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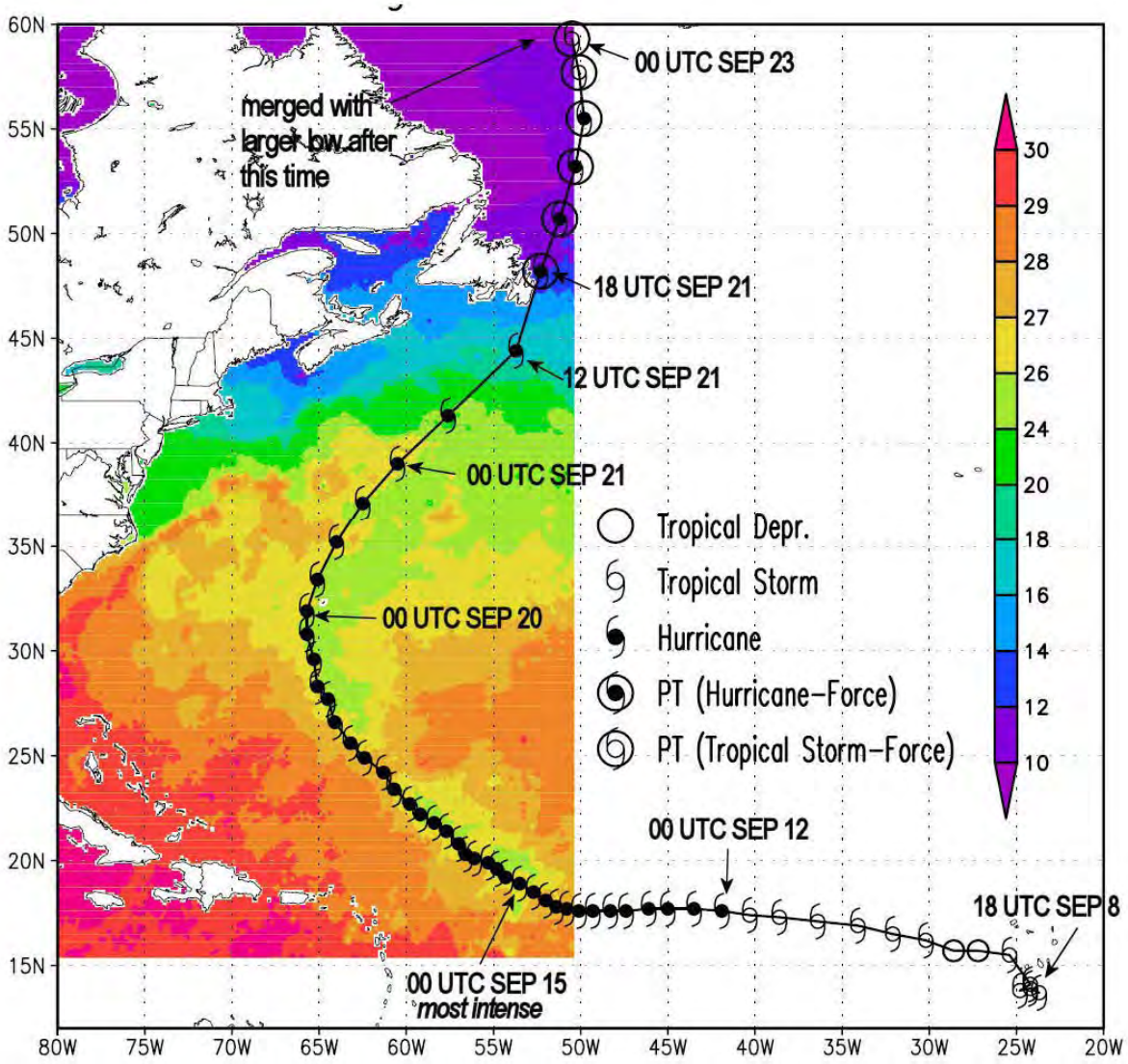
CMOS
BULLETIN
SCMO

Canadian Meteorological and Oceanographic Society

La Société canadienne de météorologie et d'océanographie

December / décembre 2010 Vol.38 No.6

Hurricane IGOR Track with Sea Surface Temperatures



Trajectoire de l'ouragan IGOR et les températures de surface de la mer

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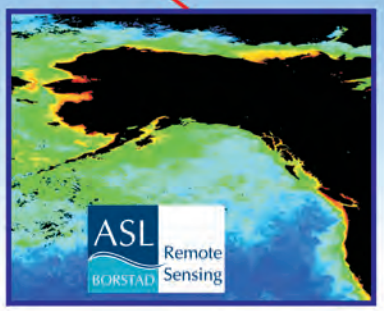

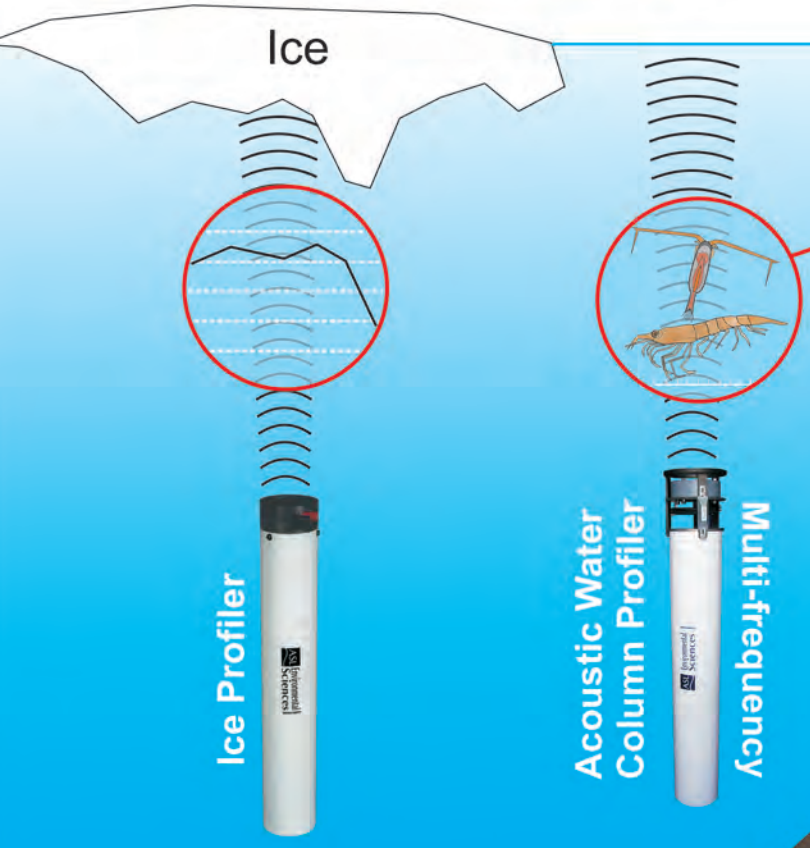

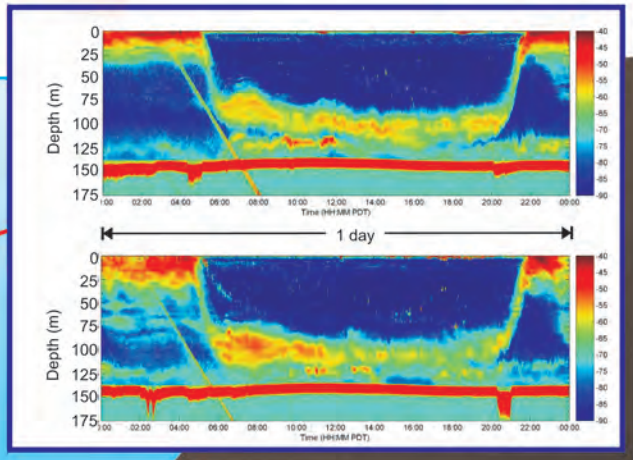

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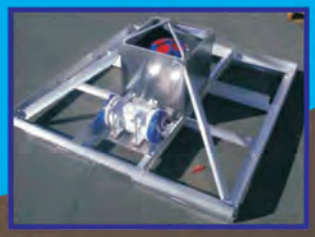

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....from the President's Desk

Friends and colleagues:

David Fissel
CMOS President
Président de la SCMO

Canada's Federal Science and Technology (S&T) Strategy, as introduced by the present government in 2007, provides a framework for Canada's S&T policies. The 2009 government policy update [Note 1] speaks of "... making Canada a leader in S&T and research and a source of entrepreneurial innovation and creativity" through our Science and Technology programs. As well as the substantial economic benefits realized from S&T, it was stated that "new knowledge and technologies will help us meet many of the challenges of the 21st century - from preserving the quality of the environment to enhancing our health, protecting our safety and security, and managing our energy and natural resources".

The four priority areas identified for Canadian S&T include the Environment and Natural Resources/Energy (in addition to Life Sciences and Information/Communications Technologies). Moreover, within Environment, Water is identified as one of two sub-priorities (in addition to Cleaner Production and Use of Hydrocarbon Fuels) and within Natural Resources/Energy, the Arctic (resource production, climate change adaptation and monitoring) is identified as one of three sub-priorities. In view of these priorities and sub-priorities, science funding for meteorology and oceanography, along with other geophysical scientific disciplines, would be expected to rank high in terms of federal government funding for government and university science and technology programs. However, in my personal view, such expectations have not been met in the federal budgets and programs of 2009 and 2010. We have seen funding reductions in some government science programs and uneven funding in university programs, with cutbacks in some along with some new initiatives.

(Continued on page 199 / Suite à la page 199)

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

CMOS Bulletin SCMO
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Articles

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

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Cover page: Formed off the coasts of Africa early September, Hurricane Igor reached Newfoundland's Peninsula on September 21 with a pressure low at 950 hPa and winds speed of 140 km/h. Severe damages were caused by extremely heavy rainfall and high winds. The cover page picture illustrates Hurricane Igor storm track along with sea surface temperature. To learn more, please read the article written by Chris Fogarty from the Canadian Hurricane Centre on **page 209**. The picture is a courtesy of Environment Canada.

Page couverture: Né au large de l'Afrique en début de septembre, l'ouragan Igor atteignait la péninsule terre-neuvième le 21 septembre avec un creux barométrique de 950 hPa et des vents atteignant 140 km/h. De grands dommages furent causés par les chutes abondantes de pluie et les bourrasques de vent. L'image en page couverture illustre la trajectoire de l'ouragan Igor et les températures de surface de la mer. Pour en savoir plus, prière de lire l'article de Chris Fogarty du Centre canadien des ouragans en **page 209**. L'image est une gracieuseté d'Environnement Canada.

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Canadian Meteorological and Oceanographic Society (CMOS)
Société canadienne de météorologie et d'océanographie (SCMO)

....from the President's Desk (Continued / Suite)

The mission of CMOS/SCMO is to advance meteorology and oceanography in Canada. We need to continue to highlight the importance of Canadian meteorology, oceanography and the other geophysical disciplines in relation to our national S&T priorities. In 2007, together with the Canadian Geophysical Union, CMOS/SCMO was a founding member of the Canadian Societies for the Geophysical Sciences (CSGS). The CSGS was established to provide a mechanism to link, integrate and coordinate the geophysical sciences in Canada; to provide a voice from the geophysical sciences to government, funding agencies, industry, and to the public; and to provide a way to promote the advancement of the geophysical sciences in Canada. With these goals in mind, we are looking into ways of expanding and strengthening CSGS. The voice of an invigorated CSGS is needed to address the federal S&T policy and funding issues as described above.

Finally let me take this opportunity, on behalf of the CMOS/SCMO Executive, Council and Staff, to wish everybody a happy and safe holiday season and all the best for the New Year.

David Fissel
CMOS President
Président de la SCMO

Note 1:
http://www.ic.gc.ca/eic/site/ic1.nsf/eng/h_04709.html

Reminder - Rappel - Reminder - Rappel

Now, it's time to renew your **2011 CMOS** Membership!

C'est maintenant le temps de renouveler votre adhésion à la **SCMO** pour l'année **2011**.

Highlights of the September CMOS Council Meeting

As mentioned in the October *CMOS Bulletin SCMO*, a recent change to Ontario's Engineering Act removed an exemption for natural scientists that had protected them from prosecution for practising engineering without a licence. A delegation from four scientific societies, including CMOS, met with the Professional Engineers of Ontario at their council meeting in September. The Act had already passed, but the Engineers agreed to include within the regulations a procedure to grant an exemption to natural scientists. There will be an arbitration mechanism to decide individual cases and to consider areas where science and engineering overlap – applied physics, meteorology and air quality, for example.

Dr. Tom Pedersen has agreed to be this year's CMOS tour speaker. Dr. Pedersen is a Professor in the School of Earth and Ocean Sciences at the University of Victoria and Director of the Pacific Institute for Climate Solutions.

Remember to renew your CMOS membership! The membership renewal season is under way. New memberships purchased now will be valid through 2011. The fees have changed due to the new publishing agreement for Atmosphere-Ocean. Membership now includes a free online subscription to A-O and a reduced subscription rate for the print version of the journal.

Congresses

2011 Victoria: The website for the Victoria Congress is now online, and hotel reservations are open. The call for session proposals went out in early September. There will be a Special Session at the Victoria Congress in honour of the late Dr. Dan Wright. The poster session will be held in a large hall with plenty of space for posters and exhibitors.

2012 Montréal: Planning is proceeding on schedule. The proposal to co-sponsor the conference with the American Meteorological Society has gone to AMS for approval.

2013 Saskatoon: The 2013 CMOS Congress will be held in Saskatoon during the week of May 26-May 30, in collaboration with the Canadian Geophysical Union. Conference organizers have received proposals from the Conference Centre in Saskatoon and from local hotels.

Sophia Johannessen,
Recording Secretary / Secrétaire d'assemblée

ARTICLES

What I Want to Do in Canada

Doug Wallace[1]

It is an enormous privilege and opportunity to be awarded one of these Canada Excellence Research Chairs and at the same time I am aware of the responsibility conveyed. The responsibility is, of course, to Canadian taxpayers and requires that I make a positive difference to the scientific landscape in Canada, and through science help to increase knowledge and contribute to well-being and security. I also have a responsibility to the team at Dalhousie who put the initial proposal together and who worked with me on the 2nd round proposal. Of course I hope that the considerable funding, and my own work, can benefit not only my colleagues at Dalhousie but the broader marine science community in Canada. Given that much of my work will, initially, have a focus on the North Atlantic, I am keen to establish close contacts and joint projects with other investigators and institutions in eastern Canada, including Newfoundland.

The premises and context for what I plan to investigate are as follows:

- Humans, including Canadians, are exerting unprecedented pressures on the ocean, globally;

- Canada's three oceans are subject to local pressures, impacts and threats. However, increasingly, Canada's waters are impacted by these growing global pressures.

- As a developed country, with a strong scientific base, Canada has the scientific capacity to measure, understand and predict impacts on its three oceans. With a solid scientific foundation based on state-of-the-art observations and models, Canadian society can adapt, or set policy, to mitigate impacts.

- As a developed country, Canada can contribute to international scientific endeavours to study and protect the world's oceans. Canada can, especially, work with developing countries to improve their scientific and technological capacity to assess threats from the ocean and deal with them. This will be of mutual benefit.

Scientific Program

My own personal research program will have a strong focus on in-situ measurement, particularly with respect to the ocean's carbon and nitrogen cycles. However, I recognize that it is essential to more closely integrate measurement-based and modeling approaches for the investigation of oceanic change.

Carbon: The problem of the oceanic uptake of CO_2 is of obvious significance because of its impact on future climate forcing and the forcing of ocean acidification. However, it is recognized increasingly that international and national efforts to reduce CO_2 buildup in the atmosphere require an assessment capability. This should be capable of allocating short-term changes in the atmospheric growth rate of CO_2 to the effectiveness of policies related to emission control or deliberate carbon sequestration versus changes which involve more "natural" components of the carbon cycle such as terrestrial biosphere changes or changes in ocean uptake. Measurement-based estimates of the air-sea flux of CO_2, coupled with extrapolation/interpolation using data assimilation methods, can play a key role for such assessments.

Within Europe, a common approach for characterizing terrestrial, atmospheric and oceanic carbon reservoirs is being established under a large infrastructure program called the Integrated Carbon Observing System or ICOS. The oceanic component of ICOS will include a mix of carbon measurements from Volunteer Observing Ships (VOS) and time-series measurements made at fixed-location ocean observatories. I will initiate measurements of surface and atmospheric pCO_2 on a VOS line in the North Atlantic that can complement the European lines and help to define the size and variability of the basin-scale CO_2 sink. I will also work with colleagues across Canada to explore whether a network of coordinated carbon observations (including ocean, atmosphere and terrestrial) similar to ICOS can be established in Canada and linked to related US and European initiatives.

Note from the Editor: See *CMOS Bulletin SCMO*, Vol.38, No.4, page 154 for announcement of a new Excellence Chair at Dalhousie University.

[1] CERC, Chair in Ocean Science & Technology, Dalhousie University, NS, Canada;
At time of writing: Leibniz-Institut für Meereswissenschaften, Kiel, Germany

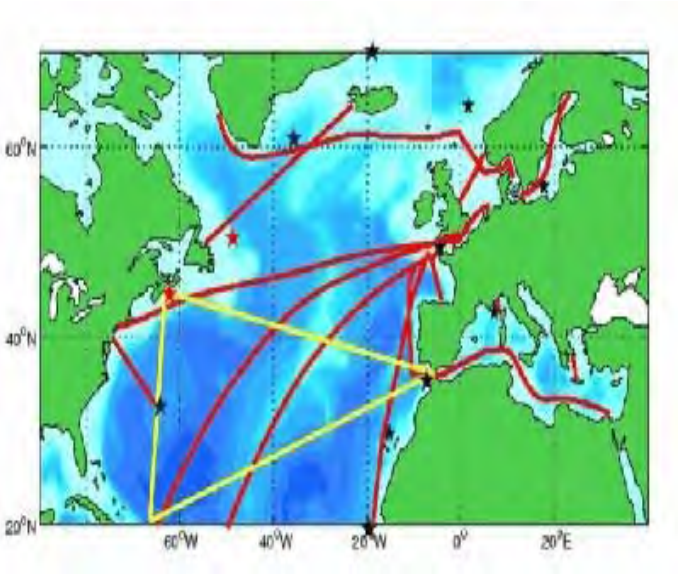

Figure caption: Map illustrating the Volunteer Observing Ship routes (*red lines*) and ocean observatories (*black/blue stars*) on which surface and atmospheric pCO_2 will be measured in the North Atlantic by ICOS investigators and by collaborators in the USA and Bermuda. Intended measurement locations for my own group as well as those of close collaborators in Halifax (Helmuth Thomas; Kumiko Azetsu-Scott) are denoted by the yellow lines and the red stars.

Nitrogen: The nitrogen cycle of the Northern Hemisphere ocean is also subject to major anthropogenic disturbance. Nitrogen deposition to open ocean areas is of growing importance, and is superimposed on ongoing massive changes to coastal nitrogen cycling due to riverine and groundwater inputs. Climatic influences on nitrogen cycling are also possible, for example via changes to factors limiting oceanic nitrogen fixation (e.g. iron supply) or changes in oceanic oxygen. The cycling of nitrogen in the oceans is important, complex and poorly understood. This is evidenced by regular fundamental discoveries (e.g. discovery of new metabolisms), and by the fact that measurements of rates and pools are the subject of continual methodological advance and refinement (e.g. applications of molecular biology, mass and optical spectroscopy). My approach to this will be to work with colleagues to measure, systematically, the spatial and temporal distributions of key nitrogen pools, as well as characteristics of key organisms responsible for nitrogen cycling. In the context of the spatial-temporal measurements, we will conduct short-term manipulative experiments (e.g. bioassays) to investigate factors underlying these distributions and measure metabolic rates. I am convinced that the joint analysis of distributions (based on abundant data) and experiments will lead to major new understanding of both nitrogen cycling and its sensitivity to change.

This work will be conducted primarily by establishing measurements along surface transects of research vessels covering large geographical distances, and therefore sampling across a wide variety of oceanic regimes. Given that ocean transit voyages by Canadian research vessels are rare, I will construct a suite of self-contained, containerized laboratories that can be deployed rapidly to take advantage of "cruises of opportunity" such as the seasonal repositioning of polar research vessels. Ideally, the work should also be conducted at ocean observatories where a temporal context for the measurements and experiments can be established.

