich Inlet;
- benthic-pelagic coupling and nutrient recirculation by bottom fish;
- short and long-term variations in zooplankton migration habits;
- benthic community responses to individual large food fall events;
- quantified time-lapsed marine scavenging of a terrestrial carcass (forensics);
- external forcing and timing of deep water renewal events, with nutrient and oxygen replenishment;
- investigations into the role of zooplankton dynamics in vertical mixing and dispersion;
- distinguishing volume acoustic back-scatter from turbulence versus suspended particulate and zooplankton using broadband active echo-sounders;
- structure and spatial variations in the semi- and diurnal tides in the Strait of Georgia;
- marine mammal vocalizations and responses to variations in shipping and other ambient sound sources;
- seasonal variations in the sediment loading and transport on the Delta slope from the Fraser River;
- sub-surface sediment loading under various environmental forcing;
- temporal evolutions of the sediment morphology on the Fraser Delta.

Many more opportunities exist through examination of the existing archived time series and imagery, and in deploying new and specialized instruments deployed in conjunction with existing platforms or as dedicated installations.

The Data Archive and Web Site

A central component of the observatory is the sophisticated data management and archive system (DMAS) and the efforts to support interactive observatory experiments through the VENUS web site. Although the projected life of the in-water observatory is 25 years, the web-enabled data warehouse is intended to be both accessible now and well into the future, so that a searchable data archive, exploratory and analysis web-interface tools, and value added information, remain a legacy long after the in situ portion delivers raw data. The DMAS architecture has three main components: data acquisition, data storage and data delivery over the web.

The observatory infrastructure provides the shore station servers with direct access to each instrument or sensor system. Data acquisition falls into three primary types: pulled, pushed or hosted. For both the pull and push instruments, a “driver” process runs on the data servers that either controls data samples by making a request (pull), or by listening to an instrument that regularly transmits data (push). Each data record, either a simple string of numerical values, or a complex binary data record, is then time-stamped upon reception by the driver, and logged into a “flat-file”. These raw data records are retained for data validation and security. For simple numerical values (i.e. from a CTD), the record is also parsed and sent onto the data archive via a massaging bus. More complex (i.e. binary) flat-file data (e.g. ADCP ensembles stored in HEX format), are appended for a certain duration (e.g. hourly or daily), at which time the entire flat-file is forwarded to the archive centre. The final data acquisition method used for specialized instrument systems is to run a dedicated host computer or data acquisition program that provides special access and control features and logs the data into pre-determined or proprietary file formats. Host examples include the hydrophone system, the digital stills camera (jpg and mpeg files), and a broadband echo-sounder. These files are also forwarded at regular intervals to the central archive for permanent storage.

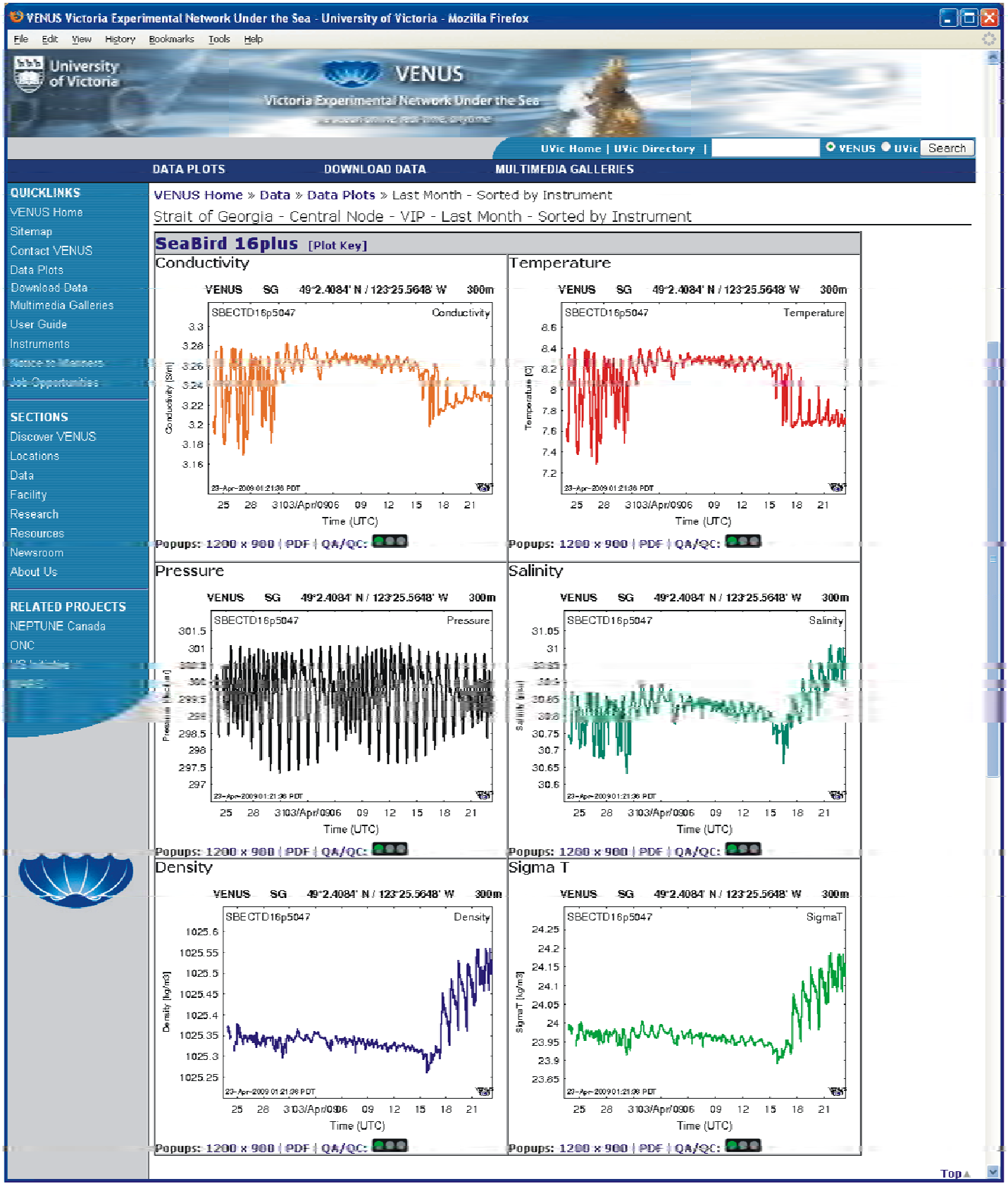


Figure 5: (Web site screen capture) The VENUS Web Site (www.venus.uvic.ca) provides direct access to live data feeds, real-time galleries of data products, free data download, research highlights and project information.

Two distinct archive systems store the observatory data and information. First is a commercial (Oracle) relational database, which manages system configuration information, scalar time series, and all the associated observatory and instrument metadata. Parsed scalar data received from the shore station drivers via the messaging bus are ingested and immediately available for re-distribution. The raw and complex (binary) flat-files are stored in a separate file management system. Often, if processing is required (i.e. multiplexed hydrophone data), the associated flat-files are processed upon reception and the subsequent data products (e.g. mp3 audio files) are then submitted to and stored in the file management system. Data are available for display or download as soon as they have reached either the DB or file archive system.

Access to VENUS data is facilitated entirely through the VENUS web site (www.venus.uvic.ca). Users can either browse an existing set of near real-time data products generated routinely and displayed in data galleries (Figure 5), or they may log-on (free registration), and request data from any instrument, for any relevant time period in a variety of formats (e.g. CSV, Matlab, plot, binary flat-file). Over 200 users accessed the system in 2008, downloading over a 1.2TB of data, while over 100,000 anonymous web site visitors accessed the galleries for pre-set data plots and products.

Operations and Maintenance

Operating a complex facility that runs 24/7/52 has special challenges. The VENUS staff rotates on-call duties, whereby regular system and web site checks confirm the operating status of each observatory sub-system. Automatic alarms trigger emails and text messages should a sub-system fail, and the on-call duty officer then logs-on to the system and assesses and re-initializes systems as necessary. Most observatory shut-downs have been associated with local power outages, both scheduled and unscheduled, due to weather or facility-wide disruptions. Twice a year, the VENUS staff, in collaboration with our scientific community, conducts maintenance cruises on a research vessel to service and maintain the sub-sea components. Platforms are recovered, instruments checked and cleaned, replaced as necessary, and re-deployed. All sub-sea operations are supported by the assistance of the ROPOS ROV. This advanced surface-manipulated ROV positions platforms and instruments, plugs and unplugs the wet mateable connectors into the Node science ports, and facilitates the recovery of platforms using lifting lines. Excluding periods for scheduled maintenance, the Saanich Inlet and Strait of Georgia observatories have sustained a 99% percent availability record since February 2006, with an accumulative instrument availability of 92%.

Conclusions

Phase I of the VENUS project was to design, build and install the world's most advanced coastal cabled observatory with an initial suite of standard oceanographic sensors accessible over the web. This has been accomplished. Active experiments and long-term monitoring are on-going. The observatory is a proven operating facility that is ready to accommodate a whole suite of new and next-generation observing systems requiring high power and bandwidth. Among the possible expansions are extending the foot-print to mobile assets such as instruments Ferries and AUVs deploying specialized benthic ecology experiments with HD and multi-dimensional cameras, expanding the geospatial coverage to include surface mapping via radar and a vertical profiler system for mid-water column measurements.

Many international initiatives to cabled ocean observatories around the world are on-going. VENUS has successfully demonstrated that Canadian technology can lead the world in this field. We encourage you to visit the VENUS web site, explore the data plots, browse the galleries, download data products, or install your own instrumentation and join the VENUS research community.

Note from the Editor: The Victoria Experimental Network Under the Sea (VENUS) has celebrated last February its third anniversary as the first array of the VENUS system deployed in Saanich Inlet on Vancouver Island in February 2006 and consisting of a 4 km telecom cable running from the Institute of Ocean Sciences out into Pat Bay where a Node and instruments sit near the 100 m isobath.

Source: *VENUS: Approaching Three Years of Cabled Ocean Observatory Science* by Richard Dewey, Canadian Ocean Science Newsletter, No. 40, December 2008.

Note du Rédacteur: Le Victoria Experimental Network Under the Sea (VENUS) a célébré son troisième anniversaire le mois de février dernier. En effet, la première ligne du système VENUS a été déployée dans l'Inlet Saanich sur l'île de Vancouver et consistait à un cable de transmission de 4 km partant de l'Institut des Sciences de la Mer jusqu'au Node situé dans la baie de Patricia où les instruments sont installés à une profondeur de 100 m.

Source: *VENUS: Approaching Three Years of Cabled Ocean Observatory Science* by Richard Dewey, Bulletin Canadien des Sciences de l'Océan, No. 40, Décembre 2008.

Concluding Activities of GLOBEC

by Ian Perry[1]

The Global Ocean Ecosystem Dynamics (GLOBEC) program, a core program of IGBP, SCOR and IOC, will complete its more than 10 years of active research at the end of 2009. To present and celebrate the successes of GLOBEC, the program will host its 3rd (and final) Open Science Meeting in Victoria, BC, 22-26 June 2009. This short article outlines the events at this Open Science Meeting, describes the activities of GLOBEC to the completion of the program, and describes what will happen to GLOBEC research after the program has concluded.

