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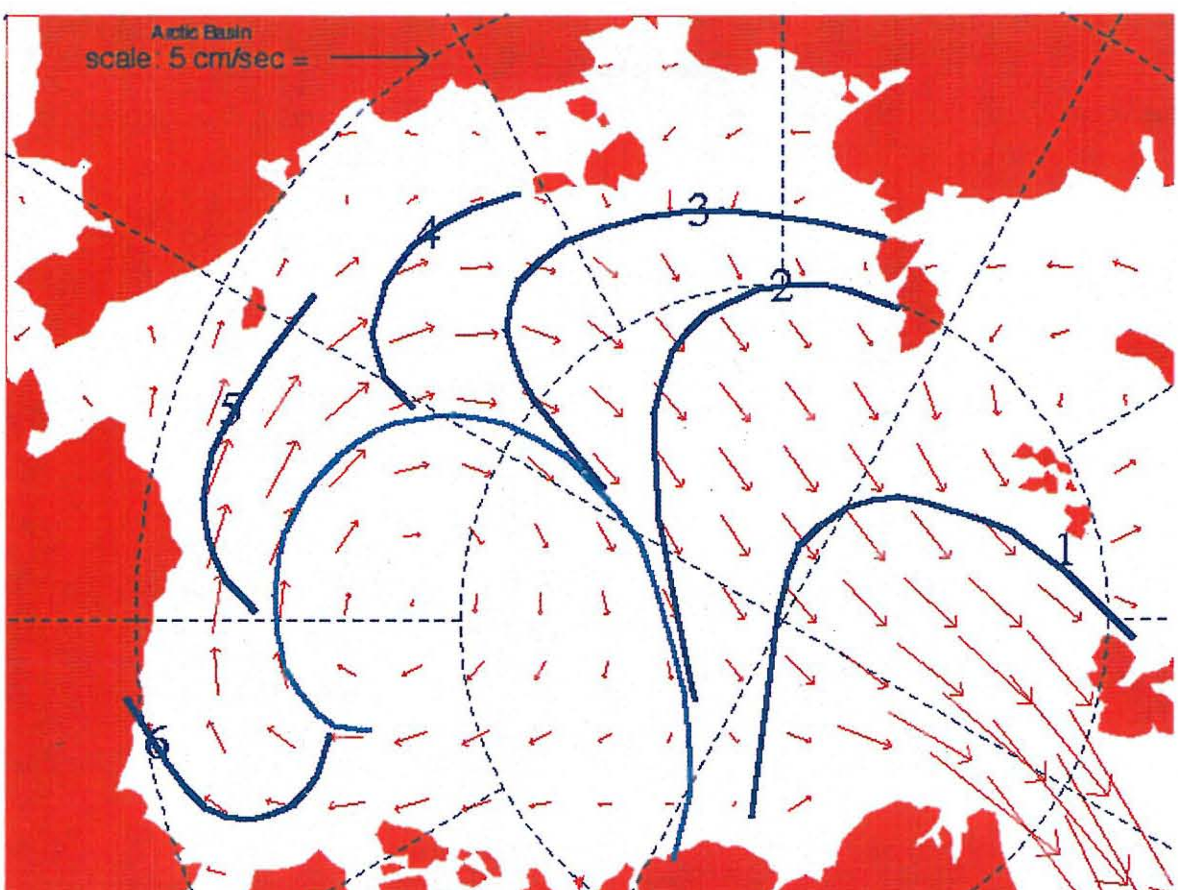

INTERNATIONAL YEAR OF THE OCEAN
ANNÉE INTERNATIONALE DES OCÉANS
1998

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CMOS Bulletin SCMO

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

Editor / Rédacteur: Paul-André Bolduc
Marine Environmental Data Service
Department of Fisheries and Oceans
1202 - 200 Kent Street
Ottawa, Ontario, K1A 0E6, Canada
☎ (613) 990-0231; Fax (613) 993-4658
E-Mail: BOLDUC@OTTMED.MEDS.DFO.CA
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Cover page: The illustration shown on cover page represents the Annual mean field of ice motion over the Arctic Basin based on 1979-1990 drifting buoy data. You can read the full article on page 101. The scale of the arrow is 5 cm/sec. Courtesy of the Polar Science Center, Applied Physics Laboratory, University of Washington. You can visit the International Arctic Buoy Program web site at: http://iabp.apl.washington.edu.

Page couverture: L'illustration de la page couverture représente le champ moyen annuel du mouvement de la glace sur le bassin de l'Arctique calculée à partir des données de bouées dérivantes pour la période 1979-1990. Vous pouvez lire l'article à la page 101. L'échelle de la flèche est de 5 cm/sec. Courtoisie du "Polar Science Center", Laboratoire de physique appliquée, Université de Washington. Vous pouvez visiter le site web du Programme International des Bouées de l'Arctique à: http://iabp.apl.washington.edu.

Next Issue

Next issue of the *CMOS Bulletin SCMO* will be published in October 1998. Please send your articles, notes, reports or news items at the earliest to the address given above. Don't miss your chance!

Prochain numéro

Le prochain numéro du *CMOS Bulletin SCMO* paraîtra en octobre 1998. Prière de nous faire parvenir vos articles, notes, rapports ou nouvelles au plus tôt à l'adresse indiquée ci-dessus. Ne manquez pas votre coup!

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Adresses électroniques de la SCMO

....from the President's desk

As I put words to paper- or rather to keyboard- this month, the temperature outside is in the 30s, as it is across much of southern Canada and the United States. June 1998 has been declared the warmest on record (at least in the U.S.A.). And yet, the latest projected Pacific Ocean sea surface temperatures indicate that El Niño has passed and that we are about to learn (in six months) what a La Niña winter will be like. The 1998 hurricane season has started, more or less on time, with tropical disturbance #1 off the west coast of Africa. What an exciting time to be a meteorologist or an oceanographer!

CMOS has been following closely the Alternate Services Delivery Study being undertaken by Environment Canada and Treasury Board. Many of our members participated in the consultations held this spring across Canada, ending up in Ottawa, two days before 32nd Congress began, on May 29. If you would like to check out what options are being considered and what the participants in the workshops said, check out the ASD web site, specifically, http://www.tor.ec.gc.ca/asd-dmps/consultations. As of July 20, you will find proceedings of the meetings held at all 16 cities. Over this summer, a final report with recommendations is being prepared and, according to Dr. McBean at Congress, if there are major changes from the present structure, additional consultations are planned. We will wait for developments and be ready to provide our advice, if requested. In any event, we will keep you informed.

STOP THE PRESS! (July 27)

The Deputy Minister of Environment Canada has just distributed a memorandum containing a major update on ASD. The full text in both official languages is available on the ASD web site (noted above) and under "What's New" on the CMOS web site, located at http://www.meds.dfo.ca/cmos/. While, obviously, much thought has gone into the crafting of this memo and much more thought (perhaps) will go into interpreting it, I will attempt to highlight the areas which may be of greater interest to CMOS:

> a) "the future of the AEP lies in emphasizing its public good role in providing an essential federal public service to Canadians". This statement of basic function is something CMOS and others have urged for some time.

(Continued next page - Suite à la page suivante)

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INSIDE / EN BREF

Printed in Ottawa, Ontario, by M.O.M. Printing.
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Included with this Vol.26, No.4 is a special issue on tornadoes and hailstorms entitled: "**The Edmonton Tornado and Hailstorm: A Decade of Research**" by Robert B. Charlton, Bradley M. Kachman and Lubomir Wojtiw.

Vous trouverez inclus avec ce Vol. 26, No.4 une publication spéciale sur les tornades et les tempêtes de grêle intitutée: "**The Edmonton Tornado and Hailstorm: A Decade of Research**" par Robert B. Charlton, Bradley M. Kachman et Lubomir Wojtiw.

Prière de noter que nos chroniques régulières reprendront avec la publication du numéro d'octobre 1998 du *CMOS Bulletin SCMO* après la pause estivale.

Please take note that our regular sections will start again after summer break with the October issue of the *CMOS Bulletin SCMO*.

b) "a departmental service agency would be clearly situated as an entity with the department". This key decision on the structure and reporting relationship for AEP did not appear to spell out the differences between the present organization (with RDG control over regional weather services) and the pre-1992 organization of AES (where the ADM was the single senior manager of weather services). CMOS has urged that policies such as commercial services and professional standards be applied uniformly across Canada. A greater national focus - which seems to be hinted at here - would be welcome.