Opportunities and some Concerns

The Chair offers a set of amazing possibilities and I am very much looking forward to returning to Canada after 22 years' absence. Inevitably I also have a few reservations and regrets about leaving Germany, and the IFM-GEOMAR in Kiel, as well as the astonishingly integrated European research environment where I have worked for the past 12 years. On viewing the Canadian marine research scene from afar, there are a couple of issues I am keen to discuss with my new colleagues.

Infrastructure: Of some concern to me is the situation with respect to infrastructure for the support of ocean-going science. Germany presently operates four modern research vessels capable of working in the distant open ocean including Arctic and Antarctic waters (*Meteor, Merian, Sonne* and *Polarstern*). This is despite the fact that Germany "owns" only a minimal amount of oceanic real estate (all of it bordering shallow, marginal seas). There is a national plan for fleet use and replacement which is the subject of national and international peer-review. There are well-established mechanisms regulating access of researchers from both academia and government research institutions to the fleet. The corresponding situation in Canada looks problematic to me, and if this concern is valid and shared, I would be eager to initiate a dialogue concerning ways to improve the situation with respect to research vessel infrastructure, financing, access, etc.

Also relating to research infrastructure: there are interesting Europe-wide discussions and projects under way aimed at establishing, coordinating and "harmonizing" ocean observing capability (e.g. ocean observatories). I would be interested to work with the broader community involved in ocean observations in Canada's three oceans to explore whether a national strategy can be developed. Such a plan would need to recognize that "one size does not need to fit all", that there are differing needs as well as different opportunities across Canada's Pacific, Arctic and Atlantic sectors. Any such planning should ideally have very close involvement of the private sector as there are a range of potential partnerships and opportunities that can be of mutual benefit. However, a national dialogue and strategy concerning such capability seems timely given developments in the USA and Europe and the strong

technological advances and capabilities within Canada. This dialogue should, from the beginning, involve Canada's very strong Earth System and regional ocean modeling communities so that observation and modeling communities can continue to mutually inform each other.

Internationalization. Canada has an impressive cadre of internationally-renowned researchers working on the marine environment and I am very much looking forward to joining the group (many of whom I already know well). Given this, it may be worth working together to promote new ways in which this community can benefit from, and contribute to, international marine science. Issues such as CO_2 uptake, nitrogen cycle and productivity changes, climate change, exploitation of fish resources, development of oil and gas in deepwater, tsunami hazards, threats to biodiversity, changes in the Arctic, and other ocean-related issues of importance to Canada are also of concern to a wide range of other nations. There are several issues that Canadian scientists and policy-makers have addressed in the past, including issues relating to ocean pollution and preservation of fish stocks and biodiversity, which are of immense importance to some developing countries where expertise is still lacking. Here, Canadian expertise and technology could be of especial benefit given the right funding opportunities. As examples, there are likely to be numerous developing countries interested in applications of Canada's Ocean Tracking and undersea vehicle technology.

There are many existing and excellent examples of how Canadian expertise has been linked to international teams investigating the Pacific, Atlantic and Arctic Oceans. Nevertheless, I believe international linkages could be strengthened and that Canadian ocean-related research could become even more international. Facilitating ties to major European research programs via the establishment of joint funding opportunities would be one obvious possibility to explore. Broader international networking would, I believe, create new opportunities to demonstrate and market Canada's excellent marine technology and expertise.

Source: Canadian Ocean Science Newsletter, # 53, October 2010. Reproduced here with the written authorization of the author and the editor.

SAR Wind Project

Environment Canada, in collaboration with the Canadian Space Agency, is developing a project entitled "The National SAR Wind Project for High Resolution Marine Wind". The project utilizes SAR satellite space-based monitoring for improving wind analysis and short-range prediction over large marine areas, and especially in the coastal zones -

http://www.asc-csa.gc.ca/eng/programs/grip/archive_101021.asp.

ODE TO A MACKEREL SKY

To be a cloud
I would be so proud.
But whichever one?
There's many to choose from.

I could be a wispy cirrus
or a threatening mammatus.
I could be harmless or ominous...
obscuring the moon I am translucidous!

I could produce sun dogs or a zenith arc
or simply provide shade while you stroll in the park.
Sure, there would be times you'd curse my name
as I cancel your picnic or wash out your ballgame.

But your gardens love it when I give 'em a soak
thanks to ME you have lush leaves on your maple & oak.
And don't forget the hours while passing time
as a child you'd look at my shapes and guess my mime.

So if you're wondering
"A poem about a cloud,
who is this silly guy?"
My explanation is inspiration
provided by this morning's
Mackerel Sky.

Chris Murphy
On-Air Presenter, The Weather Network

The Canadian Societies for the Geophysical Sciences (CSGS)

Present and Potential Future Expansion

by David Fissel

CSGS Backgrounder

The Canadian Societies for the Geophysical Sciences (CSGS) was formed in late 2007 by the Canadian Geophysical Union (CGU) and the Canadian Meteorological and Oceanographic Society (CMOS). Canadian Society of Soil Science (CSSS) subsequently has become a member of CSGS. The summary information below is on the CMOS and CGU websites:

What is CSGS?

- A mechanism to link, integrate and coordinate the geophysical sciences in Canada;
- A voice from the geophysical sciences to government, funding agencies, industry, the public;
- A way to promote the advancement of the geophysical sciences in Canada.

Goals

- Facilitate collaboration and exchange amongst Canadian geophysical sciences;
- Coordinate and promote a vision for the integration of the geophysical sciences in Canada.

Why?

Benefits from:

- Commonality of approach – application of physics to dynamical Earth systems, linkages to environment, chemistry, biology, geology;
- Scientific exchanges and interdisciplinary linkages in the geophysical sciences;
- Coordinated voice to scientific funding bodies and government on issues of policy relating to, and support for, the geophysical sciences;
- A vision for the advancement of the geophysical sciences in Canada.

Activities

Joint meetings of members of CSGS:

- Enhance profile of geophysical sciences with the public and representation in secondary and post-secondary education;
- Identify and recommend research support by governments and others;
- Recommendations to member societies.

Membership/Operation

Any society that makes a scientific contribution to the geophysical sciences.

Members currently include:

- Canadian Geophysical Union;
- Canadian Meteorological and Oceanographic Society;
- Canadian Society of Soil Science.

Discussion

It has been nearly three years since the CSGS was created. The CSGS does not appear to be very active in its own right. CSGS does not have a website of its own; instead it appears on the CMOS and CGU websites. Society meetings appear to be infrequent (there was no meeting of the CSGS in 2010 to my knowledge).

However, CSGS does seem to be effective in two ways:

- Providing a Canadian societal framework for International Earth Sciences activities which are coordinated through two International Unions: IUGG (geophysical sciences, NRC-Canada) and IUGS (geological sciences, GSC-Canada); CSGS nominally coordinates activities in the geophysical sciences and the CFES (Canadian Federation of Earth Sciences) has a corresponding role for the geological sciences;
- Enabling joint meetings between the individual member societies (CMOS/CGU in 2007 and 2010; and the proposed joint meetings discussed above in 2011, 2012 and 2013).

Expansion of the CSGS membership is desirable due to increased coverage of Geophysical Science activities within Canada, which strengthens CSGS. The increased membership will also facilitate increased cooperation and coordination of activities, of the member societies. This will lead to a better realization of the Goals of the CSGS (see above). In particular, the increased membership should lead to a higher profile of the CSGS as a voice from the geophysical sciences to government, funding agencies, industry, and the public in order to promote the advancement of the geophysical sciences in Canada.

Two other Canadian scientific societies have been identified that may have an interest in joining CSGS. These are the Canadian Society of Agricultural and Forest Meteorology (CSAFM) and The Canadian Society of Hydrologic Sciences (CSHS).

Both Societies appear to be eligible for membership in CSGS. Since the CSHS is already an affiliated society of the Canadian Water Resources Association (CWRA), there may be some discussions required to ensure that the CSHS's role in both CSGS and CWRA is mutually compatible. (CWRA represents a broader set of disciplines than geophysical sciences. However, CSGS/CMOS/CGU works effectively with other broader discipline organizations such as the Canadian Association of Physicists to the mutual benefit of each society).

Potential Ways Ahead

1. Pursue the expansion of CSGS to include membership of CSAFM and CSHS. This would be carried out in consultation with the other member societies of CSGS.

2. Consideration can also be given to identifying other potential member societies for CSGS which expand and enhance the role of the CSGS. In 2007, another potential member organization was the Canadian Geomorphology Research Group. Canadian Societies that represent other disciplinary areas in the geophysical sciences should also be identified. Two disciplines of interest are: Cryospheric Sciences and Near-Earth Space Sciences. Cryospheric science is strategically important in that the present federal government highlights the Arctic in its policies while some parts of Arctic research funding is being reduced. A revitalized CSGS could play a role in national advocacy on this issue.

CMOS Council is currently considering the expansion of the CSGS in collaboration with its other member societies. Input from CMOS membership is welcomed and can be directed to any CMOS Council member.

Summer 2010: Wettest on the Canadian Prairies in 60 years!

A Preliminary assessment of cause and consequence

by Ray Garnett[1] and Madhav Khandekar[2]

Abstract: The May-July period over the Canadian Prairies in 2010 was the wettest in 60 years and possibly 100 years. In July the federal and three prairie provincial governments announced $450 million in funding to assist waterlogged farmers. Causal factors are considered to be El Niño conditions during the past winter and spring months, below normal North American snow cover in April and extremely low sunspot activity.

Résumé: Sur les Prairies canadiennes en 2010, la période de mai à juillet a été la plus humide en 60 ans et possiblement en 100 ans. Au mois de juillet, le gouvernement fédéral et les trois gouvernements des provinces des Prairies ont annoncé des fonds de 450 millions de dollars pour venir en aide aux agriculteurs des Prairies où les terres ont été engorgées d'eau. Les facteurs suivants sont mis en cause: l'effet El Niño au cours de l'hiver passé et des mois printaniers ; la couverture de neige inférieure à la normale sur le Nord-Américain; et une activité solaire extrêmement basse.

1. Introduction

The Canadian prairies produce over 50 million tonnes of grain, over half of which is wheat. In terms of planted area, yield and quality the most weather-sensitive months are May-September with May-July being the most critical for yield. (Garnett 2002). The prairies are one of the most drought-prone regions in Canada, where droughts (recurring or irregular) of moderate-to-severe intensity have occurred for hundreds of years (Khandekar, 2004). The recent drought years of 1999-2002 are fresh in the memories of many Prairie farmers. That drought period prompted several Alberta University professors to write to the then-Premier of Alberta, Mr. Ralph Klein, an 'Open Letter' *urging* him to support the Kyoto Accord and to develop a GHG (Greenhouse gas) reduction strategy for Alberta and by extension the other Prairie Provinces (The Open Letter was published in major newspapers in Alberta in July/August 2002). The Open Letter further suggested that droughts on the Prairies could be exacerbated as human-induced concentration of GHGs would continue to increase in the future.

Against this backdrop, it is worth noting (see Table 1.) that April to September of 2010 brought more than 150% of normal rainfall to the prairie grain-growing region. The months of May through July were the wettest in the last 60 years and possibly in 100 years. This summer's almost record-breaking rains on the Prairies were reminiscent of the summer 2005, when parts of the city of Calgary as well as several other localities on the Prairies were flooded. For the prairies as a whole May-August 2010 brought 144% of normal precipitation compared to 122% of normal in 2005. The 2005 flood situation on the Prairies prompted (the then) Prime Minister Rt. Hon. Paul Martin to make a special visit to the Prairies and declare emergency funding for flood-affected regions. As this summer's harvest season continues, prospects are for a significantly reduced harvest, primarily due to excessive rains and delayed sowing due to waterlogged farms into early June. *Why are the Canadian Prairies subject to such extreme drought/wet summers*? *What is driving the summer rainfall pattern*? In this short article we analyse Prairie drought (and wet periods) using a simple teleconnective analysis of large-scale atmosphere-ocean and snow cover patterns plus a new approach developed recently by Garnett *et al* (2006).

2. Weather and grain evolution during summer 2010

The key month for seeding spring wheat and canola is May. The first ten days of May 2010 brought 25-50 mm of rain to the agricultural region of Manitoba and Saskatchewan and was followed by a deluge of 50-100 mm over the prairies as a whole during May 21-31. *Wild Oats Publishers* in Winnipeg reported on June 8th that only 25% of the crop

[1] Winnipeg, Manitoba, Canada. Ray Garnett is an independent consultant (Agro-Climatic Consulting) and researcher and has worked in the field of agro-climatology for 37 years. He is currently involved in a research project at the University of Manitoba investigating Solar and Pacific Ocean influences on Canadian Prairie summer weather.

[2]Markham, Ontario. Madhav Khandekar, is a former research scientist from Environment Canada and was an Expert Reviewer for IPCC (Intergovernmental Panel on Climate Change) 2007 of climate change documents.

was seeded. Crops in low-lying areas were being drowned out and farmers were beginning to switch to planting barley and oats. Table 1a shows the excessive rainfall and Table 1b the lower-than-normal mean temperatures May through September.

2010 Precipitation in mm	Actual	Normal	% of Normal
April	54	27	200
May	95	47	202
June	99	74	134
July	71	67	106
August	74	55	135
September	54	41	132
Mean anomaly			**152**

Table 1a: Precipitation data in mm for April - September 2010 with actual, normal values and percentage of normal.

2010 Temperature (°C)	Actual	Normal	Departure
April	6.3	3.6	+2.8
May	9.3	10.8	-1.5
June	15.2	15.4	-0.2
July	17.5	18.0	-0.5
August	16.4	17.0	-0.6
September	10.1	11.2	-1.1
Mean anomaly			**-0.20**

Table 1b: Temperature data in °C for April - September 2010 showing actual, normal and departure values.

(Table 1a & 1b: Actual precipitation and temperatures are based on 30 and 15 stations respectively. Monthly normal values are based on 100 stations for the period 1950-1995).

May-July 2010 precipitation averaged 88 mm per month, the wettest for the period 1950-2010 followed by May-July 1991 when there was an average of 86 mm per month. Five of the 10 wettest May-Julys for the period 1950-2010 have occurred since 1990: 2010, 1991, 1999, 1993, and 2005. The Canadian prairies did not experience a hot summer in 2010. Except for April, mean temperatures were lower than normal given so many rainy days with cloud cover. For example Calgary's temperatures May through July averaged -1.1º C. below normal supporting the claim that the prairies were rainier and less warm as a result of increased cloud cover.

At a June 12th press conference in Winnipeg the Canadian Wheat Board announced *"only about 7.7 million acres would be seeded to wheat*" the smallest since 1971 because the fields were too wet and that overall wheat production was projected at 18.9 million tonnes" (Winnipeg Sun, June 12th). In mid July the Federal and three provincial prairie governments announced a $450 million grant to help waterlogged producers, the largest and fastest Agri-Recovery relief package to date. The rural municipality of Lac Du Bonnet in Manitoba was declared an agricultural disaster area with disease, mold and fungus leaving only 15% of crops viable (Lac Du Bonnet Leader, July 16th)". Heavy rains in August and September delayed the harvest such that at September 30th only 29% of Saskatchewan's harvest was complete compared to the average of 75%. The wet weather, frost and slow harvest contributed to substantial losses in grain quality further dampening farmers' profits and spirits. So far, top grade Canadian Western Red Spring Wheat (CWRS) is reportedly far lower than normal while quantities of low-grade (3CWRS) and "Feed Wheat" are higher than normal. Barley is also of low quality, sprouted and of light bushel weight because of frost and heavy rains. Also lack of sufficient sunshine hours may have contributed to the poor quality of grains this year. A *frosty weather* on September 16-17 (with low temperature dipping down to -20°C to -4°C) near Saskatoon further damaged late-seeded crops and affected maturation. Harvesting conditions in 2010 have been reminiscent of 2002 when August rainfall was 174% of normal rainfall and many farmers dubbed that year as *the year from Hell!*

A Statistics Canada report on October 4th estimated 2010 Prairie wheat production at 22.2 million tonnes, down from 26.8 million tones in 2009. Estimated harvested area dropped 16% to 8.1 mln ha. in 2010 from 9.6 mln. ha. in 2009. The estimated production of all wheat may be reduced further as the depleting harvest continues to come in. The estimates of other grains (canola and barley in particular) have also been significantly reduced.

3. Possible Causal Mechanism for 2010 summer floods

What is seen as the cause of such extensive flooding? Figure 1 below underlines the importance of the persistence of SSTs (Sea Surface Temperature) in the central east equatorial region of the Pacific Ocean during the winter and spring months for June-July rainfall on the Canadian prairies. As early as 1992 Garnett and Khandekar identified a positive correlation between El-Niño conditions in the equatorial eastern Pacific and Canadian spring wheat yields. A more recent paper by Garnett, Khandekar and Babb (1998) documented a definitive relationship between

SSTs in the El-Niño regions of the equatorial Pacific and summer rainfall on the Prairies using linear correlation analysis. The correlation analysis in the 1998 paper helped develop a simple empirical technique to foreshadow summer weather on the Prairies with a lead-time of up to three months or more. A simple accumulation of SST values over the Niño-3 region (Lat 5°N-5°S, Long 170°W-120°W) was used to develop a composite of accumulated SST profiles for four drought, flood and normal summers. Forty-five years of data (1950-1994) were used to obtain profiles of accumulated profiles of SST-based indices and also other indices like PNA (Pacific North American) index. For the SST conditions in 2010, the accumulated SST profile suggests "*significantly above normal"* rainfall on the Prairies during the months June-July, when compared against five wettest, five driest and five near-median June-Julys for the period 1950-2004. The El Niño event of 2009/2010 with moderately warm SSTs appeared to have favoured good rains on the Prairies for this past summer.

During June-July the Prairies on the whole received 120% of normal rainfall, with eastern Prairies (south-eastern Saskatchewan and Manitoba) receiving about 127% of normal rainfall with the western Prairies receiving 115% of normal rainfall. According to Bryson and Hare (1974), the primary moisture source for the eastern Prairies during June and July is the Gulf of Mexico while for the western prairies it is the Pacific Ocean. The North Atlantic oscillation (NAO) index during June 2010 was –0.82 and –0.42 in July, these values being conducive to Gulf of Mexico moisture reaching the eastern Prairies. The ENSO, as well as the NAO indices, both helped transport sufficient moisture into the Prairies producing heavy rains in many locales.

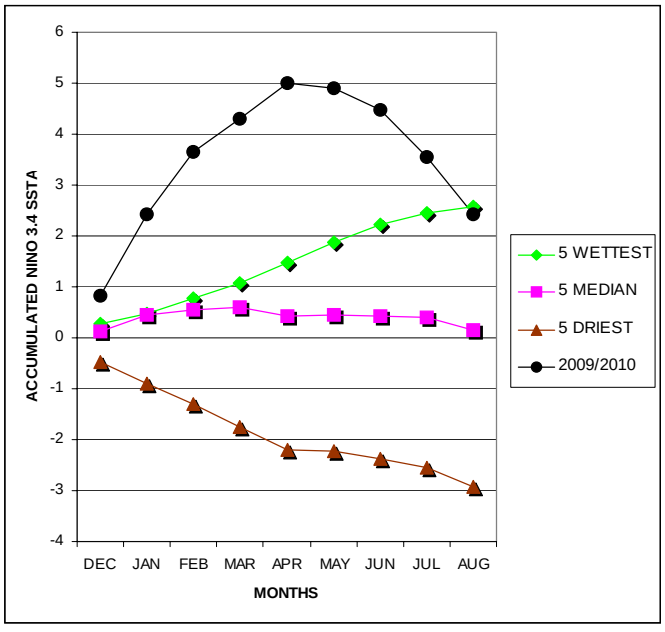

Figure1: Accumulated Niño 3.4 SSTs prior to and during the 5 wettest, 5 driest and 5 near-median June-Julys for the period 1950-2004 as compared to 2010.