Open Science Meeting

The Open Science Meeting will culminate in the integration and synthesis activities of GLOBEC by providing a new mechanistic understanding of the functioning of marine ecosystems towards developing a predictive capability and management framework for marine ecosystems in an era of global change. The three co-convenors are Ian Perry (Canada), Manuel Barange (UK), and Eileen Hofmann (USA). The conference will be structured around topical workshops/theme sessions and plenary sessions. Workshop topics include:

- Modelling ecosystems and ocean processes;
- Comparison of processes and climate impacts in sub-Arctic and Antarctic marine ecosystems;
- Worldwide large-scale fluctuations of sardine and anchovy;
- Krill biology and ecology in the world's oceans;
- Biogeochemistry of the oceans in a changing climate;
- Continuous plankton recorder surveys of the global ocean;
- Cod and climate change;
- Plankton phenology and life history in a changing climate;
- Climate impact on ecosystem dynamics of marginal and semi-enclosed seas; and
- Socio-economic dynamics and ecosystems, governance implication.

The three days of plenary sessions will focus on GLOBEC's achievements; ecosystem structure, function and forcing; ecosystem observation, modelling and prediction; ecosystem approaches to management; and Marine Science – into the future. These plenary sessions will feature both invited and contributed papers. The concluding session of "Into the Future" will feature retrospective and personal views from "insiders" and those more "external" to GLOBEC activities, as well as a "hand-off" of on-going GLOBEC work to IMBER, the Integrated Marine Biogeochemistry and Ecosystems Research program of IGBP and SCOR. Speakers in this session include Ken Denman (Canada), John Steele (USA) and Julie Hall (New Zealand). Social events include an opening reception at the BC Provincial Museum and a celebratory banquet, as well as an opportunity (provided by the University of Victoria) for tours to the Bamfield Marine Station. Details and registration information are available at the GLOBEC web site www.globec.org. The proceedings from the GLOBEC Open Science Meeting will be published in *Progress in Oceanography*.

Note for the Editor: The aim of GLOBEC is to advance our understanding of the structure and functioning of the global ocean ecosystem, its major subsystems, and its response to physical forcing so that a capability can be developed to forecast the responses of the marine ecosystem to global change.

Activities to the conclusion of GLOBEC

Although this Open Science Meeting is a major milestone in the synthesis and integration of GLOBEC research, it is in itself not the conclusion of GLOBEC. The formal GLOBEC program will continue into early 2010 by wrapping up a number of on-going projects. These include development of a Summary for Policymakers, translating GLOBEC understanding of marine ecosystems in an era of change into issues of importance to policy and decision-makers dealing with concerns for global (and local) ocean ecosystems. These include on-going collaborations with FAO on the impacts of global change on world fisheries and aquaculture. Concluding activities also include a 'brochure'-style publication written in non-scientific language describing for the general public the new understanding of ocean systems in a world of global change (which includes climate change). There is also a new collaborative program between IMBER and GLOBEC which will study issues of global change in the Antarctic (ICED, Integrated Climate and Ecosystem Dynamics in the Southern Ocean) which builds upon the success of GLOBEC's Southern Ocean program. Two other programs of GLOBEC are expected to

[1] GLOBEC Chair, DFO, Pacific Biological Station, Nanaimo, BC

continue. These programs both started half-way through GLOBEC, and are anticipated to continue for another 5 years. They are the Ecosystem Studies of Sub-Arctic Seas (ESSAS) Program (which will hold its 2009 Annual Science Meeting in Seattle, WA, 17-20 June 2009 just prior to the GLOBEC OSM), and the Climate Impacts on Top Predators (CLIOTOP) Program. More information on these on-going programs is also available at the GLOBEC web site. In addition, three books plus several special journal issues synthesising GLOBEC findings are in preparation for publication. The books include *"Climate Change and Small Pelagic Fish*" (edited by D. Checkley, J. Alheit, Y. Oozeki and C. Roy, published by Cambridge University Press in June 2009), "*Marine Ecosystems and Global Change*" (edited by M. Barange, J. Field, R. Harris, E. Hofmann, I. Perry and F. Werner, published by Oxford University Press in early 2010), and "*Resilience of Fisheries Systems to Global Change: a social-ecological perspective*" (edited by R. Ommer, I. Perry, P. Cury and K. Cochrane, published by Wiley-Blackwells in early 2010).

After GLOBEC

Although GLOBEC will formally conclude as an IGBP, SCOR and IOC program at the end of 2009/early 2010, the advances of, and issues raised by, GLOBEC continue to be significant and important. Many of these issues will be taken on by IMBER as it revises its research plan for its next 5 years of activities. A Transition Task Team was formed by IGBP and SCOR, chaired by John Field (South Africa) to identify scientific issues of importance for ocean science (including issues raised by GLOBEC) that IMBER should consider for its next phase of research. The report of this Transition Task Team is also available on the GLOBEC web site. It includes recommendations for the study of new and emerging issues not present at the start of GLOBEC or IMBER, development of regional and comparative programs, data management, and funding and implementation issues.

Throughout its more than 10 years of active study of marine ecosystem processes and responses to global changes, GLOBEC has produced over 3200 publications (over 2700 of them refereed), 26 special journal issues (and still counting), and 5 books. In addition, it has contributed to new ideas and approaches for managing marine ecosystems, and to new and emerging science issues involving marine systems. Some researchers have expressed concern about what will happen to studies of marine ecosystems, in particular of the higher trophic levels, once GLOBEC is concluded. It is clear that, while GLOBEC has accomplished much, there is much that still remains to be studied. The GLOBEC legacy and issues will continue in IMBER, in the on-going Regional projects begun by GLOBEC, and in the scientific philosophy, approach and methodologies that GLOBEC has advanced.

Source: Canadian Ocean Science Newsletter, No.43, May 2009. Reproduced here with the written authorization of the author and the editor.

Regional Weather 2008 Highlights

by David Phillips

Prairies: The Taber "Twister"

In mid-July, violent weather featuring hail, intense rain, powerful downburst gusts and tornadic winds raked across southern Alberta and Saskatchewan. Hot weather and high moisture created the perfect recipe for tornado weather. The storms did extensive damage to equipment, buildings and crops and several fields were taken right out of production. While wind was the issue in many places, hail was the big destroyer in Taber wiping out half of the corn crop and much of the grain and specialty vegetable crops. Taber farmers lost millions of dollars when entire fields of corn were shredded by the hail.

Powerful winds of hurricane force and twisting winds raked large sections of property between Vulcan and Taber, and on to Medicine Hat. Granaries were picked up and moved. Tree damage was widespread. At a communication tower outside of Seven Persons, south of Medicine Hat, a wind gust of 215 km/h was recorded just prior to the tower crumpling in the wind. Because this was a non-standard site, this Canadian record is unofficial. The highest gust record in the national archives since 1953 was 193 km/h, recorded at Cape St James, British Columbia, and St John's, Newfoundland and Labrador.

Lost power in Coaldale, Burdett and Bow Island affected 15,000 customers. At least 50 power poles were toppled when trees came down on lines. An airfield near Irvine, outside Medicine Hat, was damaged and small planes were tossed around like toys. AltaLink said about 20 of the utility's large transmission towers were either knocked down or damaged. Taber's airport was also hit hard. One hangar was destroyed, as were the planes inside it.

Atlantic: Icebergs and Ice Floes

Nearly 1,000 icebergs drifted into the transatlantic shipping lanes and oil fields near the Grand Banks of Newfoundland, more than all icebergs from 2004 to 2007 and almost as many as there were in 1912 when the RMS Titanic sank on her maiden voyage. At times, thick ice sheets accompanied by sizeable icebergs stopped production in the offshore oil fields. One iceberg roughly 100 m wide jammed the entrance of the rocky harbour at Quidi Vidi on April 30, attracting a steady flow of onlookers but also preventing ships from going back and forth.

There was also pack ice in the Gulf of St. Lawrence in the spring, enough to disrupt commercial shipping and ferry service along Canada's East Coast. Strong, persistent winds pushed the pack ice near the harbour in North Sydney, Nova Scotia, and onto the western coast of Newfoundland, preventing passenger ferries from getting into ice-clogged ports.

Open Access for ATMOSPHERE-OCEAN: A Survey of Opinions

by Richard Asselin

Introduction
ATMOSPHERE-OCEAN has been available on-line to print subscribers since 1999. The number of subscribers to the on-line version (no print) is steadily increasing while the subscribers to the print version decreases. Council decided in 2008 to make articles published three or more years ago freely available on line – open access. Since last July readers have been invited to respond to a questionnaire designed to help us determine the future steps in relation to open access, printed version and the emerging option of interactive open access.

Only fourteen readers responded to the questionnaire so that we can only gather an impression without statistical significance. Eight of the respondents identified themselves as authors, two as librarians, others were simply readers. The following table summarizes their responses to the questions asked in the survey.

Summary of replies

A1	Only one of the eleven authors and readers who replied thinks that open access journals are NOT as well-rated for purposes of promotions, grants, appointments, etc
A2	A-O would appeal a little more to authors, in general, if it were open access
A3	Seven of the eight authors would personally be slightly more inclined to publish in an open access A-O
A4	Half of the authors would be less inclined to publish in an interactive open access journal
R1	The great majority think the reputation of A-O would improve if it became open access
R2	All think the readership would increase if A-O became open access.
R3	The majority favours full open access and maintenance of a printed copy, even if only in a small number of copies; one quarter of the authors favour interactive open access; only one favours no change.
S1	All current subscribers intend to continue subscribing while articles older than 3 years are open access.
S2	One of the 2 libraries would maintain a quarterly print subscription if A-O became fully open access; all other respondents would stop subscribing to the printed version.
S3	The second library and two other respondents would be interested in a single printed annual volume, if A-O became fully open access.

Nine of the respondents also submitted written comments.
In general, the comments simply extended the numerical answers to questions. Additional points are:

1) On the maintenance of a printed version
Eliminating printing would reduce or eliminate costs for subscribers. (*Authors would also benefit because they currently pay about $30 per page for the use of colour in print: Director of publications*). A few printed copies should be preserved as archives in selected libraries/repositories and the few people who like to browse. The printed copy differentiates a scholarly journal from the teeming masses of online drivel. Hard copies are no longer used by students; print is on the way out...

2) On the practice of an interactive journal
Interactive open access is a great opportunity for petty bickering in public. We see a lot of stupid things being written in Internet forums. A serious editorial filtering of the comments would be required.

Conclusions
It seems that CMOS is on the right track with open access. The decision to make articles older than three years open access does not seem to have affected subscriptions, and is most likely inviting additional readers. CMOS should consider the possibility of going to full open access as soon as financially feasible. The decision to change printing method from offset to high quality digital (implemented in 2009) allows us to continue printing ever smaller numbers of copies without significant penalties. The idea of printing only once per year does not seem to have much appeal. We should maintain the printed version for a few more years, at least.

Authors are not ready for the introduction of *interactive* open access; also, this would require more effort on the part of the editorial staff.

Acknowledgements
The Director of Publications thanks the readers of ATMOSPHERE-OCEAN who responded to this questionnaire. The views of any other readers would still be welcome.

Libre-Accès pour ATMOSPHERE-OCEAN: Un Sondage d'Opinion

Introduction
ATMOSPHERE-OCEAN est offert en ligne aux abonnés de la version imprimée depuis 1999. Le nombre d'abonnés à la version en ligne (pas de version imprimée) augmente de façon régulière alors que les abonnés à la version imprimée diminuent. Le Conseil a décidé en 2008 de rendre disponibles gratuitement en ligne les articles publiés il y a trois ans ou plus: c'est le libre-accès. Depuis juillet dernier, les lecteurs ont été invités à répondre à un questionnaire conçu pour nous aider à déterminer les prochaines étapes concernant le libre-accès, la version imprimée et l'option émergente du libre-accès interactif.