Jean-Guy Cantin et son comité local d'organisation sont déjà en train de préparer notre prochain congrès à Montréal. Ce 33^e Congrès se tiendra du 31 mai à 4 juin 1999. Nul doute qu'ils nous préparent un autre intéressant congrès!

While browsing the CMOS site on the web, you may also have noticed a new feature on the main menu - a "Help Wanted" page which our web page editor, Bob Jones, just added in response to requests from those organizations wanting to hire new staff in meteorology and oceanography. A sign of change?

Finally (and not by any means least), we note the recent NSERC reallocation of $ 20 M of research grants to Canadian universities. We note with concern the decision to support only the field measurement proposal for solid and environmental earth sciences (which includes atmospheric and oceanographic research) and to withhold additional support to new applicants, proven researchers and to laboratory and computing facilities (as proposed).

For more background, visit the NSERC web site at: http://www.nserc.ca.

Bill Pugsley,
President / Président
CMOS / SCMO

Erratum

On page ii of Vol. 26, No. 3, the paragraph describing the cover page makes reference to the "Rube Hornstein Medal in Applied Meteorology". It should have read the "Rube Hornstein Medal in Operational Meteorology". On page 94, third paragraph, the words "Prize in Applied Meteorology" should be replaced by "Prize in Operational Meteorology". On page 95, while we referred to the "Rube Hornstein Medal" we meant the "Rube Hornstein Medal in Operational Meteorology" but the name of the medal is, strictly speaking, the "Rube Hornstein Medal" and is awarded each year for excellence in Operational Meteorology. We apologize to our readers for this mistake.

Correction

A la page ii du Vol.26, No.3, au paragraphe décrivant la page couverture, on fait référence à la "Médaille Rube Hornstein en météorologie appliquée". On aurait dû dire la "Médaille Rube Hornstein en météorologie opérationnelle". A la page 94, troisième paragraphe, les mots "Prize in Applied Meteorology" devrait être remplacés par "Prize in Operational Meteorology". A la page 95, lorsque nous faisons référence à la "Médaille Rube Hornstein", nous voulons dire la "Médaille Rube Hornstein en météorologie opérationnelle" mais le nom officiel de la médaille est la "Médaille Rube Hornstein" et elle est octroyée chaque année pour l'excellence en météorologie opérationnelle. Nous nous excusons de cette erreur auprès de nos lecteurs.

The Road to Siwa
or from the Memories of a Weatherman

by Uri Schwarz

The other day I watched a BBC-TV program *"In the footsteps of Alexander the Great"* which retraced the journeys of that warrior king through today's Turkey, Levant, Egypt, and thence into more remote regions of Iran and Afghanistan. The Egyptian part included the king's pilgrimage to Jupiter Amon's temple in the Siwa Oasis on the border between Egypt and Lybia. The journey to that oasis took him through the *"Western Desert"* of Egypt, an area well known to today's film goers because it is where the *"English Patient"* crashed with his plane during the Second World War.

And this TV program reminded me that I also traveled once to the Siwa Oasis. Of course, not with Alexander the Great, but, as the English Patient, during the Second World War. Like him, I was in the air force, the (British) Royal Air Force. But there any similarity to ancient or modern fighting men ends. I was a weather observer with a mobile meteorological unit which was sent out to measure upper winds so as to provide the necessary corrections for the 25-pounder guns used a lot by the allied armies in that area. The trajectory of the projectiles, launched by these - and any other - guns, takes them high into the atmosphere where winds affect their course. If these winds are known, corrections can be made when aiming the guns.

Our mobile unit was equipped for what was the usual method of measuring upper winds, namely balloons, bottled hydrogen to fill them, and theodolites (telescopes with horizontal and vertical measuring scales) to follow them and establish their drift as they ascend 500 feet/minute after being released. By calculating their change in position minute by minute, the wind that took the balloon from one position to the next (500 feet higher) can be computed. At night, we would tie a candle in a paper lantern to the balloon - not too close, of course, because hydrogen is very explosive, but on a long cord.

That candle, incidentally, caused me to have to dive into an air raid shelter once when taking night balloon measurements near the front line. Because soon after I let the balloon off, an air-raid siren sounded and the anti-aircraft guns opened up. After the all-clear, I launched another balloon and the same thing happened again. And then a telephone call came: *"Are you sending off ....balloons with a candle, by chance? We thought at first that they were a silent aircraft with a white and a red light (the reflection on the red balloon) and kept firing at it!"*

Anyway, nothing of that on the road to Siwa, which took us through empty deserts, sometimes hard, pebble-strewn plains, sometimes sand dunes double and triple the height of our 3-ton truck, or "lorry" as we called it. The lorry, covered by a green tarpaulin with yellow and brown camouflage (good for the English countryside but not really for deserts), was filled to the brim with 3-metre long steel bottles containing the hydrogen, the measuring equipment, tripods, boxes with balloons, lanterns, and other paraphernalia for our task. Then there was our personal kit, including a rubber "ground sheet" for each person on which we could lie, or two of which could be fastened together to make a pup-tent.

There were four of us : Corporal Smith, the "commander", fortyish, with a perpetually worried expression on his face; "Titch" Muller, a youngster of barely eighteen whose diminutive figure had given him his nickname; James, the burly driver; and myself in my early twenties, having joined the RAF to become a pilot, but, not having been found suitable, was offered the "trade" of weather observing. My friends said: *"Why don't you learn a trade you can use after the war, like cook or driver?"* But I stuck to weather observing; and little did I know that it, and my subsequent forecasting career, would be so much more interesting and rewarding in the end than what my friends had tried to shunt me into, even if I had to go back to university after the war and start more or less from scratch (I had begun studying chemistry before the war).

In view of my better education I was regarded at first by my mobile unit colleagues as a bit of an oddity. But that wore off quickly when they saw that my store of four-letter swear words was as good or better than theirs, and that I was willing to pull my weight as much as anyone else. In fact, Titch and I sometimes formed an alliance to push the Corporal into action and to overcome his hesitant and overcautious scruples. James, the driver, usually played the neutral. *"I am just the driver"*, he would say, *"its you people who are the mobile .... MET unit!"*

From the little Corporal Smith told us - he usually played his cards close to his chest in order to open himself as little as possible to reproaches if things went wrong - we were to join the artillery of the New Zealand Division to provide wind corrections for their 25-pounder guns. Unfortunately, the whereabouts of that artillery were not too clear. The war situation in the Western Desert during the winter of 1941-1942 was confused, as Rommel had broken through the British defences and the battle was moving rapidly to and fro.

So we set off towards the Western Desert, stopping at major army depots on the way to obtain food, water and directions. It must have been tough for the shy and insecure Corporal Smith to report to unfamiliar officers, who looked with some astonishment at our blue RAF uniforms, which in the Western Desert were hardly seen outside aerodromes, and to ask: *"Please Sir, could you tell us where we can find the artillery of the New Zealand Division?"*

Apparently his credentials always satisfied those officers. But we still were eyed with suspicion by soldiers encountering us. Once, when I stood in my blue RAF winter coat - it could get very cold in the desert - at the back of our lorry, a group of Australian infantrymen came towards us. One of them looked up at the dark-haired, unshaven man in the unfamiliar blue coat and said : *"Itey prisoner? Wanti cigaretti'?* Although he clearly meant well, it did offend me considerably, and I indignantly told him to f...off as I was RAF.

At first we would sleep in the back of the lorry except for James who used the more comfortable cab as his private bedroom. But the floor of the lorry was pretty hard, and the proximity of the hydrogen bottles anything but comforting. So we often bedded down on the desert sand which seemed safer as well as softer than the lorry floor, especially after we learned to dig a little groove in the sand for the hip bone. That went well until it started to rain. Then we tried to construct our pup tents but somehow never succeeded. Frankly, I think we didn't try too hard, because we disliked the idea of having to sleep too close to one another. We usually had only two or three cups of water a day for drinking, making tea, washing and shaving, and our priorities were obviously such that we did not smell like roses; and one's own smell soon becomes inoffensive.

So, we kept sleeping on the desert sand, putting the rubber ground sheet on top of us when it rained. But the rain would seep into the sand and attack one from the side and from below, which gave one the choice of being wet above or wet below. No wonder that it resulted in rheumatism from which I suffered for quite some years afterwards.