Besides SST distribution in the equatorial Pacific, the impact of solar variability as revealed by sunspot numbers appears to be an important contributor of summer weather on the US/Canadian Prairies. Research studies conducted more than 30 years ago by B.W. Curry and P. Venkatarangan (1978) identified the solar impact on the Canadian Prairies. Elsewhere, R.G. Curry in the US and W.J.R. Alexander in South Africa have documented similar strong links between drought/flood cycles and solar variability as revealed by sunspot numbers and their monthly and decadal variations (Curry 1984, 1990; Alexander 2007).

Currie and Venkatarangan (1978) found that annual precipitation over the prairies is above normal near sunspot minimum and below normal near sunspot maxima. Garnett (2004) observed that June-July in Saskatchewan between 1950 and 2004 have generally been warmer and drier than normal corresponding with peaks in the 22 and 11year sunspot cycle. The 22-year double sunspot cycle (known as Hale cycle) peaked in 1918, 1938, 1958, 1979 and 2001. Currie and O'Brien (1990) examined the lunar as well as solar (luni-solar tidal forcing) influence on rainfall at 18 stations in Illinois for the period 1895 and 1980 and identified five dry and four wet epochs. Curry and O'Brien found dry epochs on the US Prairies to be associated with twice the number of sunspots than the wet epochs. Alexander *et al* (2007) using over 100 years of data in South Africa found an almost three-fold increase in the annual flow of the Vaal River directly associated with changes in sunspot numbers over a six-year period. The rate of change in sunspot numbers appeared to be *a key* in identifying the relationship. Flood events in the Vaal River region of South Africa are associated with the first half of the first 11-year period of the 22-year Hale cycle.

Garnett *et al* (2006) describe how low sunspot activity is associated with increased cosmic rays, ions, condensation nuclei, clouds and hence rainfall as proposed in several recent studies by Svensmark and his associates in Denmark (see Svensmark and Calder 2007). Figure 2 (modified from Garnett *et al* 2006) depicts number of sunspots per month that occurred before, during and after the 5 driest, 5 near-median and 5 wettest May-Julys for 1950-2004. The sunspots activity for September 2009 through August 2010 is superimposed in this Figure. The wettest May-Julys on the Canadian Prairies occurred with about 65 sunspots per month while driest May-Julys occurred with about 110 sunspots per month.

The extremely low sunspot activity (11sunspots / month) experienced during September 2009 - August 2010 is considered to be a factor in the excessive rainfall during May through July. Sunspot activity over a sixty-year period (1950-2010) has ranged from 2 sunspots per month in 2009 to 203 sunspots per month in 1958. In 1958, summer rains were only 61% of normal the second driest May-July for the period 1950-2010 with monthly rainfall averaging 38 mm per

month. Spring wheat yields on the Prairies were 16% below trend. The year 1958 was a severe drought year on the US/Canadian Prairies.

Finally, the North American snow cover during April 2010 was 1.9 M sq. km. below the mean of 12.9 M sq. km for the 1973-2009 period. Correlation analysis by Garnett *et al* (2006) suggests that the spatial extent of spring North American snow cover, especially during April, may influence June-July rainfall. The likely correlation relates to the fact that El Niño typically brings warm dry winters while La Niña brings cold snowy winters and further that the North American snow cover during April is in general reduced (increased) following an El Niño (La Niña) event. Similar conditions prevailed during summer of 2005 resulting in severe flooding on the Canadian Prairies, as described earlier.

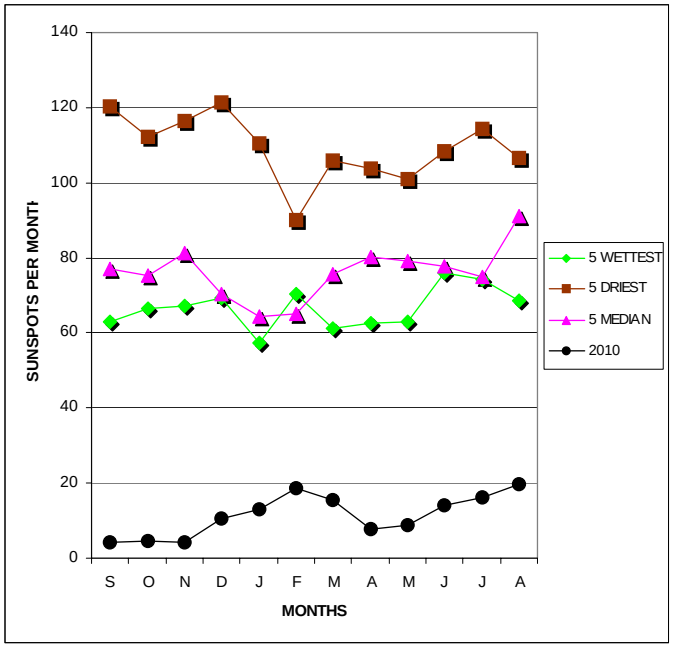

Figure 2: Number of sunspots per month prior to and during the wettest, driest, and near-median May-Julys for the period 1950-2004 as compared to 2010.

This past summer (2010) also witnessed flooding further south in the US Corn Belt, quite likely associated with extremely low sunspot activity as found by Currie and O'Brien (1990). The State of Iowa (Top corn producing US State) reported 198% of normal rainfall June through August. The United States Department of Agriculture (USDA) estimated U.S. corn yield for the 2010 crop at 165.6 bu/ac (bushels per acre) in August which is now re-estimated to be just at 155.7 bu/ac in October 2010.

4. Concluding Remarks

This past summer's excessive rains on the Canadian Prairies appear to be due to a favourable combination of SSTs in the equatorial Pacific in conjunction with solar impact related to diminished sunspot numbers. Besides SSTs and low sunspot activity, a lower-than-normal snow cover during the spring months (April-May) may also have helped in producing a near-record rainfall on the Prairies. The current solar minimum has not been equalled since 1933 (Livingston and Penn, 2009). These authors (Livingston and Penn) further project sunspots to vanish altogether by 2015.

What is in store for the summer of 2011? The La Niña conditions have been strengthening in recent months with sea surface temperature anomalies at the Niño 3.4 region averaging –1.2ºC below normal for the past three months. This is almost two standard deviations below normal. Persistence of La Niña conditions for next spring (2011) together with continuing low sunspot activity may determine summer precipitation on the Prairies for 2011 and possibly beyond.

Could the Solar Cycle 24 (2010-2021) now commencing, parallel conditions experienced by Manitoba's Selkirk Settlers who arrived in the Red River region between 1795 and 1823 during the *Dalton Minimum* of the sunspot cycles? In those years, sunspot activity failed to reach 50 sunspots per month. The settlers experienced frost, floods and locusts and probably would not have survived had it not been for the estimated 60 million bison that roamed the Great Plains around 1800 (Green, 1974). A recent book (Plimer 2009) describes the *Dalton Minimum* period as an extraordinarily cold time in Europe. How the Prairie summer weather evolves in response to the equatorial Pacific SST distribution and low sunspot activity over the next few years remains an important research area at present.

Acknowledgements: This article is part of a two-year research project initiated through the Natural Resources Institute (NRI) at the University of Manitoba and the Manitoba Rural Adaptation Council (MRAC). We would like to thank the MRAC, the Friends of Science (FOS) in Calgary, Alberta, the University of Manitoba and Beyond Agronomy Inc. for their funding assistance. Dr. Khandekar of Markham, Ontario and Jeff Babb of the University of Winnipeg are making "Payment in Kind" contributions. Overall support from Dr. Emdad Haque, Director NRI and Dr. Harvey Hill of the Prairie Agro-Climate Unit (PAU) in Regina is also gratefully acknowledged.

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Census of Marine Life Report

The Census of Marine Life (CoML) released its final report in October. Begun in 2000 and supported by a combination of private and public funding, CoML was built on more than 540 expeditions to all parts of the global ocean to learn more about the diversity, abundance and distribution of marine organisms.

The Census encountered an unanticipated riot of species, the currency of diversity, for which !ustralia's National Geographic website shows a small collection of beautiful photos. CoML upped the estimate of known marine species from about 230,000 to nearly 250,000. Among the millions of specimens collected in both familiar and seldom-explored waters, the Census found more than 6,000 potentially new species and completed formal descriptions of more than 1,200 of them. The expeditions commonly encountered rare species.

With its digital archive of almost 30 million observations, the Census has compiled the most extensive regional and global comparisons of marine species diversity. It has helped create the first comprehensive list of the known marine species, already passing 190,000 in September 2010, and helped compose Web pages for more than 80,000 of them in the Encyclopedia of Life.

Although CoML has formally ended, the program leaves important legacies in knowledge, technology and collaboration, including the extensive database. More than 2,600 papers have been published, many freely accessible online. Participants created and used the latest in technology to push observational capabilities to new areas. The Census brought scientists with different interests from different nations together to use standard protocols for sampling marine life from the deep sea to the near shore, to speed the adoption of good techniques, to build capacity economically, and to jump start initiatives in marine research. It strengthened partnerships of scholars in the humanities and natural and social sciences to use archival research to build the picture of life in oceans past and assess changing diversity, distribution, and abundance.

One Canadian CoML study by Boris Worm and Heike Lotze at Dalhousie University looked at historical records to see how life in the ocean has changed over time. They studied catches, sightings and even restaurant menus and photographs of family fishing trips to see how the population of large fish species, marine mammals and birds have changed, as well as archaeological finds and historical records that show what people were hunting and eating. This study of around 100 species, including sharks, seals and cod, showed that, on average, numbers of large marine animals have declined by 89% since records began, and that individuals being caught now are smaller than in the past.

Source: Canadian Ocean Science Newsletter # 53, October 2010.

Hurricane Igor 2010

Newfoundland's Most Damaging Hurricane in 75 years

Preliminary Storm Summary

by Chris Fogarty[1]

Storm History

Igor formed near the Cape Verde Islands off Africa on the 8th of September and moved on a general westward course across the tropical Atlantic in typical fashion. It did not attain hurricane strength until early on September 12th. The most intense state of the storm occurred early on the 15th when its minimum central pressure fell to 925 mb and maximum winds reached 135 knots – just below category-5 intensity. Thereafter while on a northwestward heading, the hurricane weakened to category-1 but greatly expanded and maintained a very low central pressure in the 940-mb range. **Igor** tracked just west of Bermuda early on the 20th delivering category-1 wind conditions. Beyond Bermuda **Igor** tracked northward then north-northeastward and was accelerating. A sharp frontal system over Newfoundland became quasistationary on September 20th and acted as a conduit of moisture and extremely heavy rainfall streaming northward from the hurricane. **Igor** responded to a digging upper-level trough associated with the front early on the 21st, consequently undergoing re-intensification throughout the day while tracking toward (then passing just east of) Newfoundland's Avalon Peninsula. The central pressure fell to near 950 mb (28.02" Hg) and winds increased by 10 kts to 75 kts (~140 km/h) as it slammed eastern Newfoundland. The trough interaction imparted a more northerly trajectory to the storm which eventually merged with another large area of low pressure on September 23nd as indicated on the track map (Figure 1).

A detailed operational storm summary (AWCN16 CWHX) was prepared within 2 days following the event serving as a meteorological assessment and historical perspective for the media and to ensure consistent data communication internally and with stakeholders. This summary in its original form appears in the appendix.

Historique de la tempête

Le 8 septembre, au large de l'Afrique près de l'archipel du Cap-Vert, **Igor** s'est formé et a maintenu sa route vers l'ouest à travers les Antilles. **Igor** n'a pas atteint la force d'un ouragan représentatif avant le 12 septembre. Tôt le 15 septembre, la tempête s'est intensifiée avec une pression centrale minimale de 925 mb (925 hPa) et des vents soufflant à 135 nœuds (juste au-dessous de l'intensité de catégorie 5). Par la suite, en direction nord-ouest, l'ouragan a diminué d'intensité pour être rétrogradé à la catégorie 1, tout en maintenant une pression centrale très basse autour de 940 mb (940 hPa). À bonne heure le 20 septembre, **Igor** se situait à l'ouest des Bermudes avec des conditions de vents de catégorie 1. Au-delà des Bermudes, **Igor** s'est dirigé vers le nord puis le nord-nord-est, tout en accélérant. Le 20 septembre, un système frontal bien défini sur Terre-Neuve, presque stationnaire, favorisait l'apport d'humidité et de pluie extrêmement forte au nord de l'ouragan. Ainsi, tôt le 21 septembre, le creux barométrique en altitude associé au système frontal s'est approfondi, de sorte qu'**Igor** s'est intensifié à nouveau au cours de la journée lors de son passage (juste à l'est) près de la presqu'île d'Avalon terre-neuvienne. Lorsqu'**Igor** a frappé l'est de Terre-Neuve, la pression centrale a chuté tout près de 950 mb (950 hPa ou 28,02" Hg) et les vents ont augmenté de 10 à 75 nœuds (environ 140 km/h). L'interaction du creux barométrique a entraîné la tempête vers le nord, et le 23 septembre il y a eu fusion avec un autre important centre de basse pression, comme le montre la carte des trajectoires de la tempête (Figure 1).

Un sommaire opérationnel détaillé de la tempête (AWCN16 CWHX) a été préparé, deux jours après son passage, afin d'informer les médias sur son évolution météorologique et son aspect historique. De plus, on s'est assuré, autant pour les employés du centre que pour les intervenants, que les données soient communiquées de façon cohérente. On peut trouver dans l'appendice le sommaire dans sa forme originale anglaise.

[1] Canadian Hurricane Centre, Environment Canada, Halifax, NS, Canada

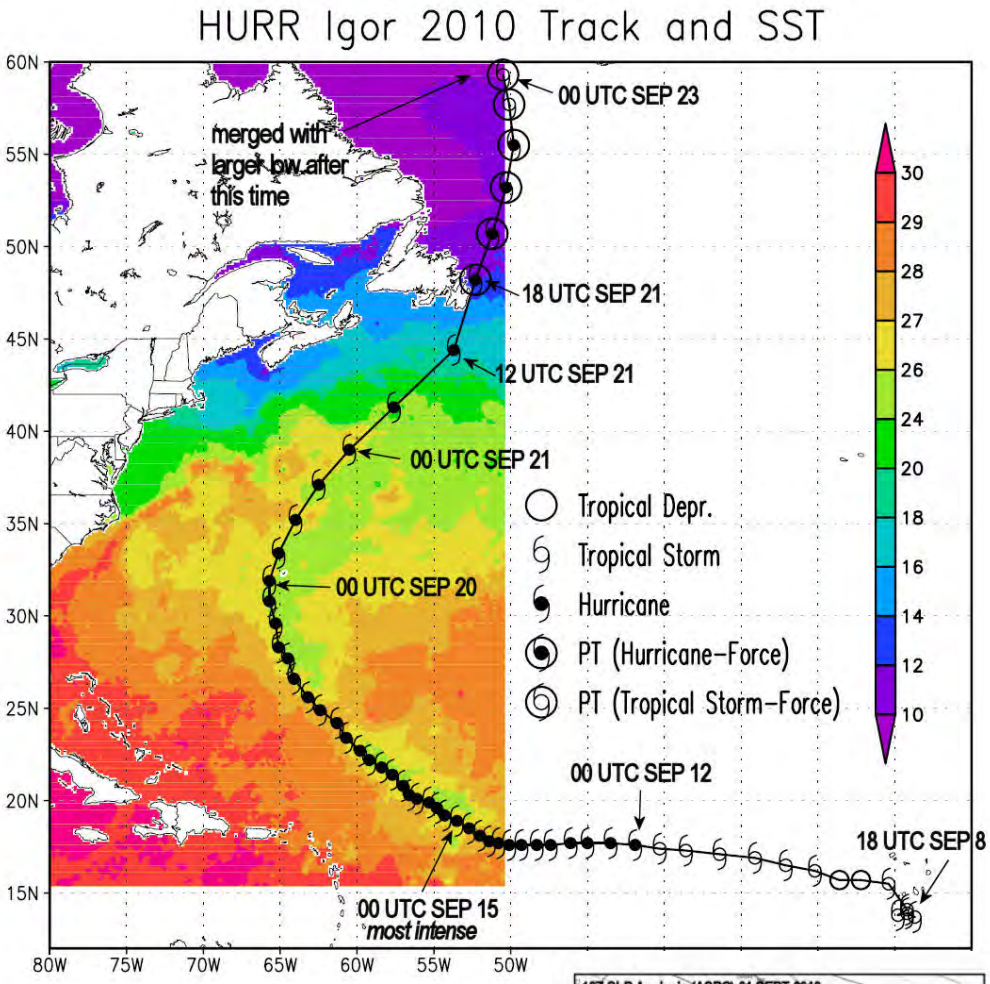
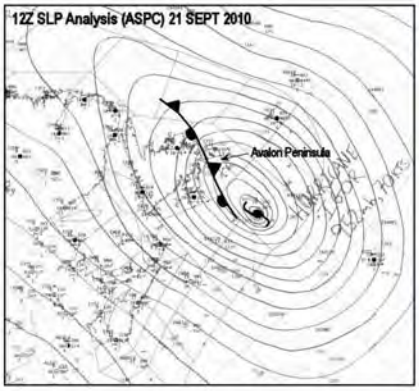
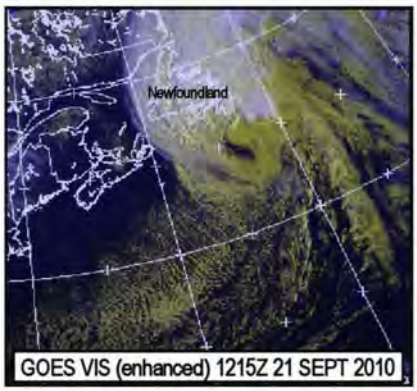
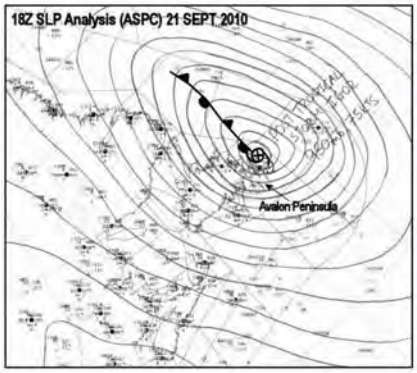


Figure 1: Storm track of **Igor** with sea surface temperatures as of September 19th, 2010







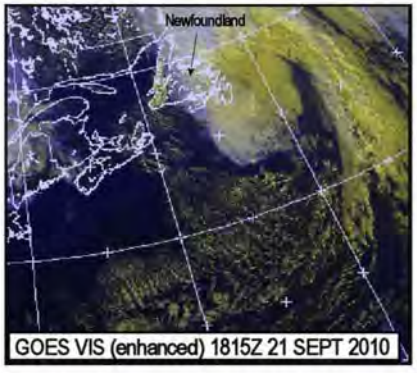


Figure 2: Visible satellite imagery (GOES) and ASPC-drawn sea level and frontal analysis during approach and passage of **Igor** near the Avalon Peninsula in eastern Newfoundland on September 21st, 2010