Seulement quatorze lecteurs ont répondu au questionnaire donc nous ne pouvons que recueillir des impressions sans signification statistique. Huit répondants se sont identifiés comme auteurs, deux comme bibliothécaires et les autres comme simples lecteurs. Le tableau suivant résume leurs réponses aux questions posées dans le sondage.

Résumé des réponses

A1	Seulement un des onze auteurs et lecteurs a répondu que les revues à libre-accès NE SONT PAS aussi bien cotées pour les promotions, les subventions, les nominations, etc.
A2	A-O intéresserait un peu plus les auteurs, en général, si la revue était offerte en libre-accès.
A3	Sept des huit auteurs seraient personnellement un peu plus enclins à publier dans la revue A-O en libre-accès.
A4	La moitié des auteurs seraient moins enclins à publier dans une revue à libre-accès interactif.
R1	La grande majorité pense que la réputation d'A-O s'améliorerait si elle devenait une revue à libre-accès.
R2	Tous les répondants pensent que l'ensemble des lecteurs augmenterait si A-O devenait une revue à libre-accès.
R3	La majorité favorise un libre-accès complet et le maintien d'une copie imprimée, même si c'est seulement un petit nombre de copies; le quart des auteurs favorisent le libre-accès interactif; seulement un ne favorise aucun changement.
S1	Tous les abonnés actuels ont l'intention de continuer leur abonnement alors que les articles publiés il y a plus de 3 ans sont en libre-accès.
S2	Un des deux bibliothécaires garderait un abonnement trimestriel à la version imprimée si A-O devenait une revue à libre-accès complet; tous les autres répondants arrêteraient leur abonnement à la version imprimée.
S3	Le deuxième bibliothécaire et deux autres répondants seraient intéressés par un volume imprimé annuel si A-O devenait une revue en libre-accès complet.

Neuf répondants ont aussi soumis des commentaires écrits.
En général, les commentaires étaient un prolongement des réponses numériques aux questions. Voici les éléments supplémentaires:

Concernant le maintien d'une version imprimée
Le fait d'éliminer la version imprimée réduirait ou éliminerait les coûts pour les abonnés. (*Les auteurs en bénéficieraient aussi, car ils paient actuellement environ 30 $ par page pour l'utilisation de la couleur dans la version imprimée: directeur des publications*). Quelques copies imprimées devraient être préservées comme archives dans des bibliothèques/dépôts sélectionnés et pour les quelques personnes qui aiment parcourir des revues. La copie imprimée différencie une revue scientifique des masses surabondantes de lecture en ligne. Les copies papier ne sont plus utilisées par les étudiants; l'imprimé est en voie de disparition.

Concernant la pratique d'un journal interactif
Le libre-accès interactif est une occasion rêvée pour les critiques mesquines en public. Nous voyons beaucoup de choses stupides écrites dans les forums Internet. Un filtre éditorial sérieux serait requis.

Conclusions
Il semble que la SCMO est sur la bonne voie avec le libre-accès. La décision de rendre les articles de plus de trois ans en libre accès n'a pas semblé avoir affecté les abonnements, et cela attire probablement plus de lecteurs. La SCMO devrait considérer la possibilité d'introduire le libre-accès complet aussitôt que ses finances le permettent. La décision de changer la méthode d'impression de l'offset au numérique de haute qualité (implanté en 2009) nous permet de continuer à imprimer même un plus petit nombre de copies sans pénalités significatives. L'idée d'imprimer seulement une fois par année ne semble pas avoir beaucoup d'intérêt. Nous devrions maintenir la version imprimée pour encore quelques années au moins. Les auteurs ne sont pas prêts pour l'introduction du libre-accès *interactif* ; cela exigerait également plus d'efforts de la part du personnel éditorial.

Remerciements
Le directeur des publications remercie les lecteurs d'ATMOSPHERE-OCEAN qui ont répondu à ce questionnaire. Les opinions des autres lecteurs sont toujours les bienvenues.

A-O Abstracts Preview

Avant Première des résumés de A-O

The following abstracts will soon be published in your next ATMOSPHERE-OCEAN publication.

Les résumés suivants paraîtront sous peu dans votre prochaine revue ATMOSPHERE-OCEAN.

Climate Trends in a Seasonal Forecasting System

by G. J. BOER

Abstract
Deterministic forecasts produced with the second Historical Forecasting Project (HFP2) multi-model two-tier seasonal forecasting system are analyzed in order to assess the presence and importance of long-term trends on seasonal forecast skill. The results show that trends in land surface temperature, 850 hPa temperature and 500 hPa geopotential height in the National Centers for Environmental Prediction (NCEP) reanalysis data, with which the forecasts are initialized and verified, are much stronger than those in the forecasts. Since biases are removed from the forecast variables, this lack of trend is unlikely to be a consequence of model climate drift.

Although the atmospheric initial conditions and oceanic boundary conditions for the forecasts contain greenhouse gas and aerosol forcing information, these forcing mechanisms are not explicitly represented in the atmospheric general circulation models with which the forecasts are made. It is possible, therefore, that long-term externally forced trends are weak or absent in the forecasts, especially over land, for this reason. The largest trends are in the December to January (DJF) season over land: their absence in the forecasts can be at least partially overcome (and cross-validated forecast skill increased in some regions) by correcting the forecast trends a posteriori.

Résumé
Nous analysons les prévisions déterministes produites à l'aide du deuxième système multimodèle de prévisions saisonnières doubles du Projet de prévisions historiques (PPH2) afin d'évaluer la présence et l'importance des tendances à long terme dans l'habileté des prévisions saisonnières. Les résultats montrent que les tendances de la température à la surface de la terre, de la température à 850 hPa et de la hauteur géopotentielle de 500 hPa dans les données de réanalyse des National Centers for Environmental Prediction (NCEP), avec lesquelles les prévisions sont initialisées et vérifiées, sont beaucoup plus fortes que celles présentes dans les prévisions. Comme les biais sont enlevés des variables prévisionnelles, il est peu probable que cette lacune de tendance soit la conséquence d'une dérive du modèle climatique.

Bien que les conditions atmosphériques initiales et les conditions océaniques aux limites pour les prévisions renferment de l'information sur le forçage par les gaz à effet de serre et les aérosols, ces mécanismes de forçage ne sont pas explicitement représentés dans les modèles de circulation atmosphérique générale avec lesquels les prévisions sont faites. Par conséquent, il est possible que des tendances à long terme forcées par des facteurs externes soient faibles ou inexistantes dans les prévisions, surtout au-dessus de la terre, pour cette raison. Les plus fortes tendances surviennent durant la saison de décembre à janvier (DJF) au-dessus de la terre : leur absence dans les prévisions peut être au moins partiellement compensée (et l'habileté contre-validée des prévisions accrue dans certaines régions) en corrigeant les tendances dans les prévisions a posteriori.

An Examination of Mixed Layer Sensitivity in the Northeast Pacific Ocean from July 2001 - July 2005 Using the General Ocean Turbulence Model and Argo Data

by JENNIFER M. JACKSON, PAUL G. MYERS and DEBBY IANSON

Abstract
The mixed layer depth (MLD) at Ocean Station Papa (OSP) in the northeast Pacific Ocean has been shoaling for the past 50 years, with the shallowest maximum MLDs ever recorded occurring in the winters of 2002-03 and 2003-04. We use the General Ocean Turbulence Model (GOTM) to estimate MLD and to determine how various atmospheric forcings from 2001-05 at four stations in the northeast Pacific affect MLD. Three of the stations are in the Alaskan Gyre: OSP (50°N, 145° W) in the south; S16 (49°17'N, 134°40W) at the southeastern edge; CAG (55° N, 145° W) in the centre; and one, NSG (40° N, 145° W), is south of the Alaskan Gyre. Interpolated Argo temperature and salinity, for both initial conditions and restoring, and atmospheric inputs (heat fluxes and wind stress) from the National Centers for Environmental Prediction/National Center for Atmospheric Research (NCEP/NCAR) reanalysis were used. Experiments showed that in the winter, MLD was most sensitive to increased winds at all stations and also to decreased heat fluxes everywhere except at OSP. In summer, MLD was most sensitive to changes in the shortwave radiation. A combination of effects from the 2002-03 El Niño (i.e., decreased outgoing heat fluxes, cloud cover and wind speeds) and a strong stratification created by a subsurface cold water anomaly caused MLD to be shallow in the Gulf of Alaska during the winter of 2002-03. Finally, our results show that for the modelled period (2001-05), MLD at OSP behaved differently than at other stations in the Gulf of Alaska and therefore OSP may not be the best location to represent the region.

Résumé
L'épaisseur de la couche de mélange (ECM) à la station océanique Papa (OSP) dans le nord-est de l'océan Pacifique s'est amincie au cours des 50 dernières années, les ECM maximales les plus faibles à avoir été observées s'étant produites au cours des hivers 2002-2003 et 2003-2004. Nous utilisons le modèle général de turbulence océanique (MGTO) pour estimer l'ECM et pour déterminer comment divers forçages atmosphériques entre 2001 et 2005 à quatre stations dans le nord-est du Pacifique influencent la couche de mélange. Trois de ces stations sont situées dans le tourbillon de l'Alaska : OSP (50°N, 145°O) au sud; S16 (49°17'N, 134°40'O) près du bord sud-est; CAG (55°N, 145°O) au centre; et une, NSG (40°N, 145°O), est au sud de le tourbillon de l'Alaska. Nous avons utilisé les données Argo interpolées de température et de salinité, à la fois pour les conditions initiales et la restauration, et les apports atmosphériques (flux de chaleur et tension du vent) de la réanalyse des NCEP/NCAR (National Centers for Environmental Prediction/National Center for Atmospheric Research). Des expériences ont montré qu'au cours de l'hiver, l'ECM était très sensible aux vents plus forts à toutes les stations et aussi aux flux de chaleur plus faibles partout sauf à OSP. En été, l'ECM était très sensible aux variations du rayonnement de courtes longueurs d'onde. Une combinaison d'effets du El Niño (c.-à-d. les flux de chaleur sortant, la couverture nuageuse et les vitesses de vent plus faibles) et une forte stratification créée par une anomalie d'eau froide subsuperficielle ont eu pour conséquence une faible ECM dans le golfe de l'Alaska durant l'hiver 2002-2003. Finalement, nos résultats montrent qu'au cours de la période modélisée (2001-2005), l'ECM s'est comportée différemment à OSP qu'aux autres stations dans le golfe d'Alaska, et par conséquent OSP n'est peut-être pas le meilleur endroit pour représenter la région.

Application of Canadian Weather Radar to Plant Disease Management Schemes in Southern Ontario

by T.L. ROWLANDSON, T.J. GILLESPIE and R.P. Ford

Abstract
Management schemes based on the mean temperature and duration of wetness periods (dew or rain) have been developed to schedule fungicide applications rationally in a number of high-value crops. Due to the spatial variability of convective rain events during the growing season in southern Ontario, data from an existing rain-gauge network are inadequate for delivering advice to the farming community. Therefore, the use of both conventional and Doppler weather radar data to supplement rainfall data was investigated. Hourly measurements of leaf wetness duration and tipping bucket rainfall data were compared to data from the King City and Exeter radars in two disease-warning schemes. When used in conjunction with the Penman-Monteith model to estimate disease indices, the King City radar data were in better agreement with the leaf wetness sensor than the Exeter radar. There was no marked difference between conventional and Doppler data. When both conventional and Doppler radar data were used in combination, the success rate in detecting rainfall occurrence was 80-85 %, with most errors due to false positives. Rainfall duration estimates from radar were sufficiently accurate in two disease management schemes that cumulate information from several successive wet periods.