When we reached an army headquarters near Sollum on the Mediterranean coast near the Egyptian/Lybian border, we were told that the New Zealand Division was "*somewhere along the road to the Siwa Oasis*", which lies some 250 kilometres due South. So, off we went, heading South from the coast following tracks of other vehicles that had gone along that route before us.

Although the desert we traversed was, at least at first, not the sandy type but rolling country covered with small stones, the going was pretty slow and we were not worried when the first day did not get us to Siwa. On the second day we were joined by another lorry also bound for Siwa, and it was good not to be alone in that waste land. On the third day, I started wondering whether I hadn't seen this hillock or that rusty car wreck before. On the fourth day Corporal Smith held a conference with the driver and only occupant of the other lorry, and they decided that we were well and truly lost.

On the fifth day things got really bad. We were low on petrol, and Corporal Smith knelt in a corner of the lorry and prayed. Titch often hid his head because he had tears running down his young cheeks; I tried to forget our situation by keeping my nose buried in one of the several Pelican and Penguin books I had brought with me, partly for reading and partly for stuffing the two breast pockets of my battle dress tunic with, because I had heard that books could stop bullets. Even James looked concerned. During rest stops he would leave his cab to come for a chat, during which he sometimes jokingly poked me or Titch; I suspected he was trying to feel which of us two would provide a better meal when food ran out. Corporal Smith probably seemed too old and tough...

Towards the end of the day we spotted tracks in the sand, the first we had seen for several days. We decided to follow them wherever they led, even if there was a risk that they might take us to the Italian oasis of Jerabub, which was not too far from Siwa on the other side of the border.

And then, just as the sun was beginning to go down and we had reached a little rise in the ground, Siwa appeared before us. Green palm trees surrounding a lake, and a hill crowned by a mosque behind which the setting sun framed the hill, the mosque and its slender minarets with a golden halo. The scene, its beauty and the relief of having reached our goal made me too cry a little.

I suppose it must have looked as beautiful to Alexander the Great when he came to the oasis some two thousand years ago to interrogate the famous oracle of Jupiter Amon. Our oracles were the fellows from the Long Range Desert Group who were stationed there and who received us hospitably. This highly mobile force was used to navigate for many hundreds of kilometres through trackless desert to reconnoitre or strike deep behind enemy lines. When they heard that we had got lost on our way to Siwa from the Mediterranean coast, they laughed as if it had been the best joke they had heard for a long time. They gave us a compass and told us that on our way back we should simply head North, disregarding any tracks we would encounter.

But where we could find the New Zealand Division, they too did not know; certainly not at Siwa which was hundreds of kilometres from the war zone.

So, North we headed again after having rested for a couple of days, eaten our fill of dates from Siwa's palm trees and bathed in the shimmering (but very salty) lake. One of the Long Range Desert Group's lorries accompanied us for an hour to ensure that we were on the right track. Using compass and map, within a couple of days we were back at the Mediterranean coast, roughly where we had started from. We were obviously relieved, but little did we know that still more adventures were lay ahead of our mobile MET unit in our search for the New Zealand Division.

Drainage of Multi-Year Sea Ice from the Lincoln Sea

by Tom A. Agnew[1]

Résumé

Durant les mois d'hiver, l'océan Arctique est recouvert en quasi-totalité de glaces de mer dont l'épaisseur moyenne se situe à 3 mètres. Un aspect de ce couvert de glace particulièrement intéressant est le fait de son mouvement sous l'effet des vents atmosphériques et des courants marins. Le déplacement moyen de la glace sur l'océan Arctique est illustré à la figure illustrée en page couverture et varie entre 1 cm/s et 8 cm/s environ (approximativement 1 à 7 km par jour). Ces estimés ont été obtenus à l'aide de bouées dérivantes dans l'Arctique qui sont maintenues par le Programme International des Bouées de l'Arctique (International Arctic Buoy Programme) (Rigor et Heilbgerg, 1997). Les connaissances actuelles sur le mouvement à grande échelle des glaces de mer à travers la bassin de l'Arctique sont basées en grande partie sur ce réseau de bouées dérivant dans l'Arctique. Ce réseau compte en tout temps une vingtaine de bouées distribuées à travers tout le bassin. Cela est considéré suffisant pour estimer le mouvement moyen sur le bassin; cepandant les bouées sont trop espacées entre elles pour capturer les événements extrêmes de glace. Récemment, des données satellitaires à micro-onde passives ont été utilisées avec succès afin de quantifier les mouvements à grande échelle de glace de mer et identifier des événements extrêmes de glace (Agnew et al., 1997 et 1998). Ce capteur satellitaire est particulièrement utile durant les mois d'hiver alors que la nuit polaire rend les capteurs satellitaires de radiation visible complètement inutilisables, et les hautes fréquences associées aux nuages bas et aux stratus rendent très difficile l'utilisation des capteurs infra-rouge.

Introduction

During winter, almost all of the Arctic Ocean is covered by sea ice which is on average 3 metres thick. One particularly interesting aspect of this sea ice cover is that it is in motion under atmospheric wind and ocean current forcing. The mean ice motion over the Arctic Ocean is shown in figure on cover page and ranges from 1 cm s^{-1} to about 8 cm s^{-1} (approximately 1 to 7 km day^{-1}). These estimates have been obtained from drifting Arctic buoys maintained by the International Arctic Buoy Programme (Rigor and Heilberg, 1997). Much of the current knowledge of large scale ice motion over the Arctic Basin is based on this Arctic Buoy Network which has about 20 buoys distributed over the Basin at any one time. This is sufficient to estimate mean motion over the Basin; however the buoys are spaced too far apart to capture extreme ice motion events. Recently, passive microwave satellite data has been used successfully to quantify large scale sea ice motion and to identify extreme ice motion events (Agnew et al., 1997 and 1998). This sensor is particularly valuable during winter when the polar night makes visible satellite sensors unusable and the high frequency of low cloud and stratus make infrared satellite sensors impractical.

Sea Ice motion indirectly controls important surface climate processes at the atmosphere-ocean interface. For example, differential motion of sea ice ensures that at any given time a small fraction, about 2 per cent of the ocean surface, is open water in the form of leads. In winter, this small fraction of open ocean is very important since extreme air-ocean temperature differences cause heat and moisture exchange and rates of new ice production to increase by one or two orders of magnitude compared to the same processes over first-year (FYI) or multi-year sea ice (MYI) (Maykut, 1982). As a result, although only a small fraction of the ocean surface is open water, it is critical in controlling the surface heat, moisture and chemical exchange with the atmosphere, the rate of new ice production, brine production within the surface layer of the ocean, and sea ice ridging and thickness distribution. Sea ice motion is also important in determining the freshwater flux out of the Arctic Basin through Fram Strait into the North Atlantic. The rate of freshening of the North Atlantic controls to a large extent the intensity of the thermohaline circulation of the global ocean.

Sea Ice Export from the Lincoln Sea

Most sea ice is exported out of the Arctic on the eastern side of Greenland through Fram Strait. Current ice flux is estimated to be around 3,000 km^3 per year (Aagaard and Carmack, 1989). The drainage of sea ice on the western side of Greenland and through the Canadian Archipelago is largely unknown and for many years was assumed to be zero for large scale sea ice budget studies. However, there is considerable evidence suggesting that this is not a good assumption. One piece of evidence in particular is the drainage of multi-year sea ice from the Lincoln Sea (see figure shown on cover page which represents the annual mean ice motion over the Arctic Basin based on 1979 - 1990 buoy data and was obtained from the Polar Science Center, Applied Physics Laboratory, University of Washington) through Nares Strait between Ellesmere Island and Greenland addressed in this study. The Lincoln Sea is known to be a region of very thick multi-year sea ice resulting from the ridging and buckling of sea ice as it is forced up against the northern coast of Ellesmere Island and Greenland by predominantly onshore surface winds. Sea ice in this area was thought to be stationary for long periods of time (several years) as the ice in this area apparently had nowhere to go. Animation of 85.5 GHz SSM/I passive microwave imagery however indicates that

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[1] DOE/Atmospheric Environment Service, Downsview, ON, Canada.