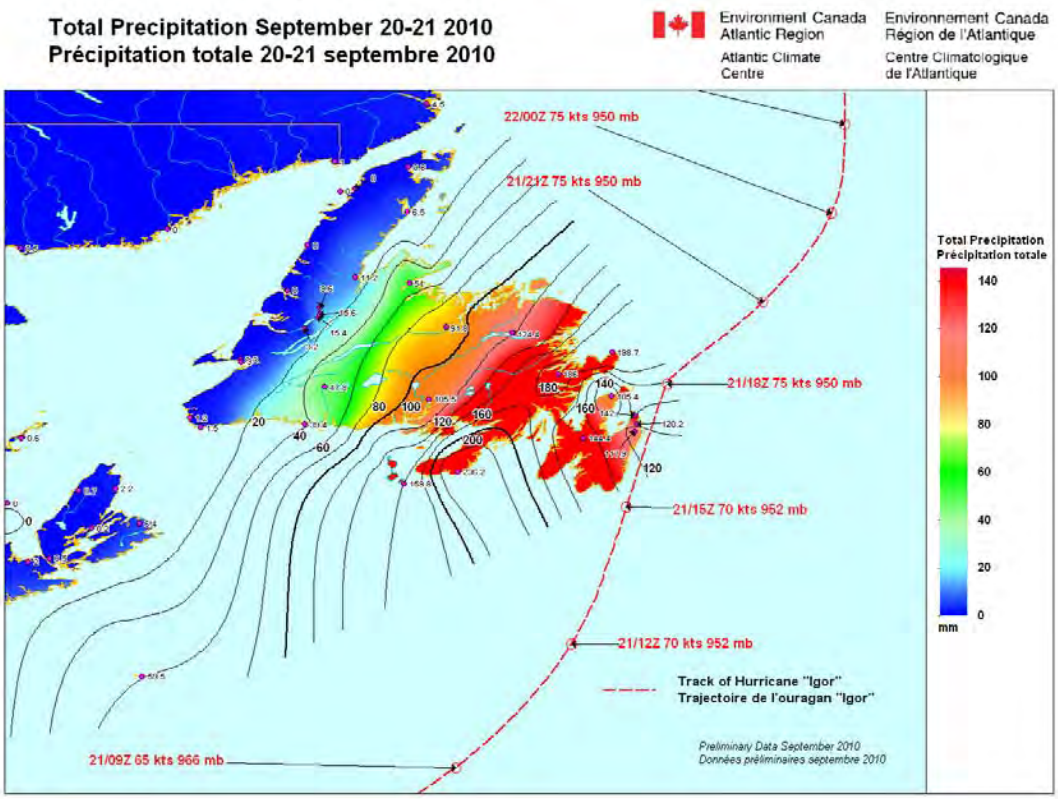


Figure 3: Total precipitation September 20-21, 2010

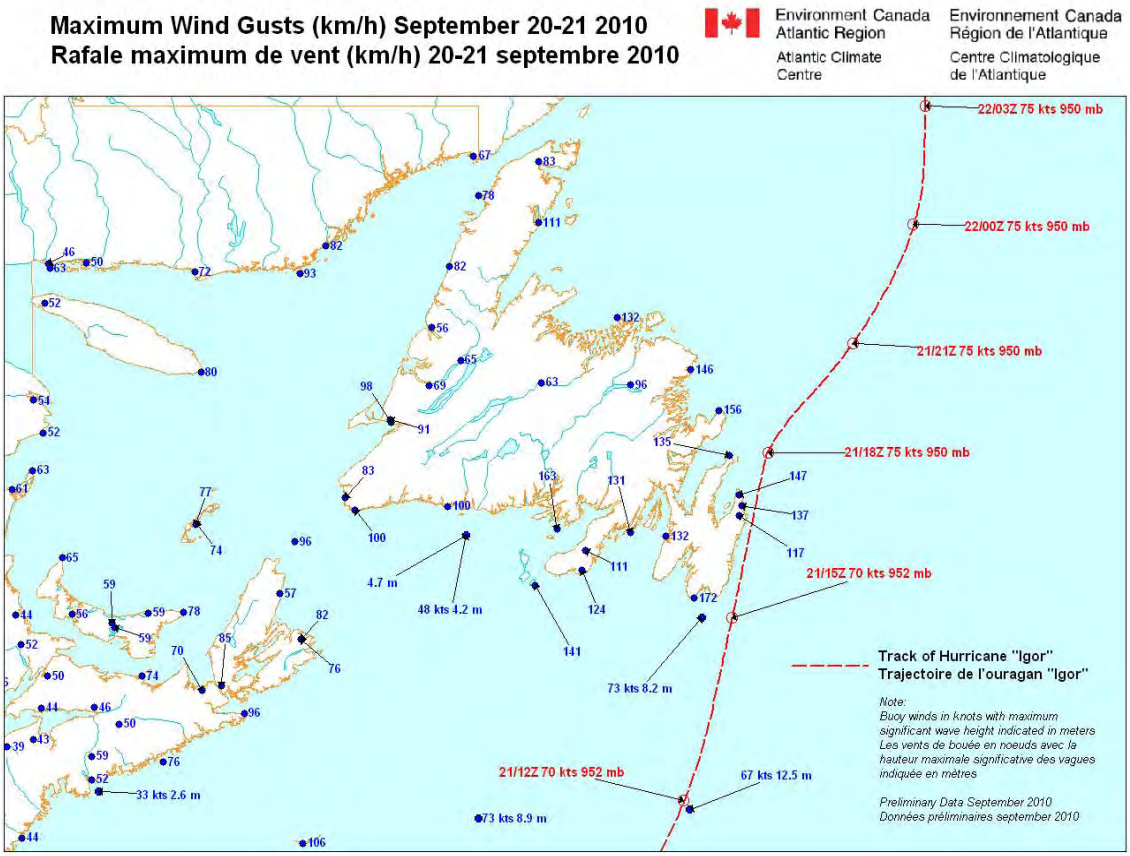


Figure 4: Maximum Wind Gusts (km/h) September 20-21, 2010

Panel 1: Rainfall-related impacts from the storm

Weather and Ocean Conditions

Hurricane **Igor** and the associated front and trough were the story behind the intensity of this combined, extratropical transition event (Figure 2). Rainfall was the greatest issue with **Igor** with well over 200 mm (8 inches) falling over the Burin and Bonavista Peninsulas (Figure 3). A large area of 100+ mm (4+ inches) rainfalls occurred over the eastern half of the island as shown in the rainfall map. Winds were also particularly strong in the north to northwesterly "baroclinic jet" that accompanied the passage of the knife-edge front and **Igor**'s centre during the morning and afternoon of September 21st. Sustained hurricane-force winds (65 to 70 kts / ~120 to 130 km/h) were recorded with gusts in the 80- to 90-kt (~150- to ~165-km/h) range (Figure 4). Details appear in the maximum wind gust map plot. Over the marine district, 13-m (~43-ft) maximum significant wave heights were reported east of the storm track, with 12-m (~39-ft) maximum significant waves reported at the Hibernia oil platform, about 250 km east of the track. Peak wave heights of 25 m (~80 feet) occurred to the east of the track. Also at Hibernia, maximum sustained winds of 94 kts (174 km/h) were reported by the 140-m (459-ft) level anemometer. Storm surge of 70 to 100 cm (~2 to 3 feet) was measured by tide gauges around the eastern portion of Newfoundland.

Impacts

There was extensive damage to roads, bridges and some buildings over a large portion of eastern Newfoundland from excessive rainfall runoff and swollen rivers. The impacts were most serious on the Bonavista and Burin Peninsulas where many communities were cut off from the principal road network due to road washouts. These washouts were severe, requiring complete bridge replacements and rebuilding of roadbeds. One person was killed when the road he was driving on gave way beneath. Torrents of water from overflowing rivers destroyed some buildings and changed the course of some rivers. Large portions of river banks and roads were removed by the extreme river flows which set new records. In some cases, full-grown trees were felled by the surging water flow. The Canadian military was brought to Newfoundland along with federal financial aid to help with the recovery efforts. Temporary bridges had to be erected to reconnect communities with essential services such as fuel and food. This took a couple of weeks in some cases. A portion of the Trans-Canada Highway in Terra Nova National Park was washed away creating a giant ravine about 30 metres (~100 feet) across. A photo of the ravine is shown in the upper right of the 9-panel photo montage (Panel 1). This was the most important road connection to be restored since it resulted in complete disconnection of Newfoundland's main population from land.

In addition to the flooding, very high wind speeds were witnessed over the eastern peninsulas of Newfoundland toppling many trees (especially in urban areas), and causing minor-to-major structural damage which included complete roof loss and curtain wall collapse. Some of the impacts are shown in the 5-panel image montage (Panel 2).

Warning and Forecast Performance

The Canadian Hurricane Centre (CHC) first issued a preliminary statement on **Igor** Friday afternoon, September 17th which was 4 days prior to the main event (Tuesday the 21st). The intention of this early bulletin was to officially begin Hurricane Centre monitoring of the storm prior to the weekend as a heads-up. This early issuance was in accordance with a new CHC standard for once-a-day WOCN31 messages on systems 4 or 5 days away from potential impact. Media interest was much less than for Hurricane Earl in the Maritime Provinces two-and-a-half weeks earlier. This lower level of media (and public) interest was likely due in part to the different track scenarios. With Hurricane Earl, the likelihood of impact somewhere in Atlantic Canada was greater further ahead in time than was the case for **Igor** which was much further out in the Atlantic Ocean. The preliminary statement on Friday discussed the probability of tropical storm and hurricane conditions with a range of track possibilities:

> *COMPUTER MODEL TRACK FORECASTS FOR **IGOR** RANGE FROM EASTERN NEWFOUNDLAND (ISLAND) TO 700 KM SOUTH OF THE AVALON PENINSULA. STATISTICAL COMPUTER MODELS SHOW A 40-50 PERCENT PROBABILITY OF HURRICANE CONDITIONS OVER THE SOUTHERN GRAND BANKS IN FOUR DAYS. FOR PERSPECTIVE, THE PROBABILITY OF TROPICAL STORM-FORCE WINDS FROM THIS STORM AT CAPE RACE IS NEAR 25 PERCENT.*

Regular CHC bulletins began in the afternoon of Saturday, September 18th. Track forecasts were consistent with **Igor** passing through the central portion of the Grand Banks from Saturday thru till Monday evening, September 20th. During the early part of Tuesday the 21st, it was becoming more apparent that **Igor** was going to track farther to the northwest and closer to Newfoundland. However, even during the day of the event, the position and track forecast had to be continually adjusted closer to land as the details of the upper-level trough influence was evolving. Intensity forecasts were highly consistent during the days leading up to the event for **Igor**'s passage past Newfoundland, indicating a transitioning hurricane with 65- to 75-kt winds. Early on Monday the 20th, forecasts began to reflect a possible re-intensification trend during the extratropical transition process over the Grand Banks, but actual track forecasts had not yet been adjusted toward Newfoundland.

Although the rainfall threat of this event was anticipated two to three days in advance, the wind threat was not specifically expected to be an issue over land until the day before **Igor**'s arrival (Monday the 20th). Computer models on Monday began to indicate an increased likelihood of a very

strong wind jet on the cold side of the interacting front north of **Igor**. Correspondingly, tropical storm warnings and wind warnings were posted Monday afternoon for eastern Newfoundland, which falls within the target lead time of about 24 hours. Hurricane watches were issued early on Tuesday the 21st as it became even more apparent that the vigorous trough-hurricane interaction was going to bring high winds across the eastern peninsulas.

The Hurricane Watches were held throughout the event (i.e. not upgraded to warning) even though there were some reports of sustained hurricane force winds at the coast. They were not upgraded to warning status based on an operational decision that the existing wind warnings advertising gusts up to 140 km/h (~75 kts) were adequate warning and the extra time and coordination to manage another series of bulletin changes would take time away from other critical monitoring and coordination talks at the time. Additionally, it was not until the onset of the highest winds that it was apparent to forecasters that sustained hurricane-force winds could occur in some coastal regions.

Much like the rainfall warnings issued by the NLWO under the guidance of the CHC, the tropical storm warnings verified everywhere they were issued and in fact some additional warnings were needed (with shorter lead time) given the exceptionally-broad westward expansion of the storm's wind field (e.g. into the Gander region (well inland)) where tree damage and power outages occurred). **Igor**'s primary impact was due to extreme rainfall, with all rainfall warnings (issued for 14 regions) verifying successfully. A more detailed breakdown of CHC, NLWO and ASPC's warning performance will be conducted during a more detailed post-season analysis. Overall, this event was very well predicted and there were very few complaints about the actual forecasts and anticipated impacts.

Appendix

This is the follow-up storm summary prepared by the Canadian Hurricane Centre gathering various data two full days following the event. This was an important bulletin as it served as a source of information and historical perspective for the press and the public, and ensured consistent data communication internally and with stakeholders.

AWCN16 CWHX 231857
SPECIAL WEATHER SUMMARY MESSAGE FOR NEWFOUNDLAND AND LABRADOR ISSUED BY ENVIRONMENT CANADA AT 4:27 PM NDT THURSDAY 23 SEPTEMBER 2010

THIS IS A FOLLOWUP SUMMARY OF INFORMATION AND METEOROLOGICAL DATA FROM HURRICANE **IGOR**'S IMPACT IN NEWFOUNDLAND ON MONDAY AND TUESDAY SEPTEMBER 20TH AND 21ST 2010. THE INITIAL BULLETIN CONTAINING STORM DATA WAS ISSUED UNDER THIS SAME HEADER AT 4:47 AM NDT ON SEPTEMBER 22ND. THE PURPOSE OF THIS FOLLOWUP SUMMARY IS TO FOCUS SPECIFICALLY ON THE METEOROLOGICAL ASPECTS AND TO SERVE AS AN UPDATE TO THE DATA AND PROVIDE AN HISTORICAL PERSPECTIVE.

THE EXTREME WEATHER EVENT THAT CAUSED SEVERE FLOODING AND HEAVY WIND DAMAGE OVER EASTERN NEWFOUNDLAND EARLY THIS WEEK WAS RELATED TO THE COMBINED EFFECTS OF HURRICANE **IGOR** AND A STATIONARY FRONT THAT HAD PREVIOUSLY DEVELOPED TO THE NORTH OF THE HURRICANE. THE FRONT WAS ASSOCIATED WITH A SHARP TROUGH OF LOW PRESSURE IN THE UPPER ATMOSPHERE WHICH PROVIDED A SIGNIFICANT AMOUNT OF ENERGY TO THE HURRICANE. THIS PREDICTED INTERACTION EXPLAINS WHY THE HURRICANE DID NOT WEAKEN OVER THE COOLER OCEAN WATERS SOUTH OF NEWFOUNDLAND. IN FACT THE INTENSITY OF **IGOR** INCREASED AS A RESULT OF THE TROUGH WHILE THE CENTRE OF THE STORM APPROACHED THE AVALON PENINSULA TUESDAY MORNING SEPTEMBER 21ST.

THE CENTRE OF THE STORM (THE AREA OF LOWEST PRESSURE) DID NOT ACTUALLY CROSS LAND, SO THE HURRICANE DID NOT TECHNICALLY MAKE LANDFALL. HOWEVER, THE AREAS OF HIGHEST RAINFALL AND WIND WERE DIRECTLY OVER THE EASTERN PENINSULAS OF THE ISLAND. ADDITIONALLY, **IGOR** WAS STILL AT HURRICANE STATUS AS IT TRACKED JUST OFFSHORE OF THE AVALON PENINSULA. AS THE CENTRE PASSED TO THE NORTHEAST OF ST JOHN'S TUESDAY AFTERNOON, **IGOR** WAS THEN CLASSIFIED AS BEING POST-TROPICAL. THIS RECLASSIFICATION DOES NOT ALWAYS IMPLY A DOWNGRADE IN STORM INTENSITY AS WAS THE CASE WITH **IGOR** WHEN THE MAXIMUM WINDS IN THE STORM INCREASED FROM ABOUT 120 KM/H TO 140 KM/H AS IT APPROACHED NEWFOUNDLAND.

THE SIZE OF THE HURRICANE - EVEN PRIOR TO ITS TRANSITION TO A POST-TROPICAL STORM - WAS IMPRESSIVE. THIS CONTRIBUTED IN PART TO THE LARGE IMPACT AREA OF SEVERE RAINFALL AND WINDS. THERE HAVE BEEN STORMS OF THIS TYPE OVER THE PAST DECADE THAT DELIVERED SIMILAR WINDS AND RAINFALL, BUT THE AREAS AFFECTED WERE MUCH MORE LOCALIZED. RECENT SEVERE RAINFALL EVENTS INCLUDE TROPICAL STORM **CHANTAL** OF 2007 AND **GABRIELLE** OF 2001 WHICH CAUSED MAJOR FLOODING AND ROAD WASHOUTS ON PARTS OF THE AVALON PENINSULA. HIGH WIND EVENTS OF SIMILAR INTENSITY BUT OVER MUCH SMALLER AREAS INCLUDE HURRICANE **MICHAEL** OF 2000 AND POST-TROPICAL STORM FLORENCE OF 2006. THESE EVENTS BOTH CAUSED STRUCTURAL DAMAGE TO BUILDINGS IN THE HARBOUR BRETON

AND CONNAIGRE PENINSULA REGIONS OF NEWFOUNDLAND.

THE FRONT THAT HAD DEVELOPED NORTH OF THE HURRICANE WAS THE PRIMARY FEATURE LEADING TO THE SEVERE RAINFALLS SINCE IT SERVED AS A CONDUIT FOR MOISTURE MOVING NORTH FROM IGOR. THE VERY HIGH WINDS WERE A COMBINATION OF THE CIRCULATION FROM THE HURRICANE ITSELF BUT SIGNIFICANTLY EXACERBATED BY THE PUSH OF COOL AND UNSTABLE AIR FROM THE TROUGH IN THE UPPER ATMOSPHERE DISCUSSED ABOVE. THIS WAS THE SOURCE OF IGOR'S RENEWED ENERGY AND REASON FOR THE NORTHWARD BEND IN THE STORM'S HEADING AS IT APPROACHED THE AVALON PENINSULA.

EVENT (FRONT/HURRICANE) TOTAL RAINFALLS FROM OFFICIAL AND OTHER SOURCES:

ST. LAWRENCE	238 MM	
BONAVISTA	200+ MM	(* SEE NOTE BELOW)
LETHBRIDGE (PRIVATE STATION)	194 MM	
ST. PIERRE/MIQUELON	160 MM	
POUCH COVE	142 MM	(HAM RADIO NETWORK)
ST. JOHN'S WEST	134 MM	
BAY D'ESPOIR (GENERATOR STN)	124 MM	
GANDER (AIRPORT)	124 MM	
ST. JOHN'S (AIRPORT)	120 MM	
CAPE RACE	54 MM	(** SEE NOTE BELOW)
BURGEO	41 MM	

100 MM = 4 INCHES, 200 MM = 8 INCHES

* STOPPED REPORTING RAINFALL AMOUNTS AT 1:30PM TUESDAY HOWEVER SIGNIFICANT RAINFALL STILL OCCURRED FOR SEVERAL HOURS AFTER BASED ON RADAR AND CITIZEN REPORTS.

** DID NOT REPORT BETWEEN 1:30 PM AND 5:30 PM ON TUESDAY AS **IGOR** WAS MOVING AWAY.

-> OTHER PRIVATE STATIONS THAT WERE WITHIN THE HEAVIEST RAINFALL ZONE HAVE NOT YET COME IN WITH THEIR TOTAL AMOUNTS - THEY INCLUDE BROWNSDALE AND PORT UNION IN THE TRINITY BAY AREA EAST OF BONAVISTA.

PEAK WIND SPEEDS FROM OFFICIAL AND OTHER SOURCES:

CAPE PINE	172 KM/H *	(122+ KM/H SUSTAINED)
SAGONA ISLAND	163 KM/H	(113 KM/H SUSTAINED) ***
BONAVISTA	155 KM/H	(122 KM/H SUSTAINED) ***
POUCH COVE	147 KM/H **	
POOL'S ISLAND	146 KM/H	(104 KM/H SUSTAINED) ***
ST. JOHN'S (AIRPORT)	137 KM/H	(92 KM/H SUSTAINED)
GRATE'S COVE	135 KM/H	
ST. PIERRE	135 KM/H	(91 KM/H SUSTAINED)
ARGENTIA	132 KM/H	
TWILLINGATE	131 KM/H	
ST. LAWRENCE	124 KM/H	

ST. JOHN'S WEST	117 KM/H	
WINTERLAND	111 KM/H	
ENGLEE	111 KM/H	
GANDER	109 KM/H	
CAPE RACE	106 KM/H	
BURGEO	100 KM/H	
STEPHENVILLE	98 KM/H	
PORT AUX BASQUES	95 KM/H	
ST. ANTHONY	81 KM/H	

* PRIVATE STATION SOUTHWEST OF TREPASSEY ON SOUTHERN AVALON.
** HAM RADIO NETWORK
*** SUSTAINED WIND IS THE AVERAGE WIND SPEED OVER A 10 MINUTE PERIOD.

-> CATEGORY-1 HURRICANE FORCE WIND IS 118 KM/H, CATEGORY-2 IS 155 KM/H AND CATEGORY-3 IS 178 KM/H.