Résumé
Des plans de gestion basés sur la température moyenne et la durée des périodes de mouillure (rosée ou pluie) ont été mis au point pour établir rationnellement le calendrier des applications de fongicides pour un bon nombre de cultures de grande valeur. Étant donné la variabilité spatiale des événements de pluie convective durant la saison de croissance dans le sud de l'Ontario, les données fournies par un réseau de pluviomètres existant sont inadéquates pour fournir un avis à la collectivité agricole. Nous avons donc étudié la possibilité d'utiliser les données des radars météorologiques conventionnels et Doppler pour compléter les données sur les chutes de pluie. Nous comparons les mesures horaires de durée d'humectation du feuillage et les données des pluviomètres à auget basculeur aux données des radars de King City et d'Exeter dans deux plans d'avertissements de maladie. Lorsque utilisées de pair avec le modèle de Penman-Monteith pour estimer les indices de maladies, les données du radar de King City s'accordaient mieux avec le capteur d'humectation du feuillage que celles du radar d'Exeter. Il n'y avait pas de différence marquée entre les données conventionnelles et les données Doppler. Quand nous avons utilisé conjointement les données des radars conventionnels et Doppler, le taux de succès dans la détection des occurrences de pluie était de 80-85 %, la plupart des erreurs consistant en des faux positifs. Les estimations de durée des chutes de pluie faites par radar étaient suffisamment précises dans deux plans de gestion de maladie cumulant les renseignements obtenus lors de plusieurs périodes de mouillure successives.

Sampling Errors in Estimation of the Small Scales of Monthly Mean Climate

by TERENCE J. O'KANE, JORGEN S. FREDERIKSEN and MARTIN R. DIX

Abstract
We examine the sampling errors in the estimation of the small scales of monthly average mean atmospheric climate as seen in mean kinetic energy. The relationships between the small scale mean and transient kinetic energy in the atmosphere and atmospheric flow simulations are discussed. We elucidate how the estimation of the mean depends on the number of realizations or the length of the

time period of the data. Studies based on both a barotropic model and on the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Mark 3 general circulation model (GCM) are performed focusing on 500 hPa and vertically averaged spectra. Results for perpetual January simulations are presented for 32, 62 and 1500 member ensembles within the barotropic model and for 1, 10 and 60 month integrations with the GCM. We find that, with too few realizations in the ensemble or averaging over just one month, the mean kinetic energy has a spurious spectrum with similar power law to the transient kinetic energy but with smaller values by about two orders of magnitude. For larger ensembles or longer averaging periods, the mean kinetic energy falls off more rapidly than the transient kinetic energy. Our results lead to the conclusion that mean kinetic energy spectra based on just one month of data, such as reported in the literature, most recently by Boer (2003), are dominated by sampling errors at the small scales.

Résumé
Nous examinons les erreurs d'échantillonnage dans l'estimation aux petites échelles des moyennes mensuelles du climat atmosphérique moyen, telles que perçues dans l'énergie cinétique moyenne. Nous analysons les relations existant entre l'énergie cinétique moyenne et transitoire à petite échelle dans l'atmosphère et dans les simulations du flux atmosphérique. Nous expliquons comment l'estimation de la moyenne dépend du nombre de réalisations ou de la durée de la période des données. Nous effectuons nos analyses en nous basant à la fois sur un modèle barotrope et le modèle de circulation générale (MCG) Mark 3 du Commonwealth Scientific and Industrial Research Organisation (CSIRO), en nous concentrant sur les spectres à 500 hPa et moyennés verticalement. Nous présentons les résultats de simulations en janvier perpétuel pour des ensembles de 32, 62 et 1500 membres dans le modèle barotrope et pour des intégrations de 1, 10 et 60 mois avec le MCG. Nous trouvons qu'avec trop peu de réalisations dans l'ensemble ou en établissant la moyenne pour un seul mois, l'énergie cinétique moyenne affiche un spectre faux, avec une loi de puissance similaire à celle de l'énergie cinétique transitoire mais avec des valeurs plus faibles par environ deux ordres de grandeur. Pour les plus grands ensembles ou les plus longues périodes de calcul de moyenne, l'énergie cinétique moyenne diminue plus rapidement que l'énergie cinétique transitoire. Nos résultats mènent à la conclusion que les spectres d'énergie cinétique moyenne basés sur les données d'un seul mois, comme ceux présentés dans les études spécialisées, et tout récemment par Boer (2003), sont dominés par des erreurs d'échantillonnage aux petites échelles.

Atmosphere-Ocean 47-2 Paper Order

AO-1002
Climate Trends in a Seasonal Forecasting System
by G. J. BOER

OC-308
An Examination of Mixed Layer Sensitivity in the Northeast Pacific Ocean from July 2001 - July 2005 Using the General Ocean Turbulence Model and Argo Data

by Jennifer M. Jackson, Paul G. Myers and Debby Ianson

AO-921
Application of Canadian Weather Radar Data to Plant Disease Management Schemes in Southern Ontario

by T.L. Rowlandson, T.J. Gillespie and R.P. Ford

AO-1004
Sampling Errors in Estimation of the Small Scales of Monthly Mean Climate

by TERENCE J. O'KANE, JORGEN S. FREDERIKSEN and MARTIN R. DIX

Regional Weather 2008 Highlights

by David Phillips

Ontario: Highway 400 Wrecking Yard
On January 20, a highly localized squall turned Highway 400 north of Toronto into a parking lot of twisted metal, trapping several people in their vehicles in bitter cold. More than 100 vehicles were involved in chain-reaction accidents caused by blinding, wind-whipped whiteouts. It was snowing so hard that conditions resembled dense fog. Dozens of people were injured in the crashes, but no-one was killed, in part because poor visibility had already forced drivers to slow down. Buses were brought in to remove shivering folks stuck in sub-zero temperatures that were made even colder by fierce winds.

Ontario: Thunder Bay Thunderstorm
A cluster of thunderstorms churned through Thunder Bay and surrounding area on June 6, dumping between 70 and 80 mm of rain. Several communities were left in a state of chaos when portions of highways and secondary roads were washed away, rendering them inaccessible and forcing a state of emergency to be declared. Nearly $2 million in damages occurred to roads and other infrastructure. The day's downpour threatened the single-day record for June, but was far off the all-time 24-hour drenching of 131.2 mm. June's total rainfall in Thunder Bay amounted to a record 194.4 mm; normal is 85.7 mm. Geraldton also had a new June record of 148 mm compared to a normal of 86 mm.

Ecological Climatology
Concepts and Applications

by Gordon Bonan

(2nd edition 2008) Cambridge University Press
Hardback, $180, 978-0-521-87221-8
Paperback, $80, 978-0-521-69319-6
550pp, 30 chapters

Book reviewed by Ted Munn[1]

Summary: I haven't read the first edition (2002) of this book but the second edition is highly recommended for students in the atmospheric sciences and physical geography; and for reference libraries.

Overview of the text: The book is subdivided into seven parts, each part being further subdivided into from 2 to 6 chapters, a total of 30 chapters. Each chapter begins with an italicized summary, which would be useful to students coming to the subject for the first time.

The titles of the seven Parts give a good idea of the book's contents:

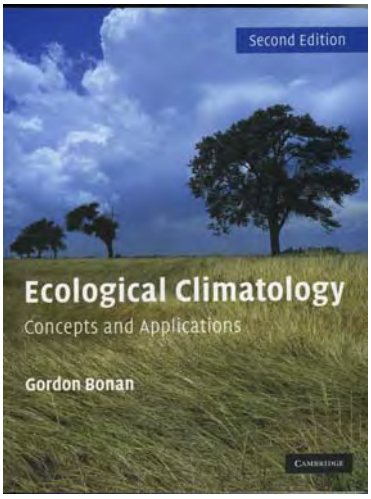
Part I: The Earth System
Part II: Global Physical Climatology
Part III: Soil Processes
Part IV: Hydrometeorology
Part V: Biometeorology
Part VI: Terrestrial Plant Ecology
Part VII: Terrestrial Forcings and Feedbacks

The encyclopaedic nature of the book means that I can only comment in the most general terms (that I was favourably impressed) in this review, adding a few personal specifics:

● I was looking for a discussion of the rapid disapperance of a snow cover in Alberta during a Chinook wind. This cannot be estimated in a simple way. How much energy is used to melt the snow, and how much to evaporate the underlying melting snow cover?

● The discussion of downslope, upslope and valley wind circulations seems to be incomplete, or at least not well organized.

● In the forest management field, the question often arises as to whether to clear-cut, strip cut, or cut the forest in squares. One of the factors to be considered is whether the freshly planted seedlings will regenerate the forest, or whether the land will never recover due to the formation of frost hollows.



● If I had written this book, I would have added a final chapter on "Applications of Ecological Climatology to Environmental Impact Assessments". In many such cases, a climatologist or physical geographer should be included as a member of the assessment team, or as an advisor to the public interest team. If I could only add a chapter if I were to delete another one, I would eliminate Chapter 14 (Turbulent Fluxes), which is too technical for the intended readership.

● I think that a glossary should have been added, considering the wide-ranging list of topics covered.

Concluding on a positive note, I thoroughly approve of the "review questions" at the end of each chapter. Even in the first chapter before the author has hit his stride, the six questions are stimulating. As an example,

In a climate with cold winters and hot summers, an architect designs a house so that the main living space faces due east. Large windows along the east wall promote winter solar heating. What can be done to mitigate excessive solar heating in summer?

I would, however, add a further question: *Why was the house designed so that the main living space faced east?*

Finally, I congratulate Cambridge University Press on the quality of their workmanship in bringing this manuscript to publication.

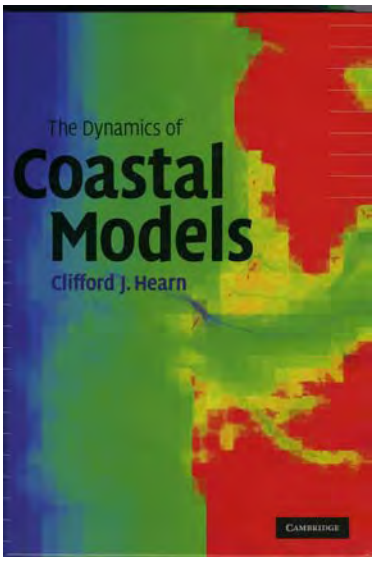
[1] University of Toronto, CMOS Member, Toronto Centre

The Dynamics of Coastal Models

by Clifford J. Hearn

Cambridge University Press, 2008
ISBN 978-0-521-80740-1, pp.488, Hardback, US$100.

Book reviewed by Marek Stastna[2]



Clifford Hearn's book sets out to introduce the modeling of various hydrodynamic processes in the coastal ocean from an elementary point of view, mostly from an analytical point of view. The author states at the outset that little mathematics beyond elementary calculus is required and indeed I believe it is possible to understand essentially all of the nomenclature and equations in the book with only the occasional reference to a comprehensive calculus textbook. The book consists of 12 Chapters that vary in theme and consistency. Chapters 1-5 lay out the basics, introduce some limited aspects of hydrodynamics and discuss several basic solutions (e.g. wind blowing over a basin of irrotational fluid). Chapter 6 discusses tides from a very elementary point of view and Chapter 7 lays out the author's point of view on mixing. Chapters 8-12 consist of assorted topics including stratification (from a box model point of view), the dynamics of partially mixed estuaries, aspects of coral reef dynamics and sediment dynamics.