YEAR	QUALITATIVE DESCRIPTION	Buoy ID
1987/88	moderate event: started around November 1/87 and continued until mid-December/97.	No buoys
1988/89	moderate to strong event: started around November 5/88 and drainage was rapid most of Nov and then slowed for the rest of the winter.	Probably no buoys
1989/90	a very strong event which began around December 9/89 and continued until about March 20/90; a very large area of the Lincoln Sea was replaced with young FYI by the end of March/90.	#7049
1991/92	Intensity of the event is unknown since most of the SSM/I data is missing in 1991 (from 91/02/06 to 91/12/02)	#10795
1992/93	moderate to strong event: started around November 24/92 and lasted all winter until near end of April/93.	Buoys in Lancaster and off Baffin Is.
1993/94	weak to moderate event: ice bridge did not form so that the strong contrast between MYI and young FYI did not appear in the imagery; there still appeared to be considerable ice motion through Nares Strait but at continuous flow rather than cycles of no ice flux then sudden large flux of ice.	Buoy in Baffin in 93/94
1994/95	moderate to strong event: starts in mid December/94. By March/95 main drainage events have occurred and a large region of the Lincoln Sea is replaced with young FYI .	Buoy in Baffin Bay in 94/95
1995/96	moderate to strong event: drainage from the Lincoln Sea began in early January/96 and lasted to the beginning of February; a substantial part of the Lincoln Sea is replaced with young FYI.	
1996/97	weak to moderate event: drainage in the Lincoln Sea began around December 24/96 and continued until mid-January/97; old ice in the Lincoln Sea is only partially drained.	

Table 1: Frequency and intensity of sea ice drainage events from the Lincoln Sea through Nares Strait over the 1987 to 1995 period from SSM/I animation.

ice in this region drains through the narrow Nares Strait between Ellesmere Island and Greenland into northern Baffin Bay on a regular basis each year. Fig. 2 (shown next page) is an uncalibrated Advanced Very High Resolution Radiometer (AVHRR) infrared image for January 15, 1990 which shows the drainage event which occurred in the winter of 89/90. Darker shades in the image correspond to warm surface temperatures indicating open water or very thin sea ice. The area of the drainage event is indicated in the image. The 1989/90 drainage event started around December 9, 1989 and continued until mid March. It was particularly extreme. An Arctic buoy which passed from the Lincoln Sea into northern Baffin Bay during this period was measured to be travelling at up to 60 km day^{-1} (Dr. Ignatius Rigor private communication). The area drained is roughly 150 km x 150 km or 22,500 km^2. If a reasonable estimate of this thick MYI is 6 m, then the volume of MYI drained is 135 km^3. Once open ocean is exposed, it immediately starts to refreeze producing new ice at a rate of about 10 cm per day on average during the winter period of about 100 days. This results in 225 km^3 of new ice produced during winter for a total estimate of 335 km^3 of sea ice drained each winter. This is an order of magnitude less than the flux of sea ice out of Fram Strait. However, this is only one of the pathways of sea ice through the Archipelago.

Frequency and intensity of sea ice drainage events from the Lincoln Sea through Nares Strait over the 1987 to 1995 period are summarized in Table 1 from SSM/I animation. During this 8-year period, drainage events occurred every year. The events start in late fall or early winter (November or December) and seem to be triggered by the disintegration of the ice bridge which forms at the southern part of Nares Strait. This allows the Strait to drain of ice until a new ice bridge forms further north preventing further ice drainage. This process then repeats with the bridge disintegrating and then reforming further up the Strait and then into the Lincoln Sea. Each time the bridge forms sea ice south of the bridge flushes more old ice south through Nares Strait and the cycle repeats. This usually happens over a one to three month period each winter. There is considerable variation from year to year in the amount of sea ice drained from the Lincoln Sea. In some years, the drainage of ice is rapid and a large part of the Lincoln Sea re-freezes into newly formed young ice or FYI. In other years, the drainage is less extensive. The Lincoln Sea refills with MYI during the summer but the dynamics of how this occurs is not discernible from the SSM/I imagery since during summer there is too much atmospheric moisture attenuation to see the ice surface using 85.5 Ghz SSM/I imagery. In general, the SSM/I imagery cannot resolve motion between the summer months of July, August and September. Below is a short description of each winter event.

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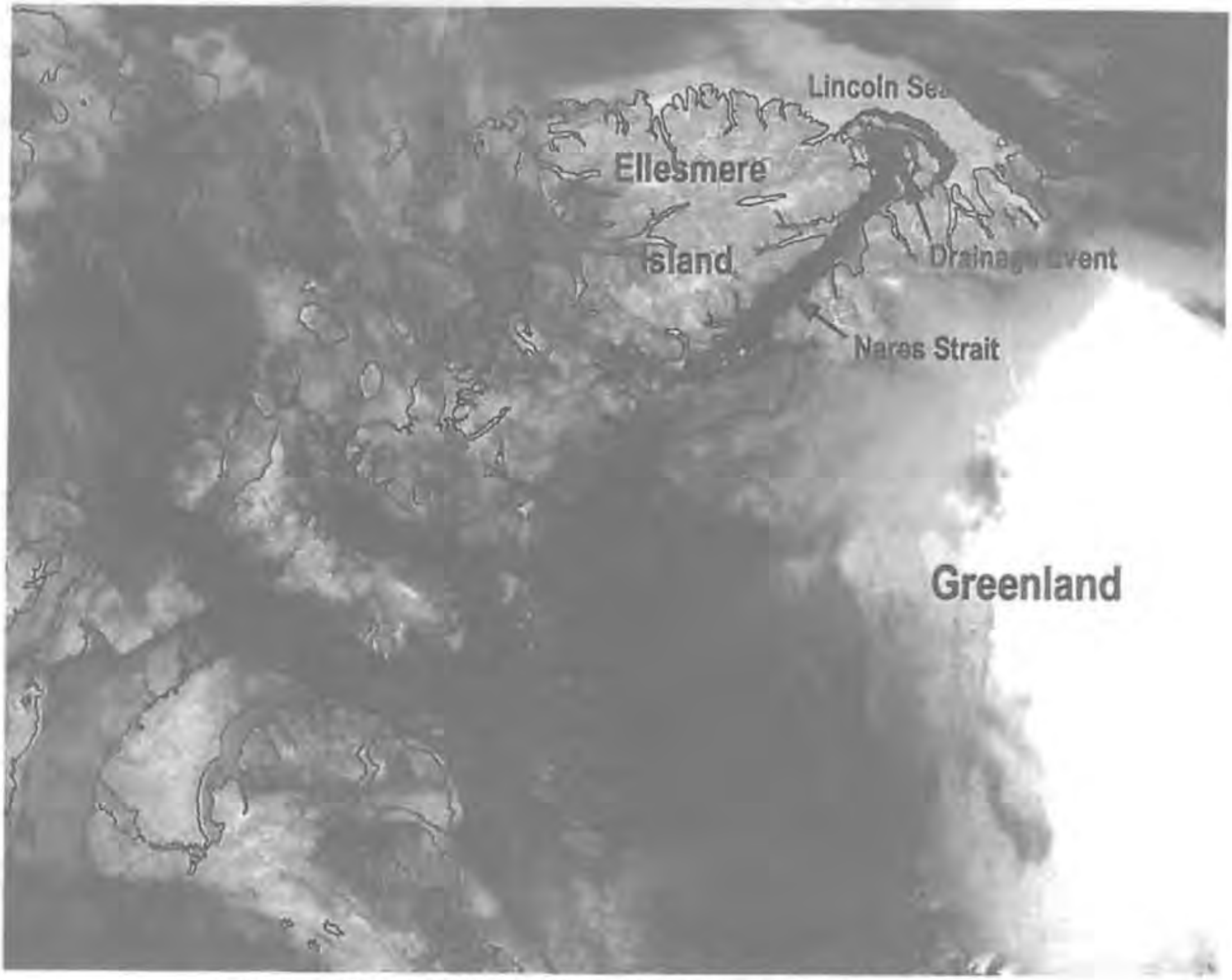


Figure 2: NOAA / AVHRR infrared image for January 15, 1990.