-> CAPE RACE DATA NOT YET KNOWN SINCE THE STATION WENT OFFLINE DURING THE PERIOD OF EXTREME WINDS.

MARINE/BUOY DATA:

BUOY	WIND GUST	SIG / PK WAVE	LOWEST PRESSURE
44139	138 KM/H	9 / 17 M *	970 MB
44251	135 KM/H	8 / 16 M	952 MB
44138	123 KM/H	13 / 25 M	957 MB
44140	98 KM/H	13 / 21 M	976 MB
44255	90 KM/H	4 / 7 M	985 MB

-> WAVE UNITS ARE IN METRES. 'SIG WAVE' BASICALLY REPRESENTS THE AVERAGE WAVE HEIGHT AND 'PK WAVE' REPRESENTS THE MAXIMUM WAVE HEIGHT.

-> UNIT OF PRESSURE (MB = MILLIBAR) USED COMMONLY IN METEOROLOGY.

* DATA RECORD FROM THIS BUOY ACTUALLY INDICATES A MAX OF 28 M WHICH WILL REQUIRE FURTHER ANALYSIS TO VERIFY.

-> A STORM SURGE OF 70 TO 100 CM WAS PREDICTED AND OBSERVED FROM BONAVISTA SOUTHWARD TO ARGENTIA AROUND THE AVALON PENINSULA.

INFORMATION ON RECORDS AND THE RARITY OF RAINFALL, WIND AND THE EVENT IN GENERAL:

HURRICANE **IGOR** AND ITS SEVERE IMPACTS CERTAINLY REPRESENT A RARE EVENT IN NEWFOUNDLAND WHICH HAS BEEN DESCRIBED AS THE WORST IN MEMORY. IN STATISTICAL TERMS, THIS WAS EFFECTIVELY A 50-100 YEAR EVENT DEPENDING ON HOW ONE CHOSES TO DEFINE IT. THERE ARE NO HURRICANES/POST-TROPICAL EVENTS OF THIS MAGNITUDE STRIKING NEWFOUNDLAND IN THE MODERN ERA. HURRICANE **JUAN** IN NOVA SCOTIA WAS THE LAST ATLANTIC CANADIAN HURRICANE TO CAUSE EXTREME DAMAGE. PRIOR TO THE NAMING OF HURRICANES, THE 1935 "**NEWFOUNDLAND HURRICANE**" 75 YEARS AGO WAS OF SIMILAR INTENSITY AND POTENTIAL LOW PRESSURE TROUGH INTERACTION. MORE ANALYSIS IS NEEDED TO MAKE SPECIFIC COMPARISONS TO HISTORIC STORMS.

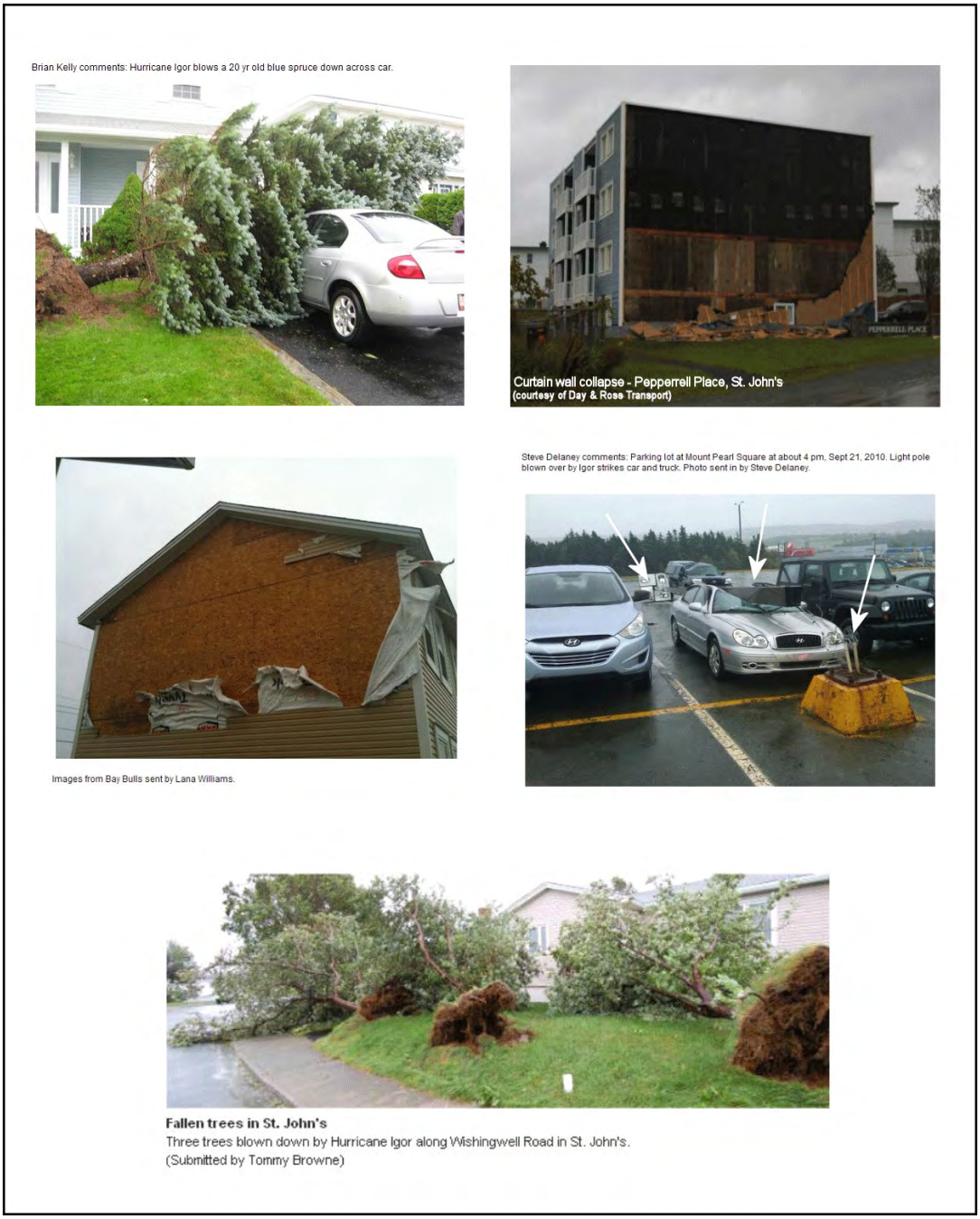
THE RAINFALL OF 238 MM AT ST. LAWRENCE DURING **IGOR** IS UNPRECEDENTED FOR THAT LOCATION. MANY OF THE OTHER STATIONS REPORTING 150 MM+ SET NEW RECORDS - AMOUNTING TO A 100-YEAR+ RAINFALL EVENT. IN TERMS OF WIND SPEEDS, NO ALL-TIME RECORDS WERE BROKEN, HOWEVER, THE WIND SPEEDS WERE RARE FOR SEPTEMBER (ABOUT ONCE

EVERY 50 YEARS) AND THE BROAD AREA OF THOSE EXTREME WINDS WAS EVEN RARER FOR THIS TIME OF YEAR. WINDS OF THIS MAGNITUDE DURING **IGOR** OCCUR ABOUT ONCE EVERY 5 TO 10 YEARS IN EASTERN NEWFOUNDLAND - INCLUDING INTENSE WINTER STORMS.

SOME DATA FROM SIMILAR EVENTS OVER THE PAST TEN YEARS IN NEWFOUNDLAND:

HURRICANE **MICHAEL** (OCTOBER 2000): PEAK WIND OVER LAND WAS SIMILAR TO **IGOR**, 172 KM/H AT ST. LAWRENCE ON THE SOUTHERN BURIN PENINSULA. HIGHEST SUSTAINED WIND DURING **MICHAEL** WAS 128 KM/H AT SAGONA ISLAND. TROPICAL STORM **GABRIELLE** (SEPTEMBER 2001): 175 MM FELL IN THE ST. JOHN'S AREA CAUSING MAJOR FLOODING. HEAVIEST RAIN LOCALIZED TO EASTERN AVALON.

Note from the Editor: The message **AWCN16 CWHX 231857** from Environment Canada has been reformat slightly to make it more appealing for the *CMOS Bulletin SCMO*.



Panel 2: Wind-related impacts from the storm

CLIMATE CHANGE / CHANGEMENT CLIMATIQUE

The Decline of the Himalayan Glaciers and the Importance of Peer Review

by John Stone[1]

On January 21st, 2010 the Economist magazine carried an article: "A mistaken claim about glaciers raises questions about the UN's climate panel". The article discusses the statement in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC AR4) that the Himalayan glaciers will disappear by 2035. This statement had already been the subject of attacks on the IPCC in the blogosphere during and after the charged Copenhagen climate change negotiations. It had also been the subject of a critical letter to Science magazine by Graham Copley of Trent University (1). The story provides valuable lessons on the importance of the peer review process and the use of "grey literature".

The statement can be found in the Asia chapter of the IPCC Working Group II Assessment Report, which deals with climate change impacts, vulnerabilities and adaptation (2):

"Glaciers in the Himalaya are receding faster than in any other part of the world and, if the present rate continues, the likelihood of them disappearing by the year 2035 and perhaps sooner is very high if the Earth keeps warming at the current rate."

The statement is in fact in a case study of not much more than a paragraph in an almost 1000 page report. It is important to note that the statement did not make it into the IPCC Summary for Policymakers which summarizes the most policy-relevant conclusions in a short document, every word of which is negotiated with governments.

An elementary understanding of physics would suggest that the possibility of glaciers of such a mass and at such an altitude declining so rapidly would require a lot more warming than even the most extreme climate models project. However, it seems there was a sort of "group think" amongst some in the glacier community for in the World Glacier Monitoring Services' eighth report (3), covering the period from 1995 to 2000 there is the conclusion:

"With a realistic scenario of future atmospheric warming, almost complete de-glaciation of many mountain ranges could occur within decades, leaving only some ice on the very highest peaks and in thick but down-wasting rather than retreating glacier tongues."

The actual reference for the IPCC statement is a 2005 non-peer reviewed report by the Nepal programme of the World Wildlife Foundation (4). The history of this statement though goes back even further than the WWF report and is a good illustration of how textbook errors are difficult to erase. The origin of the statement seems to be a 1999 report to the International Commission on Snow and Ice (5). This report, which was never published, was produced by Dr Syed Hasnain who repeated the conclusion in an interview around the same time with the Indian magazine Down to Earth and was subsequently picked up by the New Scientist magazine in an article by Fred Pearce (6). In these articles Dr Hasnain is quoted as saying: "most of the glaciers in the region will vanish within 40 years as a result of global warming". However, it seems the original studies refer not just to Himalayan glaciers but to mountain glaciers in general and that the actual date of disappearance was originally 2350 not 2035.

How exactly could such an obvious error have got into the IPCC Assessment Report? The IPCC does not do research but rather assesses research results in order to provide governments with reliable and accessible information on the threat of climate change. Each chapter of the Report is drafted by a writing team of experts – some 6-8 per chapter. As much as feasible they rely on published peer reviewed literature. However, this is not always possible especially in regions where the scientific capacity is weak. In such cases advantage is taken of what is referred to as "grey literature". The IPCC procedures allow for the use of such materials as long as it is openly available to review and flagged as such. Such material is extremely valuable for vulnerability and adaptation studies which often rely on unpublished reports from local and regional governments, for example, and unwritten indigenous knowledge. Drafts of each chapter are usually first shared with colleagues who are not part of the writing team and then more formally with the broader scientific community and also with governments. In the latter two reviews all comments are forwarded to the writing teams for response. Each comment (and there can be thousands) as well as the response is painstakingly catalogued. The process is

[1] Retired Meteorologist and Adjunct Research Professor in the Department of Geography and Environmental Studies at Carleton University, Ottawa, ON, Canada.
Note from the Editor: Dr. Stone has been selected as a Canadian Expert for the IPCC Fifth Assessment Report (See *CMOS Bulletin SCMO*, Vol.38, No.5, page 196).

overseen by a couple of independent Review Editors. Thus the IPCC process is in theory much more rigorous than the normal peer review.

However, it seems nothing is perfect and the Himalayan glacier statement survived all the reviews. There was only one substantive comment from a scientist who incidentally did provide other references. In the government review stage only the government of Japan commented on the statement and questioned its confidence level. The record shows that the writing team noted these comments and indicated that they will be addressed. The fact that they were not suggests all sorts of possibilities from editorial oversight to intent to alarm. It is surprising that neither Indian glacier experts nor the Indian government, who must be worried by the potential decline of their major source of water, commented on this error. But perhaps the most unfortunate error was that the glacier statements in the Working Group II drafts were not reviewed by the physical science glacier experts in Working Group I until the final stages when it seems it was too late.

The initial response of the IPCC to the story did not help. There was the usual tribal response of circling the wagons when perceived to be wrongly attacked. The IPCC Chair, Dr Pachauri, who is also the Director General of the Energy Research Institute of India (TERI), openly criticized the research of Dr Hasnain (who incidentally later worked at TERI) and made matters worse by picking a fight with the Indian Minister of the Environment. Eventually, the IPCC took the unprecedented step of posting an erratum on its web-page in which it "regrets" (but does not take responsibility for) the poor peer-review process.

The IPCC procedures (7) are under constant review by the IPCC and were considered in the recently completed Review of the Processes and Procedures of the IPCC (8) done by the InterAcademy Council at the request of the IPCC Chair and the UN Secretary-General. The Review noted that although the IPCC procedures are adequate, they are not always rigorously followed and recommended they be strengthened and more strictly enforced.

There are clearly lessons to be learned from this incident. Perhaps the most important is that there are no short-cuts to good science. As has been said many times: "science is organized scepticism". Scientists need to challenge each other constantly and not necessarily behave like a tribe and follow accepted wisdom. We also have to be cautious of model results of future climate trends. As is often stated: "prediction is extremely difficult especially about the future" and this is very much true for complex systems such as the climate which we still don't fully understand. The incident also shows just how vigilant the IPCC has to be if it is to retain its credibility and withstand the attacks of the climate change denier community.

References:

1) J. Graham Cogley, Jeffrey S. Kargel, G. Kaser, C. J. van der Veen, Science, 29 January 2010, 327:522.

2) R. V. Cruz *et al*., in *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry *et al*., Eds., (Cambridge Univ. Press, Cambridge, UK, 2007), pp. 469–506.

3) IUGG (CCS) – UNEP – UNESCO (2005). Fluctuations of Glaciers 1995–2000, Volume VIII. World Glacier Monitoring Service, Zurich.

4) WWF, *An Overview of Glaciers, Glacier Retreat, and Subsequent Impacts in Nepal, India and China* (WWF Nepal Program, Kathmandu, 2005).

5) S. I. Hasnain, "Report on Himalayan Glaciology: Appendix 6, unpublished minutes of the July 1999 meeting," (Bureau of the International Commission for Snow and Ice, 1999); www.cryosphericsciences.org/docs.html.

6) F.Pearce, *New Scientist*, 162 (2189), 18 (1999)

7) See: http://www.ipcc.ch/organization/organization_procedures.htm.

8) See: http://reviewipcc.interacademycouncil.net/report.html for prepublication copy.

For readers interested in images of how the Himalayan glaciers have retreated, the following web site has some good "before and after" pictures:

http://lens.blogs.nytimes.com/2010/07/16/archive-22/

Next Issue *CMOS Bulletin SCMO*

Next issue of the *CMOS Bulletin SCMO* will be published in **February 2011.** Please send your articles, notes, workshop reports or news items before **January 7, 2011** to the address given on page 198. We have an URGENT need for your written contributions.

Prochain numéro du *CMOS Bulletin SCMO*

Le prochain numéro du *CMOS Bulletin SCMO* paraîtra en **février 2011.** Prière de nous faire parvenir avant le **7 janvier 2011** vos articles, notes, rapports d'atelier ou nouvelles à l'adresse indiquée à la page 198. Nous avons un besoin URGENT de vos contributions écrites.

CMOS BUSINESS / AFFAIRES DE LA SCMO

Report on The Maury Project July 2010

by Grant Badgero

Kalamalka Secondary School, Coldstream
British Columbia

I was fortunate enough, through the generous funding of the Canadian Meteorological and Oceanographic Society (CMOS) and the Canadian National Committee/Scientific Committee on Oceanic Research (CDNC/SCOR), to participate in the Maury Project 2010 Summer Workshop. This project took place at the US Naval Academy (USNA) in Annapolis, Maryland during July 2010 and is run jointly by the American Meteorological Society (AMS) and the USNA.

What is the Maury Project? It is "a pre-college teacher enhancement program to promote the understanding of the physical foundations of oceanography." The program's mandate includes:

1) giving the participating teachers the background information and links, and the activity ideas to present a wide range of oceanography topics to their classes; and,

2) a strong desire to have the participating teachers act as "ambassadors" of the program, to encourage other teachers to participate in future Maury Project summer workshops.

Who is "invited"? Any teacher who has an interest in new ideas, and has some experience in using outside-the-classroom sources to teach their curriculum is invited to apply. This year's group of 24 teachers was an eclectic mix – fairly evenly split along gender lines, ranging in age from mid-20s to 63 with teaching experience from 4 to 40 years in elementary, middle, and high school, from all over the United States (from Alaska to Texas, West Virginia to New Mexico, plus the single Canadian).

Initially I wondered what we would do for an entire two-week workshop – lots! Over that time, a wide range of topics related to oceanography was covered:

a) information on Earth's individual oceans;
b) currents (wind-driven and density-driven);
c) waves (shallow and deep water);
d) tides;
e) coastal upwelling;
f) El Niño and La Niña;
g) satellite remote sensing of the sea level; and,
h) ocean sound.

Testing water turbidity with a Secchi disk

Material was covered extensively on-site (classroom and lab) and off-site. Off-site activities included tours of the National Oceanic and Atmospheric Administration's (NOAA) Science Center and research library, the National Centers for Environmental Prediction, the National Ice Center, along with a "hands-on" beach study and a research cruise on a naval vessel (using oceanographic instruments).

Doing a beach/shore topography survey

Being from the Interior of B.C., one might wonder how much of this workshop I might use in the classroom. Although all topics were interesting, I did have my favourites and will use them in my junior Science and Biology curricula. The Science 10 and Earth Science 11 curricula would very much benefit from the info and activities associated with ocean currents, waves, and El Niño/La Niña. My Biology 11 course could use the material showing the relationships between climate and biomes with ocean temperature, depth, and movement.

ANY science, or math, class could incorporate the data collecting and graphing (plotting and interpreting) activities offered in a number of the modules. As seen by the diversity of the participants, the material covered by the modules of the Maury Project could be used to different degrees depending on the grade level taught. Many of the presenters alluded to the academic and career opportunities in the area of oceanography. What was also very interesting (and practical, considering our venue) was that the practical importance of each topic discussed was given as it related to the Navy, shipping in general, and the environment.

As far as the experience as a whole was concerned this was truly "once-in-a-lifetime". The teachers I shared this time with were a great bunch of people, willing to share teaching and life experiences. I now have an excellent, and diverse, network at my disposal. As we do our local presentations, we can share, critique, and offer ideas and suggestions. As far as the organization of the workshop is concerned, David Smith was impressive! His control of the materials, pacing and venue access (with the help of his immediate team and those with the USNA, the AMS and NOAA) was excellent. The presentation of the modules (background information and activity demonstrations) done by Don McManus and the USNA instructors was top-notch. Don's enthusiasm, sense of humour and pacing were outstanding and infectious. It will now be my job to glean all of this material and do my bit to introduce the Maury Project to my colleagues. I only hope I can do the job half as well as these people have.

Taking a water sample of Chesapeake Bay

I would like to close this report by saying thank you to CMOS, CNC/SCOR and my contact, Sheila Bourque. I appreciate the opportunity to participate in the Maury Project experience. I would recommend it to anyone – to elementary and high school teachers, to veterans and especially to new teachers. It is truly worthy of continued funding from CMOS and CNC/SCOR. Thanks again.