While the themes are rather far-ranging and really a collection of personally chosen topics by the author, one could pin-point several overarching themes: the utility of box and one-dimensional models; scalings based on eddy viscosity models of the mixing length type; and model analysis based on dominant balance in the governing equations (without any asymptotic analysis per se). As with most Cambridge University Press books I have read, the typeset is easy to read and clear. There are over 150 figures, though these range widely in quality from truly excellent, well annotated expositions to sparing line drawings that border on the unnecessary. The book is well edited for language, though the occasional odd bits of grammar do crop up, especially in the later chapters. At just under 500 pages, the book has plenty of content, though at times I felt that the true strength of the concepts introduced would be made more clear with a few well chosen case studies that used more complex, preferably open source, numerical models. The book is also fairly reasonably priced ($120 or so depending on the vendor)!

I must admit I was very excited to get my hands on this book and indeed have found parts of it extremely interesting and informative to read. Having said this, I am not sure whom I would suggest as a target audience. The book does little in the way of systematic reduction of equations, making it impossible to use for a mathematics or physics course, and I found some of the omissions to be rather glaring. For example, the standard example of counter gradient transport by large eddies is never discussed, nor is there a discussion of turbulence theories, or coherent structures. Even more surprising was the lack of a serious discussion of internal gravity waves which are ubiquitous in both coastal seas and lakes. I also found it difficult to believe that the book provides only listings of Matlab code (it is possible the codes are somewhere online though in about an hour of searching I was unable to find them). As such, the book would prove difficult to use for a numerically-intensive course. Furthermore, there are no exercises at the end of chapters. Perhaps the ideal manner in which to use the book would be as part of a reading course in which a graduate student or senior undergraduate could find his/her way to topics of personal interest. Such an approach would bring out the uniqueness of the book, which, in my opinion, lies in the casual and open manner it discusses the nonlinear damping terms (bottom drag especially) common to coastal models. Indeed much of the charm of the book lies in the personal selection of interesting, and at times idiosyncratic, topics made by the author.

I have been waiting for some years to find a successor to the venerable, asymptotic analysis-based tomes from which I was educated, that would be relevant to the hydrodynamics of coastal oceans and lakes. This is not such a book. It is, however, a very interesting read and I recommend spending a bit of time with it to anyone interested in both the hydrodynamics of coastal seas and the implications of this hydrodynamics for sediment motion and biology.

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[2] Department of Applied Mathematics, University of Waterloo, Ontario, Canada

The Asian Monsoon: Causes, History & Effects

by Peter D Clift and R Allan Plumb

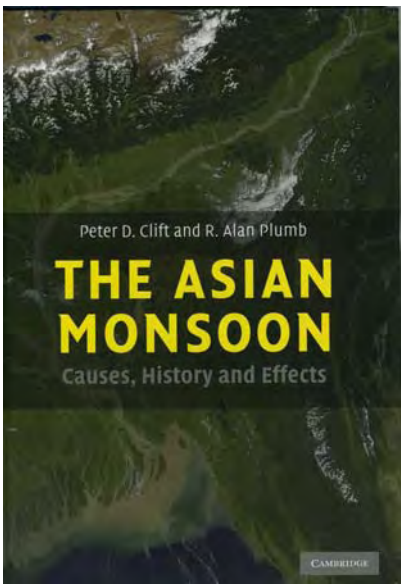
Cambridge University Press ISBN 978-0-521-84799-5:
270 pp. 2008 hardback US$150

Book Reviewed by Madhav Khandekar[3]

"*The Asian monsoon is one of the most dramatic climatic phenomena on earth today, with far-reaching environmental and societal effects. Almost two thirds of humanity live within regions influenced by the monsoon. Monsoon strength and variability have been and will continue to be crucial to the past and future prosperity of the region*".

The preface of this book opens with some dramatic phrases about the Asian monsoon, which indeed impacts two thirds of the world's humanity today, or about 4 billion people living in Asia from Pakistan in the northwest to Indonesia in the southeast and from the Maldive Islands in the southwest to China in the northeast. The Asian monsoon is the largest seasonal abnormality of the global climate system and exerts a significant impact on the earth's climate system. In the context of present debate on global warming and climate change, it is imperative that a comprehensive understanding of this fascinating and complex climate system must be developed before any meaningful assessment of present and future climate change can be made.

The Asian Monsoon presents a primarily paleo-climatic perspective on the Asian monsoon. The authors, Clift & Plumb (both affiliated with the Massachusetts Institute of Technology in USA), are experts in the area of monsoon climate and have presented a comprehensive account on the evolution and controls of the Asian monsoon over tectonic and orbital time-scales in the first five chapters. The authors have analyzed a large number of research publications on a variety of paleo-oceanographic data to document monsoon evolution and variability over time-scales from several tens of million years BP (Before Present) to just a few thousand to a few hundred years BP. The final chapter of the book deals with the late Holocene (about 5000 y BP) monsoon and human society, which provides an interesting account of social and cultural development of human societies over Asia with particular reference to the Indus Valley civilization (~7000 y BP) over the Indian subcontinent and the Dadiwan culture (~7500 y BP) from the Yellow River valley in China. This chapter also discusses monsoon development over the last 1000 years with reference to monsoon variability and political development and changes, especially over India. The book ends with a brief discussion on future evolution of the monsoon in the context of present debate on climate change, this discussion being derived primarily from the 2001 climate change documents prepared by the IPCC (Intergovernmental Panel on Climate Change).



The first chapter of the book presents the meteorology of the monsoons, with relevant schematics and discussions on the sub-tropical jet stream, the Hadley Cell in relation to the tropics, the ITCZ (Inter-tropical Convergence Zone) and the impact of the Indian Ocean on monsoon circulation. It was puzzling and disappointing to find no reference to the Tropical Easterly Jet (TEJ), an important and persistent jet stream over the Peninsular India (with peak winds of up to 100 knots at about 100 hPa) which owes its existence to the reversal of north-south temperature gradient over south Asia due to presence of the Tibetan Plateau and its significant warming during summer months in relation to the 'cooler' Indian Ocean in the south. It is this TEJ which makes the Asian and in particular the Indian monsoon complex and a fascinating research topic today.

The next two chapters discus the controls and evolution of the Asian monsoon on tectonic time-scale, from several tens of M y BP to a few hundred years BP. Chapter 2 discusses the importance of the Tibetan Plateau together with the Himalayan mountains (highest mountain chains in the world) on the strength and intensity of monsoons. The Tibetan Plateau is now believed to have evolved at around 45 to 50 M y BP and its importance in controlling the monsoon and rainfall intensity over India, central Asia and over Loess Plateau (in central China) is discussed at length. Once again, it is disappointing to see a complete absence of any reference to TEJ, which has been shown (in many studies in the 1960s by researchers in the India Meteorological Department) to exert an important control on the monsoon circulation and intensity, over the Indian subcontinent and also over parts of northern Africa where the TEJ extends during summer months. In chapter 3, the evolution of Asian monsoon over glacial and interglacial intervals is presented. A large amount of data from ocean floors (e.g., Arabian Sea sediments), weathering histories in the Himalayas and eolian dust records are analyzed to

[3] Madhav Khandekar is a former research scientist from Environment Canada. He is presently on the editorial board of the international Journal *Natural Hazards* and was an Expert Reviewer for the 2007 IPCC climate change documents.

establish monsoon variability over several M years and in particular the strengthening of the summer monsoon about 8 M y BP due to the Tibetan Plateau. In chapter 4 the evolution of monsoon over orbital time-scales (from a few thousand to hundred thousand years or more) is investigated using a variety of data, e.g. cave data, lake records, eolian data, etc. The earth's orbit exhibits three types of long-term variations, namely eccentricity (~ 100,000 y), obliquity (~ 41000 y) and precession (~ 21000 y) and this also reflects in monsoon strength which varies on the 21, 40 and 100 thousand year time-scales that control periods of glacial advances and retreats. Chapter 5 discusses the erosional impact of the Asian monsoon and how this may have impacted the tectonics of the Asian mountain ranges. The chapter concludes that the monsoon circulation and intensity had a powerful influence on the erosion and weathering of Asia over long and short geological times during the Cenozoic (~ 70 M y) and this erosional impact has resulted in an important coupling between the climate and the tectonic evolution of the mountains.

The last chapter discusses the late Holocene monsoon variability and how this has shaped the human society and culture over Asia. The authors employ records derived from ice cores, spelothems, lakes and peat bogs to assess monsoon strengths since about 8000 y BP to the present. The monsoon strengthening, following the very cold period of Younger Dryas (~ 11000 y BP) allowed vegetation to spread and diversify and this, according to the authors, may have led to the development of the Harappan and Mohenjo-daro culture between 9000 to 6000 y BP. Extensive remains of this culture are found in the northwest parts of India (which is now part of Pakistan) along the Indus River valley and in particular along the River Saraswati, referred to many times in the Hindu scriptures, *The Rig Veda,* written about 6000 y BP. The Saraswati River, which was a major river then, has all but disappeared today, most certainly due to drying of the monsoonal climate after 4200 y BP. The drying of Asian monsoon after 5000 y BP is also inferred from sediment records in northeast China where the Dadiwan culture flourished between 8000-6000 y BP when the monsoon rains were abundant. The monsoon variability of the last 1000 years is discussed in conjunction with major political and historical development of Asia, with particular reference to the rise and fall of the Moghul Empire in south Asia (1500-1700 AD). The last section of this chapter deals with the possible impact of present climate change on future monsoon circulation and intensity. This discussion appears to be strongly influenced by the IPCC (2001) projections of significant melting of the Greenland Ice cap leading to an abrupt weakening of the 'North Atlantic heat conveyer belt' and this in turn could lead to a weakening of the Asian monsoon. Studies published in the last five years do not support such scenarios. A study by Kripalani et al (2003 *Natural Hazards June 2003)* shows that the Indian monsoon, and by extension the Asian monsoon, while exhibiting decadal variability with a 30-year cycle, is not influenced by global warming, and the recent 2007 IPCC documents on climate change suggest only a small change (less than 5%) in monsoon intensity over the next 25 to 30 years. Another recent study (Latif et al *J of Climate September 2006*) concludes that the recent observed weakening of the MOC (Meridional Overturning Circulation) in the North Atlantic is part of natural variability and not a result of global warming. Finally, there is considerable uncertainty in projections of future melting of the Greenland Ice cap with publication of several recent studies suggesting that the future warming of the earth's climate due to a doubling of (human-added) atmospheric carbon dioxide may only be about 1°C or so.

In summary, this is a comprehensive book for someone whose interest is in the climate history of the Asian monsoon over last several million years. The Asian monsoon is perhaps the most complex feature of the earth's climate system and per a recent paper (Shukla *Science October 2007*) the present climate models cannot adequately simulate the monsoon intensity and its inter-annual variability. The Indian and Asian Monsoon have witnessed large-scale droughts and floods in the past and will continue to do so, global warming notwithstanding. An important research area at present is the study of inter-annual variability of Asian monsoon and prediction of future droughts and floods. Such a study and the operational knowledge derived from it may enable many Asian countries to develop suitable adaptation measures so as to adjust to the vagaries of future monsoons.

Mountain Weather and Climate

by Roger G. Barry

Cambridge University Press, 2008, 506 pages
Paperback $80.00, Hardback US$160.00

Book reviewed by Dov Richard Bensimon[4]

The first word that comes to mind in reading this book is "comprehensive". This book aims to be a reference textbook when it comes to mountain meteorology, and it accomplishes this feat quite convincingly. The author draws on countless studies in the field to cover essentially every angle of the topic one can think of. This is done so, in an organized and logical fashion, making the book relatively easy to follow.

Although the author highlights the findings of the various studies he refers to in the text, he also provides exhaustive bibliographies at the end of each chapter, should the reader want even more information on a given specialized topic. The book is quite well presented, with abundant graphics taken from various sources, but all of which are shown in a relatively uniform style and presentation.