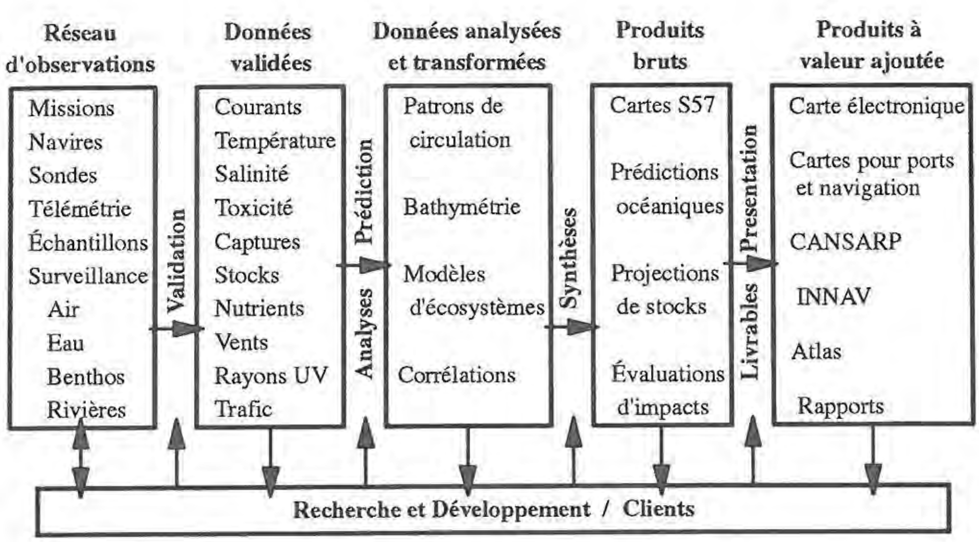
Observatoire du Saint-Laurent
St.Lawrence Observatory

par Jean-Claude Therriault

Contexte

Depuis plusieurs années, de nombreux organismes publics et privés ont recueilli et continuent de recueillir une quantité impressionnante d'informations environnementales de nature océanographique (*température, salinité, débits, courants, niveaux d'eau, vents, glaces, radiations, précipitations, cartes hydrographiques, images satellites, etc.*), ou écologique (*abondance des espèces, algues nuisibles, contaminants, etc.*) sur le Saint-Laurent. À première vue, il semblerait naturel que toutes ces variables soient couplées afin de mieux comprendre, prédire, analyser ou modéliser les changements qui se produisent dans le système du Saint-Laurent. Cependant, comme il existe peu ou pas de coordination, d'intégration ou de communication entre les différents organismes collecteurs de données environnementales, l'information recueillie par l'un est le plus souvent inaccessible aux autres. Cette absence de communication occasionne souvent de la duplication (voir tableaux 1 et 2 plus loin) et des coûts importants dans les cas où il pourrait y avoir complémentarité des programmes d'échantillonnage. Il devient alors évident que toute initiative qui vise à faciliter l'accès et l'échange des données environnementales du Saint-Laurent et à en diminuer significativement les coûts collectifs d'acquisition ne peut qu'être grandement appréciée.

Pour résoudre ce problème, l'Institut Maurice-Lamontagne (Ministère des Pêches et des Océans, Région Laurentienne) a récemment conçu et initié un projet de recherche et de développement majeur afin de mettre sur pied **l'Observatoire du Saint-Laurent (OSL)** qui représente en fait un centre de coordination virtuel (**guichet unique**) qui devrait faciliter, pour une vaste gamme de clients (fournisseurs et utilisateurs des données environnementales du Saint-Laurent), l'accès ou l'échange d'information appartenant entièrement aux divers partenaires actuels ou potentiels. Le concept de l'OSL reconnaît à sa base, l'entière propriété des diverses banques de données aux collecteurs de ces données qui garderont la responsabilité de gérer et maintenir à jour ces diverses banques d'informations environnementales et de déterminer les diverses modalités d'accès à l'information qu'ils possèdent (accès gratuit, vente, etc.). Il est prévu que ce centre de coordination virtuel de l'information sur le Saint-Laurent sera associé au Réseau canadien d'observation de la terre (CEONet) et sera accessible par Internet (**WWW**). Cette initiative devrait donner lieu à de nouvelles idées, de nouvelles vues d'ensemble, de nouveaux produits et, ce qui est le plus important, à une gestion mieux intégrée de l'information environnementale du Saint-Laurent. De plus, lorsque l'OSL sera implanté, il facilitera la transformation et l'analyse croisée de toute cette information environnementale, ce qui mènera à l'élaboration de produits inédits à valeur ajoutée qui pourront avoir un potentiel commercial important. Le concept de base et quelques exemples d'activités qui seront inclues dans l'Observatoire du Saint-Laurent sont illustrés dans le schéma qui suit :



Liste des variables environnementales

D : Débits des tributaires, des Grands Lacs et de L'Outaouais

H : Sondage et cartes bathymétriques

N : Niveaux d'eau
U_A : Vents
U_O : Courants
T_A : Température de l'air
T_O : Température de l'eau
S : Salinité

O_2 : Oxygène dissous
B : Espèces (plancton, poissons, mammifères, flore)
C : Contaminants (métaux, organiques, neurotoxique, etc.)
P_a : Pression atmosphérique
P_{w+d} : Précipitations (humides + sèches)
F_{sw} : Ensoleillement / nuages
T_r : Température du point de rosée
G : Glaces (concentration, epaisseur, etc.)

1) Acquisition des variables environnementales du Saint-Laurent

	D	H	N	U_A	U_O	T_A	T_O	S	O_2	B	C	P_a	P_{w+d}	F_{sw}	T_r	G
MDE, Service Environnement Atmosphérique	x		x	x		x					x	x	x	x	x	
Défense nationale			x				x	x	x							
Garde côtière canadienne		x					x									x
MPO, Sciences		x	x	x	x	x	x	x	x	x	x			x		x
MDE, Service canadien des glaces																x
Environnement et faune, Québec	x								x	x						
Hydro-Québec	x		x													
Agence spatiale canadienne			x		x											x
Agence spatiale européenne			x		x											x
NASA			x						x							
Patrimoine Canada									x							
MAPAQ									x	x						
Hydro-Ontario	x		x													x
Great Lakes Commission	x		x													
Outaouais River Board	x															

N.B. Chaque colonne avec plus d'un x indique une duplication ou une possibilité de complémentarité de base de données ou de systèmes de mesure.

2) Besoins des variables par services gouvernementaux

	D	H	N	U_A	U_O	T_A	T_O	S	O_2	B	C	P_a	P_{w+d}	F_{sw}	T_r	G
Prévisions météo., SEA	x	x	x	x	x	x	x				x	x	x			x
Évaluation des stock, MPO							x	x	x	x	x					
Biodiversité / habitats, MPO, MDE	x	x	x	x	x	x	x	x	x	x	x					x
États contaminants										x	x					
Prévisions niveaux d'eau, SHC	x	x	x	x	x							x	x			x
Prévisions glaces, CCG	x		x	x	x	x	x	x				x	x	x		x
Prévisions courants, MPO, SEA	x	x	x	x	x	x	x	x				x	x	x		x
Urgences environnementales, MPO, MDE	x		x		x					x	x					x
Recherche et Sauvetage, GCC, DF				x	x		x									x
Détection changements climatiques, MPO, MDE	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Régulation Grands Lacs, Commission mixte internationale	x	x	x													x
Régulation centrales hydroélectriques	x		x			x				x						x
Trafic maritime		x	x													x
Entretien voie maritime	x	x	x		x											x
Tourisme, Patrimoine Canada					x					x						
Sécurité publique (inondations, tempête, contaminants)	x		x	x		x					x					x

N.B. Chaque x qui n'apparaît pas également dans le premier tableau pour un organisme donné implique un transfert de données entre organismes

Pour résumer, on peut décrire ces activités comme un processus de transformation des observations brutes en des produits d'information à valeur ajoutée qui ont des applications pratiques pour une vaste gamme de clients (gestion des pêches et de l'habitat, navigation commerciale et de plaisance, consultants privés, divers paliers de gouvernements, grand public, etc.). La réalisation de tous ces produits d'information à valeur ajoutée implique cependant l'utilisation de sources de données multiples et interdisciplinaires et pour être utile, l'OSL doit donc reposer avant tout sur un engin de recherche et de communication qui est rapide et efficace.