Report on Project Atmosphere July 2010

by Alexander (Sandy) Adamson

High Park School, Stony Plain, Alberta

From 18 to 30 July 2010, I experienced two weeks of the hottest temperatures on record for July in Kansas City. Even better than that, I was a lucky participant in Project Atmosphere 2010, the American Meteorological Society's (AMS) Summer Workshop. At the workshop were gathered 15 American teachers and two Canadians, myself included. The other Canadian, Rosalie Schop, is a young Nova Scotian who just finished teaching her first year in Kimmirut, Nunavut. Rosalie was sent to Project Atmosphere by STAR, which stands for Storm Tracking in the Arctic. They are partners in developing part of the weather component for the new grade 12 science course in Nunavut.

Alexander (Sandy) Adamson at the Natianal Weather Service, NOAA, Kansas City, USA

I teach grade 5 in Stony Plain, Alberta. In Alberta, "weather" makes up 20% of our grade 5 Science curriculum. It can be a fun unit and I am pleased that it is part of what I get to teach. I will say that now I will be teaching weather with a whole new outlook (and expertise). There were many strong presentations at the workshop on a great variety of weather topics.

The participants were a strong group of teachers from around North America. The teachers from the south-east had hurricane and heat wave stories. The teachers from the Plains had tornado and hail storm stories. The folks from New England had experienced some strong nor'easters (and Alberta, to them, was the source of the Alberta Clippers they dislike so much). The teachers from

Arizona and New Mexico had drought stories. As Canadians we brought our stories of ten months of winter and two months of bad skating. Everybody had lived through interesting weather and everybody enjoyed teaching about weather.

A typical day would include presentations on a theme (like "highs and lows" or "hurricanes"). The presentations were quite thorough and were either presented by one of the very capable Project Atmosphere instructors or by very qualified guest speakers. We received presentations from people like **Dr. Louis W. Uccellini** (Director of the National Weather Service!) and **Bill Read** (Director of the National Hurricane Center). Hearing from some of the top weather people in the US was an honour and a treat.

A typical weather briefing session

Each day we would also typically work with a Project Atmosphere Module (PAM). These are educational materials designed to help teach weather concepts to adults. We learned a great deal from the PAMs and they will be very useful when we run our own weather workshops. We worked through PAMs on topics such as El Niño/La Niña, hurricanes, clouds, weather satellites, weather radar, thunderstorms, jet streams, snowstorms, etc. Although some of these may not be applicable to my grade 5s they were very interesting and my high school colleagues will enjoy them. The modules will need no adaptation for our workshops although some of them will need some tweaking before I use them in class.

A highlight of each day was our trip down the hallway to get our daily weather briefing. For the first few days, part of the excitement was finding our way through the warren of corridors at the National Weather Service Training Center (NWSTC). Even after we became accustomed to the building we very much enjoyed hearing from Jerry, a very experienced and knowledgeable forecaster, as he showed us a variety of radar and weather maps. We were shown the prognostications of various climate models. He made sure that everyone knew what was happening "back home" for all of the participants.

One day we took a road trip to Topeka, Kansas. There is a local National Weather Service office in Topeka and we showed up to see local forecasters in their native habitat. We also got to see them release a weather balloon which rose high above the corn fields and drifted out of sight. The next day we got to see data collected and transmitted by "our" weather balloon. The Topeka field trip was a highlight. We all enjoyed when, at the end of the trip, we travelled across the Missouri River back into the state of Missouri and we could say, "We are not in Kansas anymore".

Our evenings were mostly our own and I got a chance to see the local Major League Soccer team play (and beat) Manchester United (from the UK) in Arrowhead Stadium. The next night 12 of us went and watched the worst defeat in Kansas City Royals' history (19-1 loss to the Twins). Another evening all 17 teachers went to a very nice downtown barbecue restaurant. Our days were full and our free time was fun.

The hotel we stayed in was great. It was about a hundred-metre walk to the NWSTC where we spent our days. It was, however, quite far from downtown Kansas City. Some teachers had vehicles and served as taxis. All 17 teachers were very glad they attended.

I feel very honoured to have attended Project Atmosphere. I am grateful to the Canadian Meteorological and Oceanographic Society and the Canadian Council for Geographic Education (CCGE) for sending me to Project Atmosphere 2010.

Update on Transition of *Atmosphere-Ocean* to Taylor & Francis

At the time of this writing, the transition of the publishing operations of *Atmosphere-Ocean* to Taylor & Francis is proceeding very well. Archived articles and subscriber files have been transferred. The online manuscript submission and review system has been set-up and will be open for submissions as of 1 December 2010 (http://mc.manuscriptcentral.com/a-o). The journal web site is being populated (www.informaworld.com/TATO). We expect the new system to be fully in operation by 1 January 2011, or before.

Taylor & Francis offers two immediate benefits to CMOS members: all members will have free access to *Atmosphere-Ocean* (online) through the CMOS Members Services site (a new tab will be added for A-O), and members who wish to subscribe to the printed copy can

subscribe for the price of only $30 including shipping, while renewing their membership to CMOS.

There will be important benefits for authors also. Manuscripts (including those prepared in LaTex), will be received through ScholarOne (a market-leading online peer review system by Thomson Reuters). At anytime authors will be able to verify at which stage their manuscript is and they will receive messages from the editors, submit revisions and receive final acceptance through the system. There should be no need to query the editors outside of the system. Every message and change will be recorded for the future. Additionally, CMOS is waiving page charges for first-time Canadian authors (see *CMOS Bulletin SCMO*, Vol.38, No.4, August 2010, page 148 or web site for details at:

http://www.cmos.ca/Ao/waivingpagecharges.html

The editorial review process will be much facilitated. ScholarOne will ask the author for 4-8 keywords, which will be used by the editors to help in the selection of reviewers and also to facilitate discovery of the article once it has been published. A list of reviewers will gradually be built-up in the system, complete with a rating of their "performance". If suitable reviewers do not immediately come to mind, a search through a number of scholarly databases can be undertaken directly through the system. Standard letters of acknowledgment, acceptance, comments etc can be personalized easily. Reminders can be sent to reviewers automatically, at a frequency determined by the editor. This automation will greatly simplify the task of the editors, who are dedicated persons but generally very busy. We expect the publication delay to be reduced substantially as a result. At any time, the editorial staff and the Director of Publications will be able to see the progress of all articles in the system. There will be no need for preparing progress reports.

Once a manuscript has been accepted for publication, it moves seamlessly into the Taylor & Francis production system CATS (Central Article Tracking System), which will carry it through technical editing, quality control, online publication through *iFirst* (http://www.informaworld.com/smpp/iFirst), Taylor & Francis' own early online-publication system, assignment to an issue and printing. *Atmosphere-Ocean* will retain the highly rated services of our own Sheila Bourque as technical editor (and production manager). However, should she become overloaded by a flood of manuscripts, we can call upon our big partner's team of skilled copy editors.

Taylor & Francis brings a tremendous amount of experience, manpower and machinery to the service of *Atmosphere-Ocean*. They are working hard to help make our journal a success, increasing the number of articles, the number of readers, and the Impact Factor.

Success of our journal requires more than a good publisher: Canadian authors must start to submit more significant papers more frequently to their journal. Authors must understand that to ensure that each of their papers is reviewed by at least two referees, they must also accept to review at least twice as many papers as they write themselves. Persons who are asked to review manuscripts must make this task a priority and carry out their review with care and diligence. *Atmosphere-Ocean* has some progress to make in this regard.

CMOS has acquired an impressive capability to treat manuscripts; the rest has to be done by authors.

Richard Asselin
Director of Publications

Progrès dans la transition de *Atmosphere-Ocean* à Taylor & Francis

Au moment d'écrire ces lignes la transition des opérations de publication d'*Atmosphere-Ocean* vers Taylor & Francis progresse très bien. Les anciens numéros et les dossiers d'abonnement ont été transférés. Le système de soumission des manuscrits en ligne a été programmé et entrera en service le 1 décembre 2010 (http://mc.manuscriptcentral.com/a-o). Le site web de la revue est en développement (www.informaworld.com/TATO). Le nouveau système devrait être en opération le 1er janvier 2011, ou avant.

Taylor & Francis offre deux avantages importants aux membres de le SCMO: tous les membres auront l'accès gratuit à *Atmosphere-Ocean* (en ligne) par le biais du site Services aux membres de la SCMO (on ajoutera un nouvel onglet pour *A-O*), et les membres qui le désirent pourront s'abonner à la copie imprimée au coût de 30$, livraison incluse, en renouvelant leur adhésion à la Société.

Il y aura aussi d'importants bénéfices pour les auteurs. Les manuscrits (incluant ceux préparés en LaTex) seront reçus par ScholarOne (un logiciel avancé pour la revue par les pairs, de Thomson Reuters). En tout temps, l'auteur pourra vérifier à quelle étape son manuscrit est rendu et il recevra les messages des éditeurs, soumettra les révisions et recevra l'acceptation finale par le système. Toute communication avec les éditeurs se fera à travers le système et tous les messages et changements seront conservés indéfiniment. De plus, la SCMO exemptera de frais les auteurs canadiens d'un premier article (voir le *CMOS Bulletin SCMO*, Vol.38, No.4, août 2010, page 149 ou le site web pour les

détails:

http://www.cmos.ca/Ao/waivingpagecharges.html

Le processus éditorial sera facilité de beaucoup. ScholarOne demandera 4-8 mots-clés à l'auteur, et les éditeurs s'en serviront pour identifier des réviseurs. Ces mots-clés serviront aussi à faciliter la découverte de l'article lorsqu'il aura été publié. Une liste de réviseurs et de leur «rendement» s'établira graduellement. Si un réviseur approprié ne vient pas à l'esprit immédiatement, le système offrira une recherche dans plusieurs banques de données académiques. Les lettres conventionnelles d'accusé de réception, commentaires, acceptation etc., peuvent être personnalisées facilement. Des rappels peuvent être envoyés aux réviseurs automatiquement, à la fréquence choisie par l'éditeur. Cette automation simplifiera de beaucoup la tâche des éditeurs, qui sont des personnes dévouées mais très occupées. Nous comptons sur une réduction substantielle du délai de publication. En tout temps, le comité éditorial et le directeur des publications pourront vérifier la progression de tous les articles inscrits au système. Il ne sera plus nécessaire de préparer des rapports d'avancement.

Une fois le manuscrit accepté pour publication, il sera pris en charge automatiquement par le système de production de Taylor &Francis CATS (Central Article Tracking System), qui l'acheminera vers l'édition technique, le contrôle de qualité, l'affichage anticipé sur le web utilisant le système *iFirst* (http://www.informaworld.com/smpp/iFirst), l'assignation à un numéro et l'impression. *Atmosphere-Ocean* retiendra les services très prisés de Sheila Bourque comme éditrice technique (et gérante de la production). Toutefois, si elle devait être submergée par un nombre excessif de manuscrits, nous pourrons compter sur l'équipe de réviseurs de textes de notre gros partenaire.

Taylor & Francis amène une vaste expérience, du personnel et de la machinerie au service d' *Atmosphere-Ocean*. Ils travaillent fort pour aider à faire de notre revue un succès en augmentant le nombre d'articles, le nombre de lecteurs et son impact.

Le succès de notre revue dépend de plus qu'une bonne maison d'édition : les auteurs canadiens doivent soumettre plus de leurs articles importants à leur revue, et soumettre plus souvent. Les auteurs doivent comprendre que pour que chacun de leurs manuscrits soit révisé par au moins deux arbitres, ils doivent eux-mêmes accepter de réviser au moins deux fois plus de manuscrits qu'ils n'en publient. Les personnes à qui on demande de réviser un manuscrit doivent en faire une priorité et exécuter leur travail avec soin et diligence. *Atmosphere-Ocean* doit s'améliorer à ce sujet.

La SCMO a acquis une capacité impressionnante pour traiter les manuscrits; c'est maintenant aux auteurs de faire le reste.

Richard Asselin
Directeur des publications

CMOS is updating its database and secure server software

At the Council meeting in September, the CMOS national office presented three options for updating the CMOS database and secure web server software. These options were:

1) to continue with our current software supplier, Minasu Data Systems of Ottawa, and follow their current upgrade path;

2) to engage Cvent, an event management software supplier based in Maclean Virginia, to expand their software to handle membership management;

3) to engage Orbitrix Canada, a membership relationship management software supplier based in Toronto, to expand their current offering of membership and event management software to include the abstract management functions that we need.

The recommendation to Council was option 3), because only the Orbitrix software can handle almost immediately all our current operations plus offer the flexibility to add, at little or no cost, functions that we need but do not have, such as privileged access by Council members' files and reports and other information to support Council and other committee decisions, centre and congress operations, etc. Option 3) was also the cheapest over a seven year period, the length of time that we have been using the current system.

A contract with Orbitrix was signed 29 September 2010. The new software development process will take four to six months to complete, in five phases: planning, prototyping, testing, data migration, final acceptance. We hope to be able to reach final acceptance in March or April. The planning phase was finished and signed off in late October. We expect to receive the initial prototype in November or early December.

When completed, everything will be hosted on Orbitrix servers and CMOS will be able to shut down its two virtual servers hosted at Primus. All functions in the new system will be accessible using an ordinary web browser. CMOS national office staff, Council members and ordinary members will have different levels of access over the Internet. There will be no need for low-level user

accounts on physical servers requiring firewall tunnels, fixed IP addresses, etc., neither for the national office nor for the registration desk at congresses. This will eliminate a recurring source of difficulty and occasional breakdowns especially at congress.

With the new software there will be no need for the national office to get involved in actual database queries or in the programming of back-office interfaces or interactive web pages in obscure development languages. All such functions can be relatively easily programmed through high-level interfaces such as form design, mail-merge, etc. The Orbitrix package is based on industry-standard Microsoft Customer Relationship Management (CRM) software that interfaces seamlessly with Microsoft Office for the generation of reports, name badges and tickets, etc.

Ian D. Rutherford
Executive Director

La SCMO met à jour ses logiciels de base de données et de serveur sécurisé

À la réunion du conseil, en septembre, le bureau national de la SCMO a présenté trois options visant la mise à jour des logiciels de base de données et de serveur Web sécurisé de la Société. Les options suivantes ont été proposées :

1) Demeurer avec notre fournisseur actuel de logiciels, Minasu Data Systems (Ottawa), et suivre leur plan de mise à jour;

2) Retenir les services de Cvent (Maclean, en Virginie), un fournisseur de logiciels de gestion d'évènements, et leur demander d'inclure la gestion des membres dans leur logiciel;

3) Retenir les services d'Orbitrix Canada (Toronto), un fournisseur de logiciel de gestion de relation avec les membres, et leur demander d'inclure la gestion de résumés dans leur logiciel de gestion des membres et des évènements.

L'option 3 a été recommandée au conseil, car le logiciel d'Orbitrix est le seul à pouvoir gérer presque immédiatement toutes nos activités actuelles, en plus d'offrir la possibilité d'ajouter, gratuitement ou à coût modique, les fonctions nécessaires qui nous manquent, comme un accès privilégié aux fichiers, aux rapports et à d'autres renseignements en appui aux décisions des membres du conseil et des autres comités, et aux activités des centres et du congrès, etc. Étendue sur une période de sept ans, ce qui équivaut à la durée d'utilisation de notre système actuel, l'option 3 s'avère la plus économique.

Nous avons signé, le 29 septembre 2010, un contrat nous liant à Orbitrix. Le développement logiciel durera de quatre à six mois et comportera cinq étapes : la planification, le prototypage, l'essai, la migration des données, l'approbation définitive. Nous espérons atteindre l'étape d'approbation en mars ou en avril. La planification s'est terminée et a été approuvée à la fin d'octobre. Nous comptons recevoir le premier prototype en novembre ou au début de décembre.

Une fois terminé, le tout sera installé sur les serveurs d'Orbitrix et la SCMO pourra mettre fin à l'exploitation de ses deux serveurs virtuels hébergés par Primus. Toutes les fonctions du nouveau système seront accessibles à partir d'un simple navigateur Web. Le personnel du bureau national de la SCMO, les membres du conseil et les membres ordinaires auront différents niveaux d'accès en ligne. Il sera inutile, notamment pour le bureau national et pour le bureau d'inscription des congrès, d'avoir des comptes de bas niveau sur les serveurs physiques ou d'utiliser des tunnels de pare-feux, des adresses IP fixes, etc. Ce qui éliminera une source récurrente de difficulté et les bris occasionnels, notamment pendant les congrès.

Ce nouveau logiciel éliminera en outre le besoin qu'avait le bureau national de formuler des requêtes à la base de données, ou de développer des interfaces ou des pages Web interactives en utilisant d'obscurs langages de programmation, qui permettaient d'accéder aux fonctions de l'arrière-guichet. Toutes ces fonctions : conception de formulaires, fusion et publipostage, etc., peuvent être programmées assez facilement grâce à des interfaces évoluées. Le système d'Orbitrix s'appuie sur le logiciel de gestion de relation client (CRM) de Microsoft, norme de l'industrie, et s'intègre parfaitement à la suite Office de Microsoft, pour la préparation de rapports, de porte-noms, de billets, etc.

Ian D. Rutherford
Directeur exécutif

Note from the Editor: With the transition to Taylor & Francis, ATMOSPHERE-OCEAN becomes *Atmosphere-Ocean*.

Avis de la rédaction: Avec la transition à Taylor & Francis, ATMOSPHERE-OCEAN devient *Atmosphere-Ocean*.

BOOK REVIEWS / REVUES de LITTÉRATURE

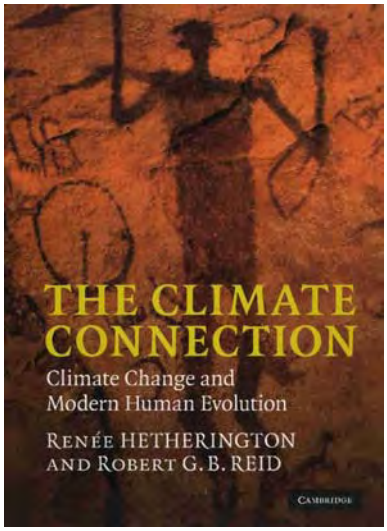
The Climate Connection: Climate Change and Modern Human Evolution

by Renée Hetherington and Robert G. B. Reid

Cambridge University Press, Paperback pp.422, $44.00
ISBN 978-0-521-19770-0

Book reviewed by John Stone[1]

Despite continuously strengthening scientific evidence, progress in adequately addressing the present and future threat of climate change is almost non-existent. We are faced now with inevitable changes as a result of past emissions of greenhouse gases and some of the changes will be irreversible within the next millennium. What actions we take (or don't take) in the next few years will determine the climate that future generations will have to face. Given this prospect we might look to the past for lessons regarding how earlier societies have dealt with changes in the climate. It was with this in mind that I accepted to review this book.



The authors, both of whom have some connection with the University of Victoria, review the existing knowledge and competing interpretations of paleological evidence regarding the evolution of modern humans. They bring together the history of climate and human development and migration. However, the evidence is so sparse, particularly before humans became settled, that there is generally little consensus amongst experts. The authors provide several examples where the evidence is insufficient for example on whether modern humans (Homo sapiens) and Neanderthals interbred or on whether the expansion of hunter-gatherers led to over-exploitation of resources and the emergence of agriculture. What we can say is that we are now the only surviving species of the Homo genus species although we have come perilously close to extinction on several occasions when the human population dropped to some 10 thousand as a result of climate and volcanic episodes. This is a future we presumably don't want to contemplate.

The authors contend that by the beginning of the last glacial cycle humans were sufficiently anatomically and mentally developed that they were well equipped to adjust to the vagaries in the climate through a series of evolutionary jumps. Future human development was then to be a history of adaptation to climate variability and change. Unfortunately, for those with a background in climate change, the authors use the word adaptation to refer to the slow genetic (Darwinian) change and adaptability to refer to developmental, behavioural and physiological changes with which we are now more familiar.

The focus is mainly on the last glacial cycle and the authors provide a detailed account of the several marine isotope stages (MIS). However, the relevance of much of this to lessons that we might learn is doubtful. Humans migrated out of Africa starting around 135 thousand years ago, although this was by no means a one-way migration. The migration peaked around 52 thousand years ago when it is speculated that the Sahara began to expand southwards and possibly by the occurrence of new zoonotic diseases. But these people were nomadic hunter-gatherers and not living in settled communities and their response to climate change was essentially to migrate – an option that is not universally available in today's crowded World.