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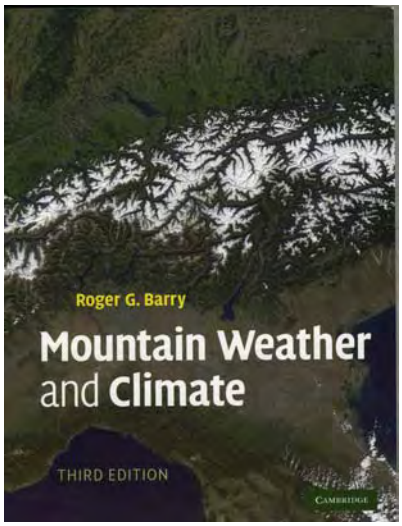
[4] Environment Canada
2121 route Transcanadienne, Dorval, QC

It should be noted that this is the third edition of this textbook. Considering the scope of material presented, this should not be surprising, since compiling such a text takes a considerable amount of time. The update is complete, though, as many references to articles published as late as 2007 are made in the text, including the fourth assessment report of the Intergovernmental Panel on Climate Change (IPCC).



The variety of sources of information that the author refers to is equaled by the variety of locations cited to illustrate various meteorological effects related to topography. Examples are taken from every continent, including Antarctica. Studies cited range from the very practical (e.g. from field studies) to the very theoretical (e.g. theories of flow patterns).

The book is broken down into seven major sections. The first is a general introduction to the topic and includes a history of studies of mountain weather. The author then examines geographical controls of mountain meteorological elements, circulation systems specific to mountains and climatic characteristics of mountains. These chapters cover topics that one might expect to find in a comprehensive textbook on mountain weather. It is the content of the following chapters, however, that really sets this book apart.

An entire section is devoted to regional case studies, covering the breadth of the entire planet. The author systematically covers major mountain chains on each continent, from the very high (e.g. the Himalayas) to the more modest in elevation (the maritime mountains of Great Britain). The book abounds in details where appropriate, as illustrated by the section on the Andes. It is subdivided in three according to differing climates: the equatorial and tropical Andes, the dry subtropical Andes and the wet Andes.

The chapter on bioclimatology is a good example of the multi-disciplinary approach used in the book. Essentially, this discusses the effect of various climates on human beings. Physiological factors such as oxygen deficiency are examined as well as how the body reacts to try and deal with this type of constraint. An interesting study is mentioned in which the authors attempted to develop an index of "well-being" as a function of pressure fluctuations in mountain environments, although this link was never proven and remains hypothetical. This chapter also contains a section on air pollution in mountain regions.

The author was a review editor for two chapters in the most recent IPCC report, Climate Change 2007. As a result, he is well placed to discuss changes in mountain climates, the subject of the final chapter of the book. He first presents evidence of this change, as seen in temperature trends, precipitation, snow pack depths and coverage, and proxy data (tree ring data, shifts in locations of vegetation along mountain flanks). He proceeds to discuss the significance of this change. Examples given are all in mountain terrains and include impacts on hydro-electric power generation as a result of diminished snow packs as well as impacts on the ski industry.

This book could arguably be the magnum opus of Prof. Barry, though his publications abound. It makes for an excellent textbook for a university course in the field of mountain meteorology, as well as being a reference for any meteorologist working in the domain.

Climate Extremes and Society

Edited by Henry F. Diaz and Richard J. Murnane

Cambridge University Press, Cambridge, UK,
ISBN 978-0-521-87028-3 Hardback – 340pages
First published 2008 - $140.00

Book Reviewed by Peter J. Lewis[5]

Climate Extremes and Society is essentially a review volume divided into two sections: one examining the evidence for recent and projected changes in extremes of weather and climate events, and the other assessing the impacts of these events on society and on the insurance industry. The book is targeted at scientists, engineers and policymakers who have an interest in the effects of climate extremes and society. Each chapter starts with a condensed summary – a useful aid in assessing its relevance for a particular interest.

In Section 1 – "Defining and Modeling the Nature of Weather and Climate Extremes", the opening chapter by David Stephenson makes a brave attempt at the challenge of defining, classifying and diagnosing extreme events by presenting a relatively simple framework. He includes a definition for the term "High-Impact event/weather", a term whose interpretation continues to challenge MSC managers and forecasters. According to Stephenson "High-impact events" are severe events that can be either short-lived weather systems (e.g. severe storms) or longer-duration events such as blocking episodes which can lead to heat

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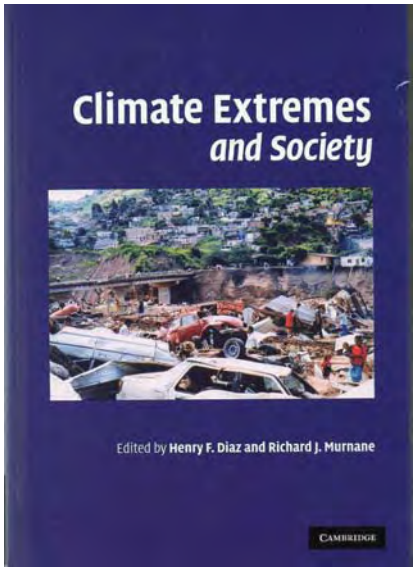
[5] Meteorological Service of Canada
Atlantic Region, Dartmouth, NS

waves and droughts". He emphasises the frequent over-simplified classification of extreme events by excedance of just one variable where, in fact, most extreme events are multi-dimensional in nature.



The remaining six chapters in Section 1 are a mixture of reviews which attempt to establish the current and historic pattern of extreme events and those which try to incorporate future predictions of extreme events under various climate change scenarios. For example, Brooks and Dotzek in "The Spatial Distribution of Severe Convective Storms and an Analysis of their Secular Changes", discuss the problems caused by differences in reporting severe convection from country to country and suggest an approach using observations of larger scale environments for severe convective storm formation as well as the need to develop formal systems of collecting severe thunderstorm reports. As an example of future projections of extreme events, Tebaldi and Meehl in "Beyond Mean Climate Change: What Climate Models Tell Us About Future Climate Extremes", outline attempts at analyzing output from atmosphere-ocean GCMs in order to assess their ability to simulate current extremes in order to infer future extremes. They looked at ten different indicators, describing aspects of extreme temperature and precipitation events for current climate and for the twenty-first century under various emissions scenarios. Their findings indicate a tendency towards warmer temperature extremes and an intensification of precipitation especially in the high-latitudes of the Northern Hemisphere.

In Section 2 – The Impacts of Weather and Climate Extremes, seven of the eight chapters are concerned with financial /societal impacts. The concerns of the insurance industry in being able to better predict and prepare for catastrophic losses predominate. Dlugolecki gives "An Overview of the Impact of Climate Change on the Insurance Industry", claiming from evidence drawn from the United Kingdom that arguments can already be made that climate change is already affecting the risks. However, Miller, Muir-Wood and Boissonade in "An Exploration of Trends in Normalised Weather-Related Catastrophe Losses", conclude when losses are "normalised" for asset values, that there is insufficient evidence to claim a statistical relationship between global temperature increase and normalised catastrophe losses. Not surprisingly, losses and potential losses associated with hurricanes and hurricane forecasting in the US are also prominent. For example, one chapter by Muir-Wood and Grossi is devoted to "The Catastrophe Modelling Response to Hurricane Katrina". The final chapter by Murnane and Knap provides an overview and history of "The Risk Prediction Initiative (RPI): A Successful Science-Business Partnership for Analyzing Natural Risk Hazard". The RPI is part of the Bermuda Institute for Ocean Sciences and was formed following the unexpectedly large losses caused by Hurricane Andrew in 1992.

Climate Extremes and Society will likely not offer the extreme events/climate change specialist any new material that cannot be found elsewhere in the literature; however, it provides a good synthesis of the "state-of-the-art" on weather and climate extremes research and their societal impacts. The inter-disciplinary approach will be of benefit to policymakers, risk managers, city planners and other non-specialists. One minor criticism would be that a few of the "chapters" seem to be too narrow in focus and would serve better as journal articles rather than material for a review volume.

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

Lagrangian Analysis and Prediction of Coastal and Ocean Dymanics, Edited by Annalisa Griffa, A.D. Kirman, Jr,, Arthur J. Mariano, Tamay Özgökmen, and Thomas Rossby, Cambridge University Press, ISBN 978-0-521-87018-4, 2007, Hardback, US$160.

An Introduction to Atmospheric Thermodynamics, by Anastasios A., Tsonis, Cambridge University Press, ISBN 978-0-521-69628-9, 2007, pp.187, US$55.

Ebb and Flow: Tides and Life on our Once and Future Planet, by Tom Koppel, The Dundurn Group, Toronto, Canada, ISBN 978-1-55002-726-6, Paperback, pp.292, CDN$26.99.

The Dynamics of Coastal Models, by Clifford J. Hearn, Cambridge University Press, ISBN 978-0-521-80740-1, 2008, pp.488, Hardback, US$100.

Basics of the Solar Wind, by Nicole Meyer-Vernet, Cambridge University Press, ISBN 978-0-521-81420-1, 2008, pp.463, Hardback, US$132.

Mesoscale Dynamics, by Yuh-Lang Lin, Cambridge University Press, ISBN 978-0-521-80875-0, 2008, pp.630, Hardback, US$165.

Chemical Oceanography and the Marine Carbon Cycle, by Steven Emerson and John I. Hedges, Cambridge University Press, ISBN 978-0-521-83313-4, 2008, pp.366, Paperback, US$90.

An Introduction to Ocean Turbulence, by S. A. Thorpe, Cambridge University Press, ISBN 978-0-521-67680-9, 2007, pp.240, Paperback, US$60.

The Asian Monsoon, Causes, History and Effects, by Peter D. Clift and R. Alan Plumb, Cambridge University Press, ISBN 978-0-521-84799-5, pp.270, Hardback, US$150.

Large-Scale Disasters, Prediction, Control and Mitigation, Edited by Mohamed Gad-el-Hak, Cambridge University Press, ISBN 978-0-521-87293-5, pp.576, Hardback, US$200.

Aquatic Ecosystems: Trends and Global Perspective, Edited by Nicholas V.C. Polunin, Cambridge University Press, ISBN 978-0-521-83327-1, pp. 482, Hardback, US$160.

Physics of the Earth, by Frank D. Stacey and Paul M. Davis, Cambridge University Press, ISBN 978-0-521-87362-8, 4th Edition, pp. 532, Hardback, US$80.

Quantitative Modeling of Earth Surface Processes, by Jon D. Pelletier, Cambridge University Press, ISBN 978-0-521-85597-6, pp. 295, Hardback, US$80.

Drinking Water Quality: Problems and Solutions, by N.F. Gray, Cambridge University Press, ISBN 978-0-521-70253-9, 2nd Edition, pp. 520, Paperback, US$70.

Ecological Climatology: Concepts and Applications, by Gordon B. Bonan, Cambridge University Press, ISBN 978-0-521-69319-6, 2nd Edition, pp. 550, Paperback, US$80.

Beach and Dune Restoration, by Karl F. Nordstrom, Cambridge University Press, ISBN 978-0-521-85346-0, pp. 187, Hardback, US$140.

Applied Geophysics in Periglacial Environments, Edited by C. Hauck and C. Kneisel, Cambridge University Press, ISBN 978-0-521-88966-7, pp. 240, Hardback, US$140.

Hydroclimatology, Perspective and Applications, by Marlyn L. Shelton, Cambridge University Press, Hardback, 2009, ISBN 978-521-84888-6, pp.426, US$90.00.

Managing and Transforming Water Conflicts, by Jerome Delli Priscoli and Aaron T. Wolf, International Hydrology Series, Cambridge University Press, Hardback, 2009, ISBN 978-0-521-63216-4, pp.354, US$140.00.