À cet effet, le Ministère des Pêches et des Océans est l'un des principaux partenaires sur un projet de développement conjoint (privé/public) d'un puissant outil de recherche qui sera à la fine pointe de nos connaissances technologiques (multi-dimensionnel) et qui devrait permettre d'implanter et d'opérer l'OSL. Cet engin de recherche et de gestion des données (la suite logicielle MariNet) est développé par un consortium de compagnies privées (Socomar, ASA Consulting, Infomar et CubeWERX) en partenariat avec deux autres ministères fédéraux (Ressources Naturelles du Canada et Défense nationale). Au cœur de ce système réside un standard international OGDI (Open Geospatial Datastore Interface) qui permet l'interconnexion entre les diverses bases de données qui seront accessibles par l'OSL. Ce projet est financé par CANARIE, un programme d'Industrie Canada qui fournit le financement instigateur de projets qui visent (1) le développement de l'autoroute de l'information (technologies Internet) et (2) le développement de technologies qui ont un grand potentiel de commercialisation au niveau national et international, et qui impliquent financièrement plusieurs partenaires pour en supporter le développement. CANARIE peut financer jusqu'à 50% du projet, c'est à dire 100% de ce que les partenaires peuvent contribuer. Par ailleurs, CANARIE impose que le promoteur principal investisse de ses propres ressources financières dans le projet en retour d'un droit de propriété pour lui permettre l'exploitation commerciale des nouvelles technologie développées. Ces deux derniers éléments constituent d'ailleurs une garantie intéressante pour la livraison du produit. Un autre avantage est un échéancier relativement court (18 mois) qui doit être respecté pour la réalisation du projet. Le projet MariNet a donc été accepté en mars 97 pour un financement par CANARIE. Il s'agit en fait d'un prêt remboursable par une redevance sur les ventes futures. Le projet a débuté au début juin 97 pour une livraison 18 mois plus tard soit décembre 1998.

Exemples illustrant la nécessité de l'implantation de l'OSL

Les deux tableaux présentés à la page précédente décrivent, pour un ensemble de variables environnementales du Saint-Laurent qui sont listées plus bas : (1) les différentes organisations qui ont en place des programmes de collecte de données pour ces variables et (2) les besoins des différents organismes ou services gouvernementaux pour ces même variables.

Une *première conclusion* de ces deux tableaux est qu'il y a une grande duplication d'effort dans la cueillette des données environnementales du Saint-Laurent par les différents services gouvernementaux. Cette duplication pourrait être encore beaucoup plus accentuée si on avait également inclus les organismes privés dans notre analyse. Une *deuxième conclusion* est que la plupart des organismes ont besoin d'informations provenant d'autres organismes.

Implantation de l'OSL

Pour mettre sur pied l'Observatoire du Saint-Laurent il a été décidé d'appliquer le principe du partenariat dans toute son étendue. Divers partenaires ont déjà été ou seront approchés sous peu pour les inciter à faire partie de l'OSL. À l'intérieur du MPO-région Laurentienne, les Sciences (la Division des Sciences Océaniques, le Service Hydrographique du Canada, les pêches et l'habitat marin), et la Garde Côtière sont déjà impliqués dans des projets de mise en disponibilité de leurs données environnementales. À Ottawa, d'autre organisations comme le SDMM, le SHC, la Garde Côtière, Environnement Canada, Ressources Naturelles, la Défense Nationale et Transport Canada sont vivement intéressés au projet. Des approches seront bientôt faites auprès des organismes provinciaux pour déterminer leur intérêt. Au niveau académique, plusieurs universités ont également indiqué leur intérêt, tandis que plusieurs firmes de consultants qui ont entendu parler du projet salivent déjà à l'idée d'une accessibilité accrue et facilitée aux données des Services Gouvernementaux. Dans plusieurs cas, l'intérêt va même jusqu'à la possibilité d'une participation financière significative.

Financement de l'OSL

À sa base, le concept de l'Observatoire du Saint-Laurent vise un auto financement à long terme par des revenus générés par des abonnements, des ventes et des ristournes sur les produits à valeur ajoutée, etc. Cependant, à court terme, des demandes ont été faites auprès de divers organismes fédéraux pour trouver un financement initial pour implanter cet outil de communication formidable, et pour en supporter les coûts d'exploitation et de maintenance pendant les premiers 3 à 5 ans. À moyen terme, il est prévu que les coûts de l'observatoire seront couverts par les fournisseurs de données selon des modalités qui restent à déterminer. Ces coûts devraient être proportionnels à la participation de chaque partenaire. Ces coûts devraient diminuer graduellement à mesure que la vente de données et autres produits à valeur ajoutée se développera. Lorsqu'il aura atteint sa vitesse de croisière et un niveau acceptable d'auto financement, l'exploitation de l'OSL pourra vraisemblablement être confiée au privé ou à un organisme para-gouvernemental, supervisé par un conseil d'administration formé des représentants des principaux partenaires de l'OSL.

Avantages pour le MPO liés à l'implantation de l'OSL

- Accès aux données de multiples sources et disciplines grandement facilité au bénéfice des chercheurs et différents gestionnaires;
- Amélioration considérable des services offerts tout en faisant des économies importantes de temps pour le personnel du MPO qui doit répondre à des demandes de plus en plus croissantes de données par des clients tant à l'interne qu'à l'externe;
- Établissement d'un mécanisme d'échange de données à un niveau opérationnel entre les diverses organisations du MPO et les autres organismes et partenaires externes;
- Point d'entrée unique pour accéder à un "centre d'achat" des données environnementales du Saint-Laurent, avec procédures de recouvrement de coûts déjà en place;
- Opportunités augmentées pour susciter des collaborations entre divers partenaires de l'OSL;
- Accès à des produits à valeur ajoutée de divers niveaux (du modèles très sophistiqué pour utilisation spécifique jusqu'au produit visant l'information et l'éducation du grand public);
- Accès transparent à n'importe lequel jeu de données de l'OSL avec l'engin de recherche MariNet sans avoir à se préoccuper du format natif des données;
- Accès en temps réel à certaines informations environnementales (e.g., cartes de télédétection, niveaux d'eau, présence d'algues toxiques ou autres contaminants);
- Possibilité de publication électronique de rapports comme l'état du Golfe, l'état des stocks de poisson, etc.;
- Concept intégrateur des différentes disciplines comme l'océanographie, l'hydrographie, les pêches, les opérations de la Garde Côtière, etc.
- Accès à des banques de données bibliographiques diversifiées.

Pour en savoir plus sur l'Observatoire du Saint-Laurent et le développement de la suite logicielle MariNet, on peut s'adresser à Robert Siron, coordonateur du projet OSL au No. tél.: (418) 775-0759 ou No. courriel:

sironr@dfo-mpo.gc.ca

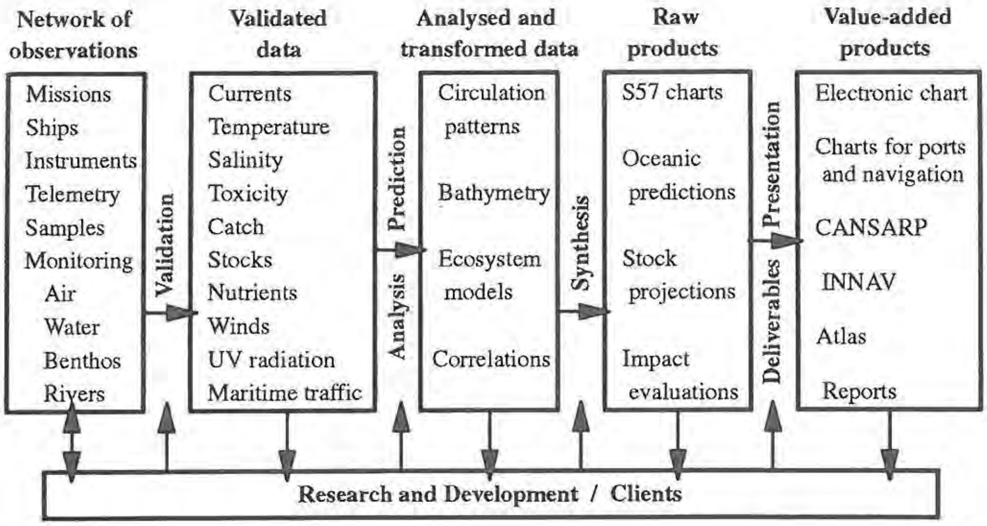
Observatoire du Saint-Laurent
St.Lawrence Observatory

by Jean-Claude Therriault

Context

For years, many public and private organisations have been collecting environmental information on the St. Lawrence system. This information has included both oceanographic (temperature, salinity, runoffs, currents, water levels, winds, ice, radiation, precipitation, hydrographic charts, satellite images, etc.) and ecological (species abundance, toxic algae, contaminants, etc.) measurements. It is evident that access to all available information could improve our ability to understand, predict, analyse, or model the changes occurring in the St. Lawrence system. However, since there is little or no coordination, integration, or communication among the organisations, data of one is often inaccessible to another. This lack of effective communication among data producers leads to a duplication of measurements (see tables 1 and 2 below) and, consequently, increases the funding level that is necessary to collect and process the data. Any initiative that would result in more cost-effective and efficient exchange of environmental data from the St. Lawrence would, therefore, be welcome.