The more relevant period is the last 10 thousand years of the Holocene with its relatively more stable climate that saw rapid development of settlements, first in the Fertile Crescent – the cradle of civilization. What is fascinating, but omitted from this book, is the evidence that agriculture developed in several other parts of the World quite independently. As already noted, there is no consensus on what triggered the transition from a hunter-gatherer existence and the beginning of agriculture. One suggestion is the occurrence of a series of major droughts such as that caused by the Younger Dryas episode and also the flooding of the Black Sea when sea-level in the Mediterranean rose rapidly. These changes stimulated the need to adapt. In addition, with the number of humans increasing and the interactions between different groups becoming more frequent, there was an increase in the development and transfer of new technologies. Many believe that technology will again solve today's threat of climate change but there is evidence that there are significant human and institutional barriers which we still don't fully understand.

At the same time that civilization was developing in the Fertile Crescent, humans were migrating across the globe. The reason for these migrations is not explained very thoroughly in this book but it is suggested that they were

[1] Retired Metorologist and Adjunct Research Professor in the Department of Geography and Environmental Studies at Carleton University, Ottawa, ON, Canada.

following the large animals that constituted their main food source. The link to climate is that it determined the growth of vegetation on which these large animals depended. It is commonly thought, for there is scant archaeological evidence, that humans entered North America from Asia across the Bering land-bridge when sea-level was some 120 metres lower around 21 thousand years ago during the Last Glacial Maximum – that is, when it was very cold and therefore presumably humans were already adapted to extreme temperature. They then migrated southwards either through a gap between the Cordilleran and Laurentide ice sheets or along the exposed coasts. And the rest, as they say, is history.

The book is structured such that there is a lot of repetition of material. For example, chapter 5 deals with the climate over the last 135 thousand years; chapter 6 discusses the effects on the landscape over this same period and chapter 7 discusses the impacts on humans during each MIS. Bringing the evidence on each MIS together would have produced a better storyline. Indeed, the book does a poor job of linking the climate and anthropological information. Thus, contrary to the title of the book, the authors have not succeeded in "connecting" the various elements. It does not provide the reader with satisfactory explanations of "why" human development progressed as it did. We are provided with few lessons from the historical past to guide us. Jarad Diamond in his book *Collapse* does a much better job by bringing in such factors as the over-exploitation of land and water resources and the inevitable conflicts.

There are lots of other annoying things with this book: an excessive use of invented abbreviations and no Glossary, collecting all the colour diagrams in the centre of the book with no captions or page numbers, and a lot of material on genetic and epigenetic developments (including in three extensive Appendices) that is not really needed. It is also not clear what is the intended audience; more likely graduate-level anthropologists rather than climate scientists.

So what can we learn from studying the development of our ancestors? Perhaps the most disconcerting is, to quote the authors, there is almost universal consensus among archaeologists and anthropologists that it takes almost catastrophic conditions to make human beings change their ways – often through desperate responses. This gets us back to the human and institutional barriers mentioned above such as the human capacity for denial. The authors suggest that one negative consequence of our increasingly and artificially stabilized environment, itself brought about by technology, may be the reduction in our ability to recognize environmental change. We fail to hear Nature's voice. As Ursula Franklin has said: "It is as if Nature constantly sent e-mails and nobody opened them of those that could". What complicates matters is that in the past the climate affected human development whereas today human development is affecting the climate – a regrettable positive feedback.

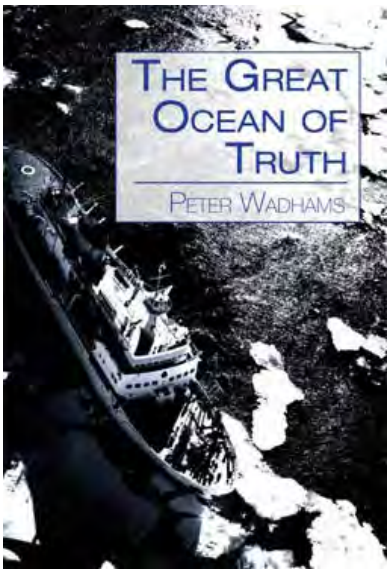
The Great Ocean of Truth

by Peter Wadhams

2009, Melrose Books, UK, £15.99
ISBN 978 1 907040 30 6

Book reviewed by Paul LeBlond[2]

Hudson 70 was Canada's most far-reaching oceanographic expedition, embracing the Americas in their entirety in a first-ever circumnavigation. It was the first and also the last such Canadian venture. Scientific questions of strategic relevance to Canadian marine resources required using a ship of the Hudson's capabilities on all three coasts. The logical solution, much cheaper and quicker than building or refitting another ship, was to send the Hudson around. The expedition would start from Halifax, the Hudson's home port, probe the bottom waters of the Atlantic all the way to their source in Antarctica, traverse the Pacific from south to north to conduct geophysical studies of the Gulf of Alaska, and continue into the Arctic to survey the Beaufort Sea. Returning home through the Northwest Passage would complete the circumnavigation.



The long and exotic itinerary offered opportunities for piggy-backing scientific investigations that enhanced the value of the expedition. Researchers studied whales and plankton in the Atlantic, amphipods on the beaches of Tierra del Fuego. A team of scientists from western Canada and USA joined the ship to survey the fjords of Chile, similar but interestingly different from those of British Columbia. The long traverse northward from the vicinity of Antarctica across the equator and on to the Gulf of Alaska was made along the 150° meridian to determine the shape of the geoid, a project led by Bill von Arx. The many scientific accomplishments are summarized in a short Appendix by Charles Shafer. The author also offers to provide "interested readers" who will contact him at pwadhams@damtp.cam.ac.uk with a complete list of publications arising from Hudson 70 operations.

[2]Galiano Island, British Columbia, Canada

This is not the first book to describe the Hudson 70 expedition. It is, however, quite a different account from that presented by Alan Edmonds in his "Voyage to the Edge of the World", published in 1973, soon after the expedition. Edmonds, a science journalist, interviewed most of the participants at length and did an excellent job at explaining the whys and the hows of the scientific activities. I looked for any sign of Wadhams in Edmonds' book. I found him near the end, briefly mentioned by name as "a scientific maid-of-all-work ", entertaining the staff with his guitar. But there is also a reference to some "terrible trio" of young crew and scientists-assistants involved in minor pranks, one of whom was most likely our Peter.

The great difference is that "The Great Ocean of Truth" is a candid first-person eyewitness account of the voyage, at sea where the science was conducted, and ashore where some of the most interesting action took place. Indeed, the book could be subtitled "*Around the Americas with an inquisitive young Englishman*." At 21, freshly graduated with a physics degree at Cambridge, Peter Wadhams leapt at the opportunity to learn about oceanography first hand and see the world on a major expedition. The letter from the Bedford Institute offering him the position did not even mention a salary. "I didn't care", he wrote, "Please take me!"

The science and the work at sea are described directly, through the eyes of the young man who attached the bottles on the wire and entered the data on the computer, but also from the perspective of the author's experience as a seasoned oceanographer. The author vividly relives with us forty-year-old memories and tells us about his adventures through the eyes and voice of his younger self. We see the researchers and the crew at work and at play, as observed by Peter, the most junior member of the scientific team, also the only one who stayed aboard for the entire circumnavigation. We follow him ashore, eager to see as much as possible of the new countries he visits. A brief visit to Rio, the first port of call, includes a bus ride to Brasilia. Across the pampas, in Darwin's footsteps – except by train – from Buenos Aires to Córdoba , on the next shore leave. He joins crew members on their search for "ethnic entertainment". Like Darwin, who was only 22 when he set out on the Beagle, he is eager to see the land, its fauna, flora and people and he is also interested in girls and music… he and his friends serendipitously end up at the Cosquín Folk Festival, unaware of the prominence of the event (Google it! "The most important music festival in South America").

Before navigating the treacherous fjords of southern Chile, we visit Punta Arenas, where the staff of 'Maria Teresa' warmly welcomes the crew of the Hudson. With the ship in port at Valparaiso and while Canadian officials were making formal announcements in Santiago, Peter fits in a quick trip to Lake Titicaca and Macchu Picchu. Everywhere, the young Peter – pictures show him, big smile, big ears –follows his dreams, thinking that "the man who lets himself slip into a boring and monotonous life is letting his soul die by slow stages". Amen!

I strongly recommend the book to anyone interested in the Hudson 70 expedition and its participants -- many of whom have left this mortal coil. I especially enjoyed it as a candid and lively (just how candid? you'll have to read the book) account of a bright young man's exploration of foreign lands.

Machine Learning Methods in the Environmental Sciences

Neural Networks and Kernels

by William W. Hsieh

Cambridge University Press, 2009, pp. 349
Hardback: ISBN 978-0-521-79192-2, USD $65.00
Paperback: ISBN 978-0-521-79642-2 (Not Yet Available)

Book reviewed by William Burrows[3]

Machine learning methods were originally grouped under a subject known as artificial intelligence because the architecture in neural network algorithms was thought to mimic that of the brain. The term artificial intelligence applies less today as understanding grew over the years that machine learning methods are actually linear and non-linear extensions of linear classification, regression, and probability prediction methods for continuous and discrete predictands. Theoretical and applied developments have progressed substantially in recent years as increasing computer power allowed very complex calculations to be made quickly. Today machine learning methods have become ubiquitous in many science and engineering fields. In the environmental sciences machine learning methods are now used extensively in satellite data processing, weather and climate prediction, general circulation models, air quality forecasting, analysis and modeling of atmospheric weather elements, oceanographic and hydrological forecasting, ecological modeling, and the monitoring of snow, ice, and forests. Professor Hsieh has produced a large body of work on the theory and application of machine learning methods to environmental science problems and he is considered by many to be one of the premier scientists in this field.

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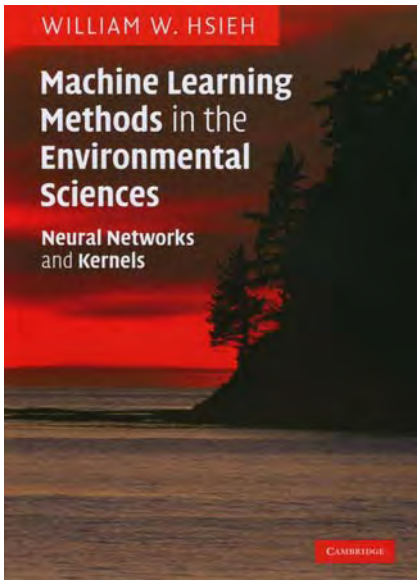
[3] Environment Canada, Cloud Physics and Severe Weather Research Section
Toronto, ON *and*
Hydrometeorology and Arctic Laboratory
Edmonton, AB



This book is written at a level suitable for graduate or advanced undergraduate students with a prior knowledge of multivariate calculus, matrix theory, linear algebra, and basic probability. No previous knowledge of machine learning methods is assumed. One can learn the subject from basic to advanced concepts with this book, making it suitable as a textbook and reference. The material is explained in a straightforward, clear, concise, and complete manner. The reader does not have to wade through lengthy explanations and can proceed quickly. All relevant topics are covered from historical to very recent. The full mathematical equations are presented for every topic so the reader may fully appreciate the theory and concepts discussed. Numerous diagrams are included, and are of great utility for explaining complex material and concepts. All of the main facets of machine learning are covered, including theory, data selection, data reduction and data clustering, and problems of overfitting and underfitting data. There are sections in Chapters 8 and 9 on forecast verification, a subject often poorly addressed by researchers when analyzing and presenting their results. Each chapter ends with a set of exercises and it is possible to obtain solutions. A list of associated software websites is given. One may obtain data and codes at no cost at a book website www.cambridge.org/hsieh .

The first three chapters cover the basic theory of statistics, linear statistical analysis, and time series analysis that are necessary to understand the material of the subsequent chapters. I found the early chapters particularly useful for a quick review of important statistical and probability theory, linear multivariate and statistical analysis topics such as principal component and canonical correlation analysis, and basic time series analysis. Chapters 4 to 6 introduce the reader to neural networks (NN). In the fourth chapter, on feed forward neural network models, historical developments leading to the most commonly used neural network today, the multi-layer perceptron (MLP), are explained, including basis functions and the back-propagation method, which is fundamental for training a MLP NN. Chapter 5 explains the methods for non-linear optimization needed for finding a global minimum in the cost function while avoiding being trapped in local minima. These include the older deterministic optimization methods such as the Gauss-Newton method and the more recent stochastic methods such as simulated annealing and evolutionary computation. Topics in learning and generalization of a NN fit of the training data when applied in a prediction mode to independent data are discussed in Chapter 6.

The book then goes on to deal with the many exciting developments in machine learning that have occurred in recent decades. In Chapter 7 Professor Hsieh introduces the reader to kernel methods, which became popular in the mid-to-late 1990s. Kernel methods include support vector machines, used for classification and regression, and probabilistic (Gaussian processes) models. MLP NN and kernel methods both require a mapping from the input space to a hidden space called the "feature space", and this can be of very high or even infinite dimension if the input data set has many predictors. This dilemma is known as the "curse of dimensionality". The MLP NN method tries to evaluate the structure of the feature map adaptively by means of a hidden layer of neurons (a set of nonlinear adaptive basis functions). The problem of multiple local minima arises and the computational cost becomes unsustainable as the number of predictors increases. In contrast the kernel method does this mapping at a moderate computational cost by means of a kernel function that gives the inner product in feature space without having to evaluate the feature map directly. Thus some problems which could not be solved previously with a MLP NN can be solved with a kernel method. Having laid the theoretical foundation for NN and kernel methods, the book goes on to discuss how they can be used for nonlinear classification in Chapter 8, nonlinear regression in Chapter 9, nonlinear principal component analysis in Chapter 10, and nonlinear canonical correlation analysis in Chapter 11. Tree-structured classification and regression, known as CART, and its bootstrap extension, known as the random forest, which are nonlinear algorithms different from NN and kernel methods are also discussed in Chapter 9. In Chapter 10 the book also discusses the self organizing maps (SOM) method, which is in widespread use for unsupervised data clustering. Finally, in Chapter 12 Professor Hsieh discusses applications of machine learning methods to a wide range of problems in the environmental sciences.

This book is unique because it presents machine learning in the context of environmental science applications. I found it to be a valuable tool to bring myself up-to-date with the historical and recent developments in the subject of machine learning, and I believe the reader will too. The purchase price is modest. I highly recommend that any student or researcher interested in machine learning methods obtain a copy.

Weather on the Air
A History of Broadcast Meteorology

by Robert Henson

Published by the American Meteorology Society
Distributed by Universtiy of Chicago Press
Hardback, ISBN 978-1-878220-98-1, pp.241, $35.00

Book reviewed by Rob Haswell[4]

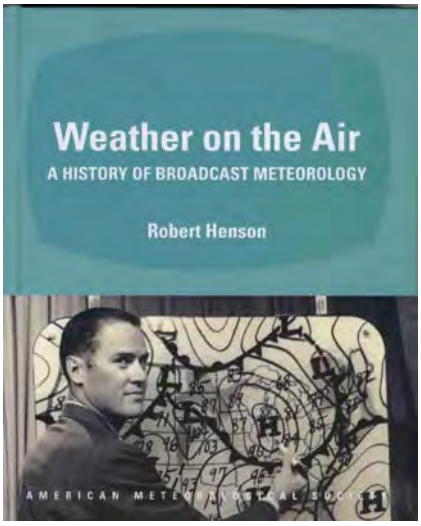
The modern world of TV weather might be flashy with HD graphics and 3-D animations but this book on the history of broadcast meteorology opts for a more low key, retro look and still manages to catch your eye and draw you into its pages. Published - perhaps most appropriately - by AMS Books, Weather on the Air tells a wonderful and engaging story of the evolution of broadcast meteorology.

In the first chapter, "And Now Your Forecast" - we get a high speed overview of the history of broadcast weather from its first years in print through radio and television. If you just read this chapter you will be very well versed in how the modern world of weathercasting came to be. Even for those in the business you'll find something you likely didn't know like the fact that Raquel Welch was once Raquel Tehada the "Sun-up Weather Girl" on KFMB!

Chapter two takes us through a sort of day in the life of a TV weather person. For the general public and those in meteorology who've never been interested in TV weather, it will open your eyes to the crazy atmosphere of broadcast meteorology and perhaps prove just how much real science is involved in an area of meteorology that some cast off as just "fluff". The latter portion of the chapter deals with the concept of certifying on-air meteorologists and gives some history of both the AMS and NWA programs. It does not deal with CMOS endorsements but there may be something our Society can draw from the back story of our sister societies.

The second chapter dove-tails nicely into the third as we move from the world of the TV weather person to the marriage of public and private meteorologist and how they shape the day-to-day weather cast. It's a nice look back to the early days of the old Weather Bureau and digs into the break from relying government employees to deliver weather on private television stations which came to a head in 1952 when a complaint was lodged that the free services of the US Weather Bureau were undercutting the ability of private forecasters to build a business. The resulting change in policy opened the doors to more and more private forecasting which has built into today's business.

Chapter four is close to my heart in many ways as it looks at the ever changing and evolving attitudes and styles of delivering the weather from the straight laced scientists of the 50s through the puppets and cartoons of the 60s and 70s and into today's return to a more scientific but personality-driven forecast. The chapter even touches on my own long-ago predecessor "Albert the Alley Cat" who delivered the weather from WITI where I now hold the reins of morning weather. It's a wonderful look at how everything old is new again and how the weather person has always played a unique role in local broadcasting.



The middle of the book, chapters five and six, offer a look at the technical side of weather broadcasting and a look at how the weather-man became the weather person and how the role of the broadcast meteorologist has become more and more culturally diversified. In the middle of the book is a feast for the eye with full colour photos of weather people and technology from past and present. It's also my only complaint about the book in that this section could have been much much larger. How do you tell the story of a visual medium and not include more visuals? I could have taken in at least another several pages and would have loved to see more visuals through out the book. Were I the publisher, I would have stopped just short of making this into a coffee table book. At only a little over 200 pages, in a mid-sized font, there is room for more.

Chapter seven is an interesting look at how we, as a viewing audience, follow the weather. While the only weather that truly affects your life is the weather above your heads, we routinely check out national and international weather. The evidence of that is obvious in the success of The Weather Channel and our own Weather Network.

Chapter eight then brings it back to the local weather casters by focussing on the role of the meteorologist during severe weather. It's an excellent overview of how the broadcast meteorologist is key to getting timely, life-saving information out to the public. It takes an interesting look at warnings before TV and radio and shows how they have evolved and been further refined in the era of 24 hour media. It pays the proper respect to the area of broadcast meteorologist where the TV and radio weathercaster plays his or her most important role.

[4] Fox 6 - Milwaukee. Also Chair, CMOS Weathercaster Endorsement Committee

The third to last chapter (9) seems a bit out of order in that it back-tracks to looking at the history of the broadcast meteorologist but this time through only the medium of radio. I'm not sure where I'd put this chapter to make it fit better but it does seem to be an odd man out. It is, however, a great read and really gives proper respect to those on the air without the benefit of graphics! Also a little bit of an oddball chapter is the second to last "Cloudy and Warmer" which is a look at how climate change has been treated in broadcast meteorology over the past several years. Again it's a good read and interesting to see the trends in reporting but it doesn't quite seem to fit and the politics of it all puts a little negativity into a mostly upbeat book.

Finally, what would a history book be without a look forward? The final chapter "The Extended Outlook" looks at where the weathercast is headed what massive changes lie ahead in the world of local television and radio. It examines in depth the new world of multi-platform broadcasting where the local TV meteorologist now also does weather on the web, social media, mobile apps, for several local radio stations and web sites and writes a blog. The chapter does offer some concern for the future of broadcast meteorologists pointing out that all of the information for the true weather nut is easily and readily available but it also states quite firmly that there is a need for a human element. The weathercaster is "a personal link to the unknown" observes the author, and goes on to quote the well-known Gary England saying "when individuals feel at risk from sever weather they seek out ... the person they know and trust."