Estuaries, Dynamics, Mixing, Sedimentation and Morphology, by David Prandle, Cambridge University Press, Hardback, 2009, ISBN 978-0-521-88886-8, pp.236, US$130.00.

Principles of Snow Hydrology, by David R. DeWalle and Albert Rango, Cambridge University Press, Hardback, 2009, ISBN 978-0-521-82362-3, pp.410, US$150.00.

Applied Geostatistics with SGeMS, A User's Guide, by Nicolas Remy, Alexandre Boucher and Jianbing Wu, Cambridge University Press, Hardback, 2009, ISBN 978-0-521-51414-9, pp.264, US$99.

Global Warming, The Complete Briefing, by John Houghton, Cambridge University Press, Paperback, 2009, ISBN 978-0-521-70916-3, pp.438, US$59.00.

Atmospheric Thermodynamics, Elementary Physics and Chemistry, by Gerald R. North and Tatiana L. Erukhimova, Cambridge University Press, Hardback, 2009, ISBN 978-0-521-89963-5, pp.267, US$70.00.

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

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New Doppler Radar for 2010 Winter Games

VANCOUVER, BC -- March 28, 2009 -- The Honourable Jim Prentice, Minister of the Environment, today announced a new Doppler radar, the final piece of technology installed to provide weather forecasting for the 2010 Winter Games.

“Since 2003, Environment Canada has been training and preparing to deliver weather services for the Games,” said Minister Prentice. “With this final installation of the new Doppler radar, we are ready to provide the real-time weather information that 2010 decision-makers need to keep the Olympics safe and fair”.

“Obtaining accurate information about the complex weather in south-western B.C will enhance the safety and security of the Games,” said the Honourable Gary Lunn, Minister of State (Sport). “This new system will also help athletes prepare for weather conditions during competitions”.

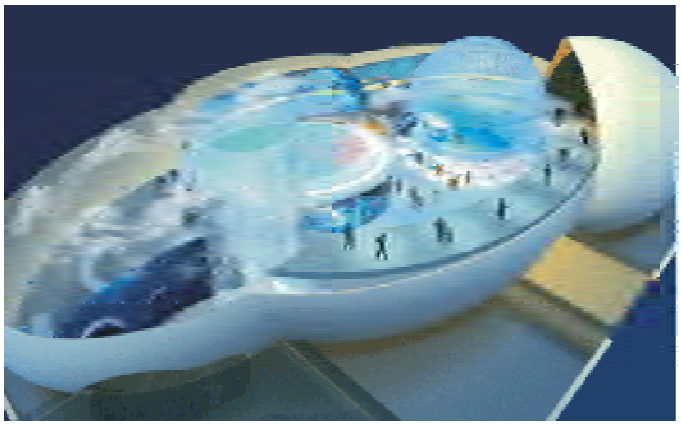
March 28, 2009, Vancouver, B.C. Rodger Wu of Environment Canada Pacific Region Storm Prediction Centre shows Environment Minister Jim Prentice the images transmitted by the Doppler radar. Photo credit: Environment Canada, 2009.

The Doppler radar provides Environment Canada’s forecasters with important information about the motion and structure of weather systems in the Callaghan Valley, on Whistler Mountain and along the Sea-to-Sky Highway. The radar, located just outside of Whistler, will help determine if and when a storm could cause severe weather that will impact the Games or safety of the public.

For the 2010 Winter Games, the Government of Canada has committed $13.4 million to provide weather services for Games operations, leadership on Games sustainability and environmental assessments of Olympic venues. Hosting the 2010 Olympic and Paralympic Winter Games is a unique opportunity for Canada to showcase its accomplishments and innovations to the world, while realizing sustainable environmental, social, cultural and economic benefits across the country and for all Canadians.

WMO Pavilion at World Expo 2010

Construction has begun on the WMO pavilion at the World Expo 2010 site in Shanghai, China. With floor space of 2 000 m^2, it will be the first meteorological pavilion in the 157-year history of the Expo.



Expo visitors will receive updated weather forecasts free on their mobile phones. There will also be weather updates on a large screen in front of the pavilion and on the pavilion’s Expo Website.

Expo 2010 will be held from 1 May to 31 October 2010, a season of plum rain, flood and typhoons in Shanghai, with constantly changing weather, ranging from hot sunshine to heavy thunderstorms.

Reference: WMO Website visited March 9, 2009.

Weather and climate get a supercomputing boost

Two new supercomputers ordered by the Bureau of Meteorology and The Australian National University (ANU) will deliver 12 times the power of previous models, ensuring Australia is at the forefront of international weather forecasting and climate modelling.

The Bureau and ANU have selected Sun Microsystems to deliver two state-of-the-art supercomputers capable of processing the vast amount of data needed to meet the needs of the community in forecasting extreme weather events and climate.

The new supercomputers will provide an interoperable computing environment capable of delivering the processing capability needed to model complex weather and climate dynamics. They will be located in Canberra and Melbourne.

Acting Director of the Bureau of Meteorology, Dr Neville Smith said the time is right for a new supercomputer

capable of further improving weather prediction as well as providing Australian climate researchers with the processing power needed to undertake more demanding climate forecasts.

"Together the new supercomputers will provide the computer power needed to develop the Australian Community Climate and Earth System Simulator – a new project to tie together weather forecasting as well as climate and ocean forecasts."

ANU Vice-Chancellor Professor Ian Chubb said that building capacity for the future research needs of the nation is critically important and that he was pleased the climate and earth systems sciences research community would be better able to rise to national challenges with the new supercomputers. He also remarked that working with the Bureau, CSIRO and others to this end had been very constructive.

"For more than two decades ANU has supported computationally-intensive research across national research communities. The new acquisition will ensure that Australia becomes internationally competitive again in this important area, lifting capability by a factor of 10. In addition to climate modelling and weather prediction, the renewed capability will serve a wide range of other cutting edge research for the nation."

Funding for the ANU-led National Collaborative Infrastructure Project (NCI), comes primarily from ANU, CSIRO and the Commonwealth Government's National Collaborative Research Infrastructure Strategy (NCRIS). The new supercomputers are expected to be operational in 2009.

Reference: WMO Website visited March 19, 2009.

Rob W. Macdonald, Chair of CNC/SCOR

Rob Macdonald will become the Chair of the Canadian National Committee (CNC) of the Scientific Committee on Oceanic Research (SCOR) at its Annual General Meeting on May 31, 2009. Robie is a Research Scientist at DFO's Institute of Ocean Science in Sidney, B.C. He is internationally recognized for his work on contaminant pathways in Pacific and Arctic aquatic systems. Dr. Macdonald directs interdisciplinary programs to study the environmental pathways of contaminants including their delivery, transport and elimination from aquatic systems. The focus of his research has been on contaminant transport in the context of oceanographic biogeochemical processes.

Robie received his PhD from Dalhousie University in 1972. He has published 145 papers in refereed journals, 30 papers in refereed proceedings/book chapters, over 50 technical/data reports and one co-edited book (The Organic Carbon Cycle in the Arctic Ocean). He has participated in

Dr. Rob W. Macdonald

over 50 field trips, 29 as chief scientist, 20 to the Arctic Ocean using departmental vessels, icebreakers and ice-capable aircraft. Included amongst his many awards and distinctions, Robie has received the Best Paper award for articles published in Science of the Total Environment during 2004 and 2005, the Miroslaw Romanowski Medal of the Royal Society of Canada (2005), the President's Prize of the Canadian Meteorological and Oceanographic Society (2000) and was inducted as a Fellow of the Royal Society of Canada in 2004. Robie has been an Adjunct Professor at University of Victoria (CEOR), University of Manitoba (Department of Environment and Geography), and professeur invité à l'Institut National de la Recherche Scientifique (Québec). Robie has served on many ocean science committees, most recently as co-Chair of the Canadian IPY Science Review Committee, member of Polar Research Board (United States) of The National Academies (2001-04), member of Canadian Arctic Shelf Exchange Study (CASES) science steering committee (2000-present), member of the Canadian IPY Steering Committee, member of the Continental Margins Task Team, and member of the Canadian National Committee for the Scientific Committee on Oceanic Research (CNC/SCOR) (2003-2007). In this latter capacity, as a member of CNC/SCOR, Robie has helped initiate and maintain many programs, including reviewing new SCOR working group proposals, contributing articles by himself and colleagues to the electronic Newsletter, ensuring updates to the listing of ocean science MSc and PhD theses, providing contributions to the oceanographic historical photo collection, and participating in the CNC/SCOR lecture series as a tour speaker in 2007.

Robie succeeds Gordon McBean as Chair of CNC/SCOR. Gordon will remain on the Committee as Past-Chair.

Source: Canadian Ocean Science Newsletter, No.43, May 2009. Reproduced here with the authorization of the Editor.

Source: "Événements météorologiques marquants par région pour l'année 2008" on page 76 and "Regional Weather 2008 Highlights" on pages 84 and 89 are extracted from Meteorological Service of Canada - Environment Canada - Government of Canada, The Green Lane™ Website , 30 December 2008.

Source: "Événements météorologiques marquants par région pour l'année 2008" en page 76 et "Regional Weather 2008 Highlights" en pages 84 et 89 sont des extraits du Service Météorologique du Canada, - Environnement Canada, Gouvernement du Canada, site web La voie verte[MC], 30 décembre 2008.

CCGS Amundsen 2009 Expedition Plan

Report by Alfonso Mucci[1]

CCGS Amundsen Icebraker

The icebreaker CCGS Amundsen, fresh out of dry dock for repairs, upgrades and scheduled inspections, after spending 15 consecutive months at sea in support of the Circumpolar Flaw Lead (CFL) program and various ArcticNet projects, is being readied for a 6.5 month trip back to the Arctic. The ship is scheduled to leave Quebec City on June 4, 2009 (Leg 1) and will enter the Arctic Ocean in early July through the Bering Strait after travelling through the Panama Canal and a short stopover in Victoria. Since many of the scheduled research activities must be conducted during the ice-free season in the Beaufort Sea, researchers could not wait for the opening of the Northwest Passage. The first scientific leg (Leg 2a) will be carried out between July 16th and 30th by ArcticNet researchers on the Mackenzie Shelf. Moorings will be installed, and water column and sediment sampling will be carried out. The Malina project will be conducted during Leg 2b between July 30th and August 27th. More than 50 stations will be visited during this leg over much of the southern Beaufort Sea. Researchers from the Canadian Arctic GEOTRACES program (described in an earlier CNC-SCOR Newsletter) will share the ship with their ArcticNet colleagues during Leg 3a (August 27 to September 12th). They will work along a single onshore-offshore transect (up to 9 stations) from the Mackenzie Valley to the multi-year ice edge. ArcticNet studies initiated during Leg 2a will be completed during Leg 3b (September 12 to October 8) with moorings being serviced, piston coring and bottom mapping activities. ArcticNet researchers will then travel east for Leg 4 (October 8th to November 12th), servicing moorings in the southeastern Beaufort Sea and Amundsen Gulf, visiting stations along Coronation Gulf, Queen Maud Gulf, McClintock Channel, Parry Channel, Lancaster Sound, Baffin Bay and Davis Strait, as well as a number of inlets and fjords (Scott Inlet, Iqaluit, Nachvak Fjord, Saglek Fjord, Okak Fjord, Anaktalak Fjord) on its way back to Québec City.

Source: Canadian Ocean Science Newsletter, No.43, May 2009. Reproduced here with the authorization of the Editor.

[1] McGill University, Montréal, Québec, Canada

Environmental organizations are pairing up to lay the groundwork for professional certification in meteorology

Calgary, May 8, 2009 - ECO Canada, in collaboration with the Canadian Meteorological and Oceanographic Society (CMOS) and Environment Canada, is constructing the foundation for a professional certification program in the field of meteorology.