It is within this context that the Maurice Lamontagne Institute (Department of Fisheries and Oceans, Laurentian Region) conceived of and initiated a major research and development project, the **Saint Lawrence Observatory (SLO)**, that will act as a virtual centre of coordination, a **one-stop data source** serving a vast array of clients (producers and users of environmental data from the St. Lawrence) and that will facilitate access to or exchange of information. A core concept of the St. Lawrence Observatory is that the various databases will belong to the data producers. The data producers will be responsible for managing and updating their environmental databases and for determining the conditions for access to their information (free access, fees, etc.). This virtual centre of coordination will be associated to the Canadian Earth Observation Network (CEONet) and will be accessible by Internet (**WWW**). This initiative should stimulate new ideas, novel overviews, and new products, but most importantly, it represents a better method of integrating and managing environmental information from the St. Lawrence. Once implemented, the SLO will facilitate the transformation and cross analysis of the environmental information, which will lead to the development of new value-added products that could have important commercial potential. The basic concept and a few examples of the activities included in the St. Lawrence Observatory are illustrated in the following schema:



To summarise briefly, we can describe these activities as a process of transformation from raw observations to value-added data products that have practical applications for a vast array of clients (fisheries and habitat managers, navigators of commercial and pleasure boats, private consulting firms, various government agencies, the general public, etc.). However, the realisation of these value-added data products necessitates the use of data from multiple sources and of an interdisciplinary nature, and to be useful, the SLO must therefore be based on a research and communication engine that is rapid and efficient.

For this purpose, the Department of Fisheries and Oceans is involved as one of the principal partners in the joint public and private development of a state-of-the-art research engine (multi-dimensional) that will allow the implantation and operation of the St. Lawrence Observatory. This research and data management engine (the MariNet software suite) is being developed by a consortium of private companies (Socomar, ASA Consulting, Infomar, and CubeWERX) in partnership with other federal departments (Natural Resources Canada and National Defence). At the heart of the system is the OGDI (Open Geospatial Datastore Interface), an international standard that allows the interconnection of the diverse databases that will be accessible from the SLO. This project is financed by CANARIE, a program of Industry Canada that offers initial financial backing to projects that are concerned with (1) the development of Internet technologies and (2) the development of technologies having a large potential for commercial use at national and international levels and that involve the financial commitment of several partners. CANARIE can finance up to 50% of a project, that is, 100% of what the partners contribute. However; CANARIE requires that the main promoter invest its own financial resources in the project. In return, the promoter will retain ownership and may commercially exploit the newly-developed technologies. The conditions imposed by CANARIE act as a guarantee for the delivery of the product. Another advantage is the relatively short period (18 months) within which the project must be completed. The MariNet Project was accepted for financing by CANARIE in March 1997. The financing offered by CANARIE is in fact a loan that will be repaid using fees from future sales. The project began in June 1997 and will be completed within 18 months, in December 1998.

Examples illustrating the need for the SLO

The two tables that follow (next page) describe, for the environmental variables listed : (1) the different organisations that have environmental data collection programs in place, and (2) the needs of the different organisations or government services for the same variables.

List of environmental variables

F:	Flow from tributaries, the Great Lakes, the Outaouais	O_2:	Dissolved oxygen
		B:	Species (plankton, fishes, mammals, flora)
H:	Soundings and bathymetric charts	C:	Contaminants (e.g., metals, organic compounds,
L:	Water levels		
U_A:	Winds	P_a:	Atmospheric pressure
U_O:	Currents	P_{w+d}:	Precipitation (wet and dry)
T_A:	Air temperature	F_{sw}:	Solar radiation / cloud cover
T_O:	Water temperature	T_{dew}:	Dew point temperature
S:	Salinity	I:	Ice (e.g., amount, thickness)

1) *Measurements of environmental variables in the St. Lawrence*

	F	H	L	U_A	U_O	T_A	T_O	S	O_2	B	C	P_a	P_{w+d}	F_{sw}	T_{dew}	I
EC, Atmospheric Environmental Service	x		x	x		x					x	x	x	x	x	
National Defence			x				x	x	x							
Canadian Coast Guard		x					x									x
DFO, Science		x	x	x	x	x	x	x	x	x	x			x		x
EC, Canadian Ice Service																x
Environnement et faune, Québec	x								x	x						
Hydro-Québec	x		x													
Canadian Space Agency			x		x											x
European Space Agency			x		x											x
NASA			x						x							
Heritage Canada									x							
MAPAQ									x	x						
Hydro-Ontario	x		x													x
Great Lakes Commission	x		x													
Outaouais River Board	x															

N.B. Each column with more than one x indicates a duplication or a possibility of cooperation in the measuring system and the building up of databases.

2) *Requirements of variables by government services*

	F	H	L	U_A	U_O	T_A	T_O	S	O_2	B	C	P_a	P_{w+d}	F_{sw}	T_{dew}	I
Weather forecasting, AES	x	x	x	x	x	x	x				x	x	x			x
Stock evaluation, DFO							x	x	x	x	x					
Biodiversity / habitats, DFO, EC	x	x	x	x	x	x	x	x	x	x	x					x
Contaminants										x	x					
Water level predictions, CHS	x	x	x	x	x							x	x			x
Ice forecast, CCG	x		x	x	x	x	x	x				x	x	x		x
Current predictions, DFO, AES	x	x	x	x	x	x	x	x				x	x	x		x
Environmental emergencies, DFO, EC	x		x		x					x	x					x
Search and Rescue, CCG, DND				x	x		x									x
Climate change detection, DFO, EC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Joint International Great Lakes Commission	x	x	x													x
Regulation for hydroelectric plants	x		x			x				x						x
Maritime traffic		x	x													x
Maintenance of seaways	x	x	x		x											x
Tourism, Heritage Canada					x					x						
Public security (flooding, storms, contamination)	x		x	x		x					x					x

N.B. Each x that does not also appear in the first table for a given organisation implies a transfer of data between organisations.

The *first conclusion* that we may draw after examining these tables is that there is possibly much duplication of effort in the gathering of environmental data from the St. Lawrence by different government services. This duplication would be even more conspicuous if we had also included private organisations in our analysis. A *second conclusion* is also evident: that most of these organisations need to obtain information from other organisations.

Implementation and operation of the SLO

The implementation of the St. Lawrence Observatory will rely heavily on the efforts of the different partners. Various organisations and groups have been contacted (or soon will be) and have been invited to become partners in the SLO. Within the Laurentian Region, the Science Branch (the Division of Ocean Sciences, the Canadian Hydrographic Service [CHS], Fisheries, and Marine Habitat) and the Coast Guard are already involved in projects to make their environmental data available. In Ottawa, other organisations, like MEDS, CHS, the Coast Guard, Environment Canada, Natural Resources, National Defence, and Transport Canada, have demonstrated keen interest in the project. Provincial groups will soon be contacted to determine their willingness to become involved in the project. Several universities have also indicated their interest, and consulting firms have responded enthusiastically to the idea of having easy access to data collected over the years by the different government departments. In several cases, these groups have also indicated a willingness to participate financially.

Financing of the SLO

A basic concept of the St. Lawrence Observatory is that it will eventually be auto-financed by revenues generated by subscription fees, sales and rebates from value-added products, etc. In the short term, however, different federal organisations have been contacted for the initial financing necessary for the implementation of this powerful communication tool as well as for the maintenance and operation costs for the first three to five years. In the medium term, it is planned that the observatory costs will be met with fees from the data producers according to terms that remain to be established. These fees should be proportional to the participation of each partner and should gradually diminish as the sales of data and other value-added products increase. When the observatory is fully operational and at an acceptable level of auto-financing, its operation could be entrusted to a private or a para-governmental organisation supervised by an administrative board formed of representatives from the principal partners of the SLO.