Reading this book has in some ways renewed my desire to continue becoming that person that my viewers turn to when they feel they are at risk. I advise all those in broadcast meteorology and those aspiring to join the world of the weathercaster to give this a read.

Books in search of a Reviewer (Partial list)
Livres en quête d'un critique (Liste partielle)

2010-01) *Remote Sensing for Biodiversity and Wildlife Management, Synthesis and Applications*, Steven E Franklin, McGraw-Hill, Hardback, 2010, ISBN 978-0-07-162247-9, pp. 346.

2010-04) *Challenged by Carbon, The Oil Industry and Climate Change*, Bryan Lovell, Cambridge University Press, Paperback, 2009, ISBN 978–0 521-14559-6, pp.212, US$30.

2010-07) *Ocean Circulation, Wind-Driven and Thermohaline Processess*, Rui Xin Huang, Cambridge University Press, Hardback, 2009, ISBN 978–0 521-85228-9, pp.791, US$85.

2010-09) *Climate Change and Small Pelagic Fish*, Edited by Dave Checkley, Jürge Alheit, Yoshioki Oozeki and Claude Roy, Cambridge University Press, Hardback, 2009, ISBN 978–0 521-88482-2, pp.372, US$155.

2010-16) *Controlling Climate Change*, Bert Metz, Cambridge University Press, Hardback, 2010, ISBN 978-0-521-76403-2, pp.359, US$125.

2010-17) *Introduction* to *Coastal Processes* and *Geomorphology*, Robin Davidson-Arnott, Cambridge University Press, Hardback, 2010, ISBN 978-0-521-87445-8, pp.442, US$125.

2010-19) *Stochastic Physics* and *Climate Modelling*, Edited by Tim Palmer and Paul Willimas, Cambridge University Press, Hardback, 2010, ISBN 978-0-521-76105-5, pp.480, US$150.

2010-25) *The El- Niño-Southern Oscillation Phenomenon*, by Edward S. Sarachik and Mark A. Cane, Cambridge University Press, Hardback, ISBN 978-0-521-84786-5, pp.369, $75.00.

2010-28) *Heliophysics: Space Storms and Radiation: Causes and Effects*, Edited by Carolus J. Schrijver and George L. Siscoe, Cambridge University Press, Hardback, ISBN 978-0-521-76051-5, pp.447, $75.00. Book received October 13, 2010.

2010-29) *Contemporary Issues in Estuarine Physics*, Edited by Arnoldo Valle-Levinson, Cambridge University Press, Hardback, ISBN 978-0-521-89967-3, pp. 315, $120.00. Book received October 13, 2010.

2010-30) *Measurement Methods in Atmospheric Sciences, In situ and remote*, by Stefan Emeis, Borntraeger Science Publishers, Hardback, ISBN 978-3-443-02066-9, pp. 272, 103 figs, 28 tables, € 68. Book received October 18, 2010.

2010-31) *Introduction to Amospheric Physics*, by David G. Andrews, 2nd edition, Cambridge University Press, Paperback, ISBN 978-0-521-69318-9, pp. 237, $65.00. Book received October 25, 2010.

2010-32) *Climate Capitalism, Global Warming and the Transformation of the Global Economy*, by Peter Newell and Matthew Paterson, Cambridge University Press, Paperback, ISBN 978-0-521-12728-8, pp. 205, $30.00. Book received October 25, 2010.

SHORT NEWS / NOUVELLES BRÈVES

Arctic Coastal States Committed to Safety at Sea in the Arctic

Dominion Hydrographer of Canada – First Chair of the Arctic Regional Hydrographic Commission

October 12, 2010 - The five Arctic coastal states: Canada, Denmark, Norway, the Russian Federation and the United States, under the leadership of Canada established the Arctic Regional Hydrographic Commission (ARHC) in Ottawa on October 6, 2010. The Dominion Hydrographer of Canada, Dr. Savithri (Savi) Narayanan, will be the first chair of the Commission, with Denmark as the Vice Chair.

Presenting the new statutes to the International Hydrographic Bureau. Sven Eskildsen, Denmark, Evert Flier, Norway, Alexander Shemetov, Russian Federation, John Lowell, USA, Savithri Narayanan, Canada and Alexandros Maratos, President, International Hydrographic Bureau.

The establishment of the ARHC is an historic event. Since the establishment of the International Hydrographic Organization in 1921, fifteen regional hydrographic commissions have been established worldwide. The Arctic Ocean remained without such a commission until today.

The Arctic is undergoing extraordinary transformations facilitating increased natural resource development and marine traffic at a time when little reliable navigational and environmental data exists. At present, less than 10% of Arctic waters are charted to modern standards. To meet current and emerging challenges, the Arctic Coastal States, represented by their hydrographic offices, have recognized the need for enhanced collaboration and coordination of their Arctic activities and therefore established the ARHC.

By exchanging knowledge and information and by providing quality assured data, the members of the ARHC aim to facilitate environmentally responsible exploration of Arctic waters and the development of the maritime infrastructure required for safe navigation and protection of the marine environment in the Arctic.

The ARHC is committed to enhancing cooperation with other intergovernmental organizations and the international hydrographic and maritime transportation community with a perspective towards advancing the much needed Arctic maritime infrastructure.

Les états côtiers arctiques s'engagent à assurer la sécurité en mer dans l'arctique

L'hydrographe fédérale du Canada : première présidente de la Commission hydrographique régionale pour l'Arctique

12 octobre 2010 – Sous la direction du Canada, les cinq états côtiers arctiques (Canada, Danemark, Norvège, Fédération de Russie et États-Unis d'Amérique) ont créé, à Ottawa et le 6 octobre 2010, la Commission hydrographique régionale pour l'Arctique (CHRA). L'hydrographe fédéral du Canada, Dre. Savithri (Savi) Narayanan sera la première présidente de la commission dont la vice-présidence sera assumée par le Danemark.

Signature des statuts par le Canada. (Hommes G à D): Dion Gaulton, Lieutenant-Commandant Ina Gillis (MDN), Dale Nicholson, Colonel Rob Williams (MDN), Sean Hinds. (Femmes G à D): Siddika Mithani (SMA, Océans & Science), Sheila Acheson, Kian Fadaie et Savithri Narayanan. Exceptés pour les hommes en uniforme, tous les autres sont du MPO.

La création de la CHRA constitue un événement historique. En effet, depuis l'inauguration de l'Organisation hydrographique internationale en 1921, seules quinze commissions hydrographiques régionales ont été créées de par le monde. L'océan Arctique en était dépourvu jusqu'à aujourd'hui.

Les extraordinaires transformations que l'Arctique subit facilitent l'accroissement de l'exploration et l'exploitation des ressources naturelles, ainsi que le trafic maritime. Toutefois, il n'existe que peu de données fiables sur l'environnement et destinées à la navigation : à ce jour, moins de 10 % des eaux arctiques ont fait l'objet de levés effectués conformément à des normes modernes. Afin de relever les défis actuels et émergents, les États côtiers de l'Arctique, représentés par leurs services hydrographiques, ont reconnu la nécessité d'améliorer la collaboration et la coordination de leurs activités arctiques, ce qui explique la nécessité de créer la CHRA.

En échangeant les connaissances et informations, jumelées à la fourniture de données dont la qualité est assurée, les membres de la CHRA visent à permettre une exploration respectueuse de l'environnement des eaux arctiques et le développement de l'infrastructure marine nécessaire à une navigation sécuritaire dans l'Arctique et de la protection de son environnement.

La CHRA s'emploie à renforcer la coopération avec d'autres organisations intergouvernementales et le monde international maritime et hydrographique, dans le but de faire des percées en matière d'infrastructure arctique qui répondra aux besoins pressants.

CMOS Tour Speaker 2011

Climate Change and the Pacific Institute for Climate Solutions: Blending Science, Social Science, Politics and Opportunity

Thomas F. Pedersen, Executive Director, Pacific Institute for Climate Solutions, University of Victoria

Abstract: Global warming caused by human activities is happening. It is scientifically well understood and, as will be discussed in the lecture, it presents a serious challenge to human societies. But in that challenge lies an opportunity for us to do things better, to unleash a new era of creativity, to improve the stewardship of our natural environment, and to revitalize our economy while generating new, cleaner industrial activity.

Taking such action demands concerted political leadership and policy development informed by high-quality interdisciplinary research. The latter requirement led the Government of British Columbia to create in 2008 the Pacific Institute for Climate Solutions (PICS), an endowed four-university consortium hosted and led by the University of Victoria that focusses on blending the social and physical sciences and engineering to provide best-practice policy pathways that the provincial government can follow.

The role PICS is now playing in contributing to British Columbia's response to the climate-change challenge will be described and set within the larger North American context. But there remains a problem: most 'climate solutions' are not of provincial scale, and many span, if not the full globe, at least the scale of the nation or continents. 'Solutions' case studies that span both the science-policy intersection and large spatial scales will be presented. For example, the directive to enhance corn-ethanol production in the U.S. has reinforced unwelcome, distal oceanographic impacts that might have been curbed had science and interdisciplinary discussion been used more effectively in the policy design. And in Canada, our provincially-controlled electrical grid system hampers our ability to accommodate renewable energy, thereby limiting the scope we have to reduce CO_2 emissions. Europe is taking a collective, aggressive and different tack that will be contrasted to the current situation in Canada.

Finally, it is increasingly clear that Canada could take steps that would simultaneously allow us to reduce carbon emissions — an imperative that climate science tells us is a must — while yielding significant new economic value. Getting there will require recognition by the Canadian public (and its mirror – our politicians) of both need *and* opportunity. Therein lies another challenge—one which PICS is also addressing—that is rooted in the communication of science, economic perceptions and economic reality, and human behavioural psychology.

Short Biography: Born and raised on an orchard in British Columbia's verdant Okanagan Valley, Tom Pedersen completed an undergraduate degree in Geology at the University of British Columbia in 1974 and began his professional career as an Exploration Geologist, searching for ore deposits in Canada's north. Curiosity about the earth, and particularly the ocean, propelled him back to graduate school two years later and in 1979 he graduated from the University of Edinburgh with a Ph.D. in Marine Geochemistry. He joined the University of British Columbia as a post-doctoral fellow that year. UBC subsequently appointed him to faculty and in 1994 he was promoted to Professor. He served as Associate Dean, Research, for the Faculty of Graduate Studies at UBC from 2000 to mid-2002 before

joining the University of Victoria in 2002 as Director of the School of Earth and Ocean Sciences. In 2003, he took on the role of Dean of Science at UVic and, in September 2009, became Director of the Pacific Institute for Climate Solutions. He has published extensively in the field of Paleoceanograhy (the history of the oceans), and uses geochemical and isotopic measurements of marine sediments as fingerprints of physical, biological and chemical oceanic processes.

Pedersen has received several honours for his scholarship including a UBC Killam Outstanding Teaching Award in 1990, a Killam Faculty Research Fellowship in 1997, and the Michael J. Keen Medal of the Geological Association of Canada in 2002. He was elected to Fellowship in the Royal Society of Canada in 2002, and Fellowship in the American Geophysical Union in 2006. Although he enthusiastically enjoys his academic role, he remains in his heart a farmer who is still very curious about the ocean.

2010 Canadian Environmental Employment Profile

September 22, 2010 - ECO Canada's 2010 Profile of Canadian Environmental Employment is now available for download. The study provides valuable information for employers, educators and professionals working in the environmental sector and students considering a potential future in environmental work. The data was gathered through a quantitative survey of 2,204 organizations across all major industry groups in Canada and weighted by statistics reported from the Labour Force Survey, the Census, and the Canadian Business Patterns Database in order to facilitate the estimation of total national and provincial environmental employment and the characteristics of these workers.

The report covers several topics including:

- Profile of current environmental employment in Canada;
- Strategies used by HR departments;
- Best practices for retention and recruiting of workers;
- Employee engagement & turnover;
- Per-employee budgets for training;
- Hiring and hiring difficulties during the economic downturn;
- Future hiring expectations.

The objectives of ECO Canada's Labour Market Information reports are to provide Canada's environmental stakeholders including employers, the academic community, potential employees, and governments at all levels with current and accurate information to help guide initiatives and foster growth within the sector.

More information can be found on our website as well as English and French copies of the report available for free public download.

The Canadian Foundation for Climate and Atmospheric Sciences Full speed ahead

Dawn Conway, CFCAS Executive Director

CFCAS marks its 10th anniversary both elated by the achievements of the last decade — and concerned for the future. Over the year it has highlighted the research accomplishments that its funding has made possible and worked to ensure sustained support. This article summarizes developments in both areas.

In November CFCAS published a book of achievements entitled ***The Sky's the Limit***. The book describes progress in all areas of the Foundation's mandate, illustrating the areas with vignettes of specific initiatives. The book was formally launched at a reception in Ottawa on November 24, 2010. Other recent communications products include profiles of research networks, a report on the May, 2010 CFCAS-Environment Canada Symposium: ***Canadian Water Security: The Critical Role of Science***, and the CFCAS Annual Report.

Over the summer and fall CFCAS submitted — and presented — a **Brief to the House of Commons Finance Committee**. This Committee holds pre-budget consultations and its report feeds into preparations of the next federal budget. CFCAS's recommendations were simple: renew federal funding for climate, atmospheric and oceanic sciences research; and channel the funds through a tried-and-true agency such as the Foundation. CFCAS has also submitted its **Business Case** to the Minister of the Environment, to assist him in considering the case for renewed support.

Over 140 federal scientists have been actively involved in the work of CFCAS-funded networks. Over the last few months CFCAS executives and staff have met with senior officials in seven federal agencies, including the Privy Council Office, Finance Canada, several science-based Departments, and NSERC. Reports were distributed on the operational, policy and other benefits Departments derive from CFCAS-funded partnerships.

CFCAS has now invested over $117 million in research on air quality and extreme weather, climate models and predictions, and marine conditions. The investments have levered an additional $158 million in cash or in-kind support. Half of all CFCAS funds have been used to support research personnel: to date, over 1,200 students and research personnel have benefited. The Foundation is hugely appreciative of the work done by scientists to transfer knowledge to the stakeholder community and for their attention to improving models and predictions, the training and education of skilled people and cross-disciplinary analyses. CFCAS continues to work for renewed support for Canada's research community.

2010 Canadian Marine Ecosystem Status and Trends Report

The ESTR, prepared by the Science Advisory Secretariat of Fisheries and Oceans Canada, reports on the condition, trends, drivers, and stressors of 25 Canadian ecozones - 15 terrestrial, 1 freshwater, and 9 marine. It includes key findings and identifies emerging issues related to: climate and oceanography; species; contaminants; industrial impacts and development; coastal zone cumulative impacts; and biological and ecological effects - http://www.dfo-mpo.gc.ca/CSAS/Csas/publications/sar-as/2010/2010_030_e.pdf.

In Memoriam

Stephen Edmond Hurlbut

1949 - 2010

STEPHEN EDMOND HURLBUT, an ocean engineer and expert advisor on numerical modeling and monitoring of coastal and estuarine processes, died suddenly on October 10 at his home in Nova Scotia. Born in St. Albans, Vermont in 1949, he graduated from Bellows Free Academy in 1967 and was appointed to and attended the U.S. Air Force Academy in Colorado, transferring to the University of Vermont where he earned a BSc in mechanical engineering in 1972. He was a licensed professional engineer (P.Eng.) with an M.Sc. in Ocean Engineering from the University of Rhode Island (1978) where he was a research associate for two years. He moved to Nova Scotia in 1980, attracted by Canada's social and political climate, and has lived there since with his spouse of 32 years, Kate Moran, Professor and Associate Dean at the University of Rhode Island currently on leave serving in the White House Office of Science and Technology Policy. From 1983 to 1997, he served as president and then as an associate of ASA Consulting Ltd. of Dartmouth, Nova Scotia, and from 1997 to 2006 as a senior engineer with Coastal Ocean Associates Inc., which was acquired by AMEC Earth & Environmental in 2006. At the time of his death, he was a Senior Associate Engineer with AMEC, an international engineering and consulting firm. As an ocean engineer he worked on projects ranging from oceanographic processes, coastal engineering, and the impact of accidental and routine marine discharge on near shore and offshore water quality. Most recently, his worked focussed on the assessment of water quality in Halifax Harbour. He served as an expert on panels reviewing the Confederation Bridge, the Voisey Bay Nickel Development, and the Annapolis Basin Coastal Zone Project. Steve loved dogs and was known for his canine training abilities. He was an enthusiastic outdoorsman whose interests included canoeing, hiking, backcountry skiing, and gardening. He competed at high levels as a champion athlete, in running races and triathlons and was twice selected to represent Canada in his age group at the World Triathlon Championships. He competed in Olympic distance. He most recently competed in the 2009 Shubie Sprint Triathlon in Dartmouth, Nova Scotia. Steve was a member of the Dartmouth Whalers Swim Club and served as the registrar for 19 years.

UQÀM

POSTE DE PROFESSEUR(E) RÉGULIER (RÉGULIÈRE) EN MODÉLISATION NUMÉRIQUE APPLIQUÉE AUX SCIENCES DE L'ATMOSPHÈRE

Le département des sciences de la terre et de l'atmosphère souhaite recruter un professeur en modélisation numérique appliquée aux sciences de l'atmosphère. Ce professeur travaillera à l'application du calcul de haute performance au climat, au sens large du terme, incluant des domaines tels l'assimilation des données, la prévision météorologique ou la simulation climatique, et touchant l'une ou l'autre des composantes du système Terre : l'atmosphère, l'océan ou la surface terrestre.

La candidature recherchée devra démontrer les aptitudes requises pour développer un programme de recherche dynamique dans ce domaine qui nécessite des moyens de calcul colossaux qui sont maintenant rendus disponibles grâce à l'octroi de financement au Consortium CLUMEQ-II. À l'UQAM, le Centre ESCER pourra, en renforçant ce créneau, devenir un pôle de recherche pour l'expérimentation numérique au Canada, en partenariat avec Environnement Canada et Ouranos, dans la foulée des programmes de recherche internationaux tels THORPEX (The Observing System Research and Predictability Experiment) et WCRP (World Climate Research Programme) de l'Organisation Météorologique Mondiale.

Exigences : Doctorat en sciences de l'atmosphère ou l'équivalent ; expérience postdoctorale ; connaissances approfondies en modélisation numérique pour la simulation du Système Terre ; recherches et publications de haut calibre ; une expérience d'enseignement et d'encadrement d'étudiants, ainsi que la gestion d'une équipe de recherche, sera considérée comme un atout ; maîtrise du français parlé et écrit.

Les personnes intéressées sont priées de faire parvenir un curriculum vitae en français, détaillé, daté et signé, des tirés à part et/ou des copies de réalisations récentes, ainsi que trois lettres de recommandation **avant le 14 février 2011, 9h00 HAE** à :

Monsieur Enrico Torlaschi, Directeur
Département des Sciences de la Terre et de l'Atmosphère
Université du Québec à Montréal
C. P. 8888, Succursale Centre-Ville, Montréal (Québec) Canada H3C 3P8
Téléphone : (514) 987-3000 poste 2278 – Télécopieur : (514) 987-7749
Internet : http://www.rhu.uqam.ca/AffichageProfs/2210620B.htm

avec copie électronique à person.delphine@uqam.ca

Date d'entrée en fonction : 1er juin 2011
L'Université a adopté un programme d'accès à l'égalité en emploi et un programme d'équité en emploi pour les femmes, les membres des minorités visibles, les autochtones et les personnes handicapées. Toutes les personnes qualifiées sont invitées à poser leur candidature, mais la priorité sera donnée aux Canadiennes, Canadiens et aux résidentes, résidents permanents.

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Gamal Eldin Omer Elhag Idris, C.Chem., MCIC

Chemical Oceanography,
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Douw G. Steyn

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Boundary Layer & Meso-Scale Meteorology

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

45th CMOS Congress
45e Congrès de la SCMO

Ocean, Atmosphere and the Changing Pacific
Océan, Atmosphère et le Pacifique en Transition

Victoria 2011

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June 5 - 9 / 5 - 9 juin

http://www.cmos.ca/congress2011

Race Rocks Lighthouse. Photo coutresy of SpringTideCharters


make | faites
calibration | le calibrage
second nature
seconde nature
Achieve peak performance in data acquisition
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