The objective of this project is to document the National Occupational Standards (NOS) for meteorological practitioners and better define environmental occupations in meteorology.

The documented NOS will be made available to educational partners for the development of new educational programs and updates to curriculum. It will also be available to practitioners for use in their professional development, and to employers for use in human resource development.

Long-term objectives of the project include:

- Promote recognition of qualifications of meteorological practitioners;
- Facilitate labour market mobility across Canada;
- Guide the development of meteorological-related education and training programs;
- Increase career awareness and opportunities for meteorological practitioners.

As in the past, ECO Canada will develop national occupational standards with the full participation of educational institutions, employers and practitioners to ensure buy-in from both academic and industry partners.

This project is funded by the Government of Canada's Sector Council Program. For more information go to www.eco.ca/meteorology or send your questions to meteorology@eco.ca

Background:
ECO Canada develops programs that help individuals build careers in the environmental field. It also provides employers with resources to find and retain the best environmental professionals and informs educators and governments of employment trends to ensure ongoing prosperity of this growing sector. For more information please visit: www.eco.ca.

New Deputy Minister of Fisheries and Oceans Canada

In February 2009, Prime Minister Steven Harper announced the appointment of Claire Dansereau as Deputy Minister of Fisheries and Oceans Canada (DFO), effective March 2, 2009. She takes on this new role after serving the department as Associate Deputy Minister since January 2008. Before joining DFO, Ms. Dansereau was the Senior Assistant Deputy Minister of Socio-Economic Policies and Regional Operations at Indian and Northern Affairs Canada. Prior to that, Ms. Dansereau was Vice-President and Special Advisor to the President of the Canadian International Development Agency. Before joining the federal Public Service, Ms. Dansereau served as the Executive Director of CUSO. Prior to that, Ms. Dansereau worked for the Government of British Columbia (BC). During her time with the provincial government, she worked as Associate Deputy and then, as Deputy Minister of Transportation and Highways, and as Vice-President of Forest Renewal BC, a crown corporation. Ms. Dansereau's strong background in regional and natural resources management enabled her to work with the BC forest industry and as an environmental policy advisor. Ms. Dansereau holds a Bachelor of Science (Honours) degree in microbiology.

Claire Dansereau

Nouvelle Sous-ministre de Pêches et Océans Canada

En février 2009, le premier ministre Steven Harper a annoncé la nomination de Claire Dansereau au poste de sous-ministre de Pêches et Océans Canada (MPO) à compter du 2 mars 2009. Elle assume ses nouvelles fonctions après avoir occupé le poste de sous-ministre déléguée depuis janvier 2008. Avant d'entrer en fonction au MPO, Mme Dansereau était sous-ministre adjointe principale du Secteur des politiques socio-économiques et des opérations régionales, au ministère des Affaires indiennes et du Nord Canada. Avant cela, elle était vice-présidente et conseillère spéciale auprès du président de l'Agence canadienne de développement international. Avant de se joindre à la fonction publique, Mme Dansereau était directrice exécutive de CUSO. Elle avait auparavant travaillé pour le gouvernement de la Colombie-Britannique. Durant cette période, elle a occupé le poste de sous-ministre déléguée, puis celui de sous-ministre au ministère des Transports et des Routes. Elle a aussi été vice-présidente de Forest Renewal BC, une société d'État. La solide expérience de Mme Dansereau en gestion des ressources naturelles et régionales lui a permis de travailler avec l'industrie forestière de la Colombie-Britannique et de jouer le rôle de conseillère en politique environnementale. Mme Dansereau est titulaire d'un baccalauréat en sciences avec spécialisation en microbiologie.

Mark your Calendar

"Coastal Zone Canada 2010" will be held 25-29 July 2010 in historic Charlottetown, Prince Edward Island. The conference is being hosted by the PEI Department of Fisheries, Aquaculture and Rural Development and held at the University of Prince Edward Island. For more information please visit their web site at: http://www.gov.pe.ca/czc2010/.

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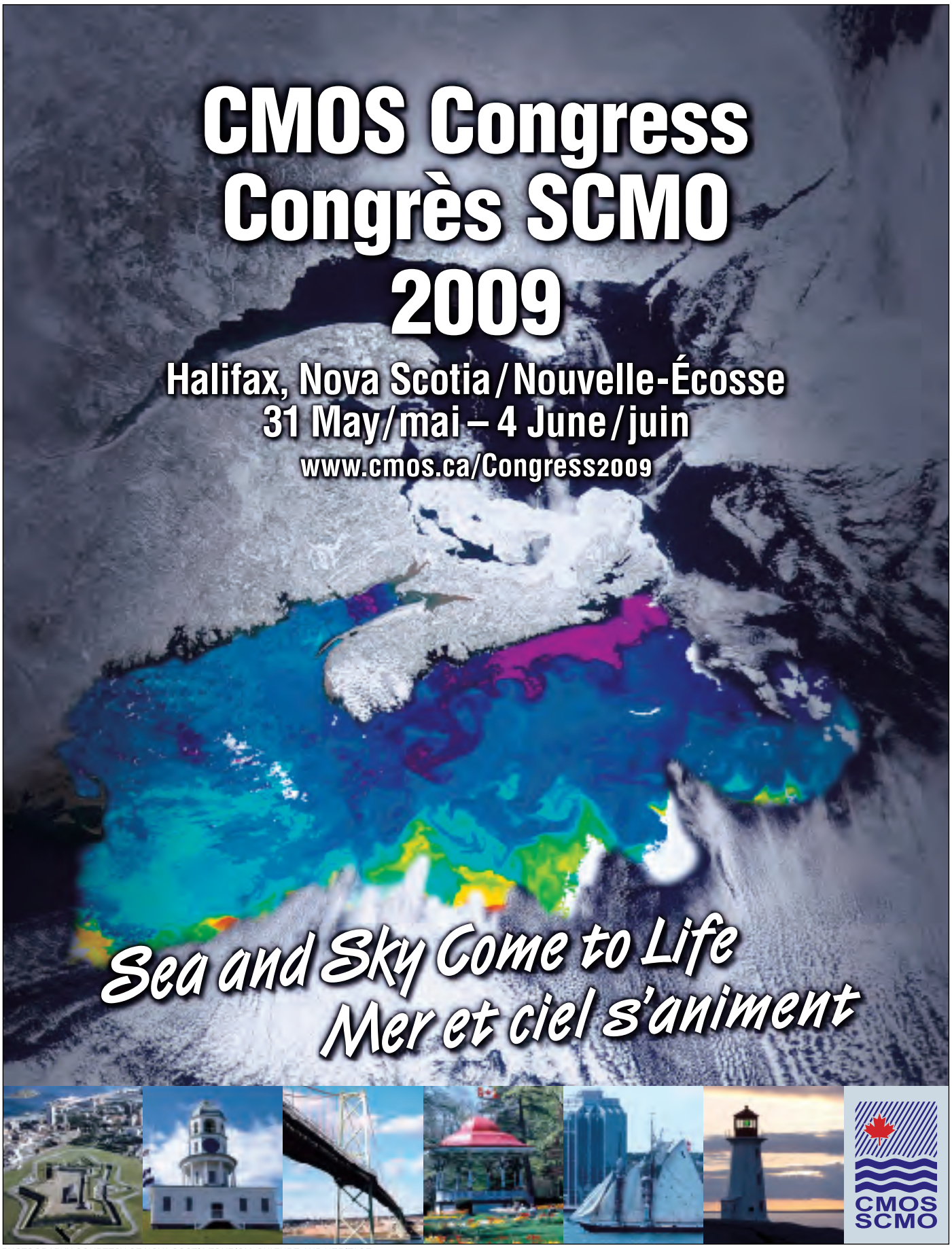

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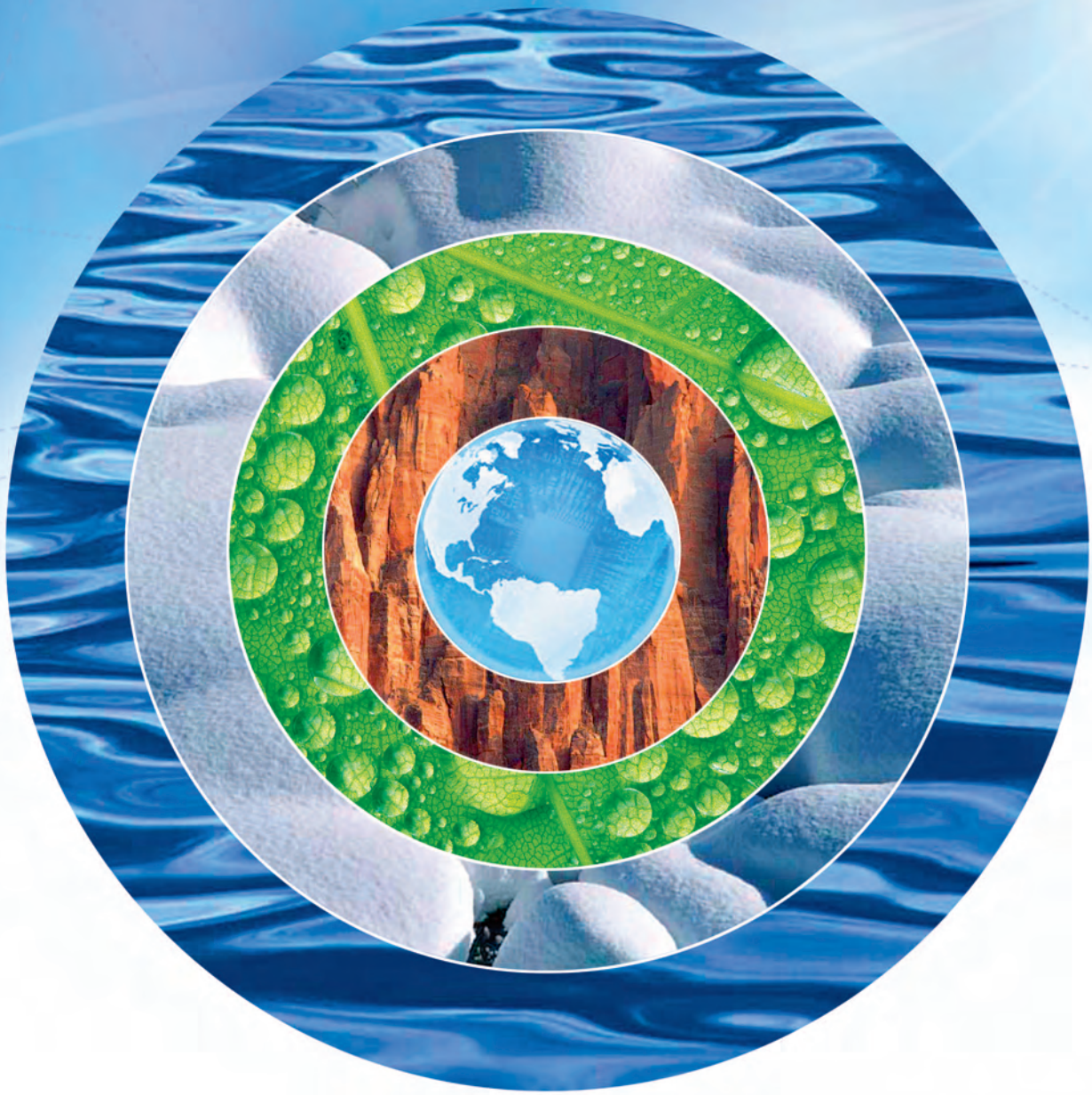

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