Advantages for DFO from the implantation of the SLO

- Ready accessibility to multi-disciplinary data that will benefit researchers and managers;
- Considerable improvement of services offered while simultaneously saving time for DFO employees who must respond to data requests from clients within and outside DFO;
- Establishment of data exchange protocols among different DFO groups as well as with outside organisations;
- A one-stop point of access to a clearinghouse of environmental data from the St. Lawrence, with procedures for cost recovery already in place;
- Increased opportunities to foster collaboration among the different SLO partners;
- Access to value-added products of different levels (from sophisticated models for specific uses to products conceived for the information and education of the general public);
- With the MariNet engine, there will be transparent access to any level of the SLO data set, with no need to consider the original data format;
- Real-time access to certain environmental data (e.g., remote sensing maps, water levels, presence of toxic algae or contaminants);
- Possibility of electronic publication of reports such as the "State of the Gulf", the Fisheries Stock assessment reports, etc.;
- Integration of different disciplines and activities, such as oceanography, hydrography, fisheries, and Coast Guard operations;
- Access to diverse bibliographical databases.

For more information on the St. Lawrence Observatory and the development of the MariNet software, contact Robert Siron, SLO project coordinator (tel.: (418) 775-0759; e-mail:

sironr@dfo-mpo.gc.ca

The Future of Atmosphere-Ocean

Richard A. Asselin and Neil J. Campbell

Résumé

La Société Canadienne de Météorologie et d'Océanographie a connu de plus en plus de problèmes reliés à une pénurie d'articles scientifiques, lesquels permettent la publication de la revue "Atmosphère-Océan" (A-O), Table 1. Malheureusement, ces problèmes devinrent encore plus apparents lorsque la Société tenta sans succès de publier à temps sa première parution en 1998. Cette situation provoqua une étude approfondie de la revue A-O, ainsi que de sa viabilité comme revue scientifique. Les résultats de cette étude ont été présentés au 32e Congrès de la SCMO à Dartmouth, N.-É., le 1er juin 1998, par le Directeur des publications, Richard Assellin. Cet article met au jour les grandes lignes de cette présentation.

Introduction

The Canadian Meteorological and Oceanographic Society (CMOS) has increasingly had problems with a shortfall of scientific papers for the publication of Atmosphere-Ocean (A-O), Table I (shown at the end). Unfortunately, this became only too apparent when the Society attempted, and subsequently failed, to go to press on time with its first issue in 1998. This situation prompted an in-depth examination of A-O and its future viability as a scientific journal. The results of this study were presented at the 32nd CMOS Congress in Dartmouth, N.S. on June 1, 1998, by the Director of Publications, Richard Asselin. Highlights of the presentation are as follows:

History

Initially a search of the Journal Citation Reports in the Science Citation Index of the Institute for Scientific Information (ISI) was conducted by NRC's Canadian Institute for Scientific and Technical Information (CISTI) on behalf of CMOS. Accordingly, the ranking statistics on A-O are based on data published by ISI for the years 1992 to 1996 inclusive, (the latter being the most recent issue available at the time) and was compared to approximately 4600 journals from around the world. Journals reviewed came from diverse fields covering the living, non-living and physical sciences, as well as astronomy and mathematics and included some 34 atmospheric-science and 43 oceanographic journals. Numbers are approximate, due to the changing face of the world of publications over the past five years.

Quality criteria

All of the above journals were reviewed and ranked according to five general criteria: the **number of citations**, **impact factor, immediacy index, current articles** and the **cited half-year**. Additional statistics were extracted by NRC from the ISI data base which showed the relationship of A-O with other atmospheric and oceanographic journals. These results are classified under the heading of **impact rank**:

- **Citations** - ISI ranked A-O on its lifetime cumulative number of citations at the 39th percentile (39%), with 436 citations, placing it about 2/3 of the way down the list of the 4600 journals reviewed by ISI. This ranking is surprisingly good since it is based on only 540 A-O publications from 1973 to 1996 but it represents approximately four citations for every five papers published.

- **Impact factor** - The impact factor is defined as the number of citations to articles published in the last two years, divided by the number of articles published during that time. It is considered to be one of the most important of the quality criteria. Here, A-O stands at a much higher level at 59%, giving A-O an impact factor of ca. 0.78, with three out of four articles having been cited within two years of publication. When compared specifically with science journals of the same nature, A-O ranks somewhat better in the oceanographic journals, registering in the 55th percentile, compared with the 45th of those published in meteorology.

- **Immediacy index** - According to the immediacy index (number of citations to this year's articles, divided by the number of articles published in the same time-frame), A-O ranks at 81%, indicating that its articles are very quickly noticed and utilized. Statistics show that A-O is above-average for atmospheric journals and well above-average for oceanographic journals. However, it is both revealing and disturbing to note that A-O is ranked at 24% for all those evaluated by ISI. This tells us that 3486 journals published more articles per year than A-O. Of the meteorological and oceanographic journals themselves, only three or four journals appear to have published as few articles as has CMOS.

- **Cited half-year** - This statistic measures the longevity of the articles. The exact definition is difficult to define but it translates approximately into how many years ago from now did A-O achieve half o f the citations it now has. A-O rates rather well showing it compares favourably with all journals cited, including the atmospheric and oceanographic journals.

Before continuing, certain observations must be made with respect to the above information. It is important to note that A-O, whether compared to all scientific journals or separately within a group of topic-related journals, achieves an above-average level of citation ratings. This level of achievement is significant and particularly encouraging, considering the fact that A-O annually publishes almost the lowest number of articles in its category. The statistics relating specifically to the top 25 journals in atmospheric sciences and physical oceanography are very relevant. Here, citations of A-O show that users of A-O articles generally publish in journals with a much higher scientific impact and circulation. Recognition of this fact is of importance because these journal citations give credence to the quality of A-O papers and expose the journal to a much larger public than that of its own subscribers.

- **Impact rank** - It is of interest to examine the detailed ranking of A-O within the small group of atmospheric and oceanographic journals (Tables II and III). Here, the journals with a consistently better ranking than that of A-O can be considered as its main competitors, with A-O ranking at 22nd out of 34 in the meteorological journals and slightly better at 20th out of the 42 journals in the oceanographic field. Note, however, the number of journals at the fringe of A-O sciences. Examples of these are the Journal of Air-Waste Management, Journal of Aerosol Science and the Journal of Paleooceanography. These journals, as well as others, can be considered to be well outside A-O's field of interest in a competitive sense. Not all journals are included in ISI's database each year. This organization considers timeliness of publication as one of the most important criteria but also it takes into account editorial requirements such as abstracts, titles, references, etc. The peer review process, editorial board, and the reputation of the publisher are also taken into consideration before a journal is accepted for review and inclusion in their data base.

Further evaluative factors

Citation reports are an objective way of measuring a journal's quality, but it is well-known that they have their limitations. Other factors are equally relevant.

One factor that it would be appropriate to mention is that the **technical editing** of A-O has received a number of commendations from authors over the years. Appreciation has been expressed repeatedly for the quality of the review in general, for its linguistic level in particular, and for its identification of inconsistencies and scientific errors, which, from time to time, have remained undetected by others. A number of authors have even taken the time to comment on the skills and helpfulness of the CMOS editorial staff.

Also requiring evaluation is the **time-delay** from the point of submission to that of the actual publication. This is of particular interest to authors. Here, statistics maintained by both the editors and the Director of Publications show that, on the average, three months generally elapse between the submission and the sending of review results to the author. Four additional months are usually required for the revisors and the final proofing and acceptance of the paper. The delay generally depends on the care and quality of the written presentation. It is at this stage that an article may be said to be ``in press``. However, a delay may result at this point from any number of factors - the timing of other submissions to make up an issue, the status of the respective review of a paper, or delays brought about by the author himself. These factors, therefore, account for the loss of additional time before the article actually appears in print. In some instances, printing has had to be held off to accommodate authors. On occasion, a delay may occur due to the quarterly nature of A-O. In all, the elapsed time from first submission to publication may vary from six to as many as ten months in total.

Other factors that require examination are **costs** and **circulation**. **Page charges** at $75 Can. per page compare favourably, on a dollar per word basis, with a number of prominent US journals. Page charges are less common in European journals, and, as a result, there may be fewer European submissions to A-O than would otherwise be the case. They are, in part, perceived by some authors to be a disincentive to journal submissions. On the other hand, there have been few requests to date for page-charge-reduction and these have generally resulted in minor rebates only. It should be noted that subscription rates for A-O are very low (currently $35 for members and $100 for institutions) and are comparable to those of other, more prominent journals on the basis of number of articles published per year.

The situation is less positive when considering **subscription** numbers. For many years, A-O subscriptions have oscillated between 600 and 700 with 40% of these being institutions and 60% individuals. It is unclear why a journal with so little impact on the budget of an institution or individual would not be more popular, particularly when the Canadian dollar is at an all-time low. However, scientists indicate that the limited readership of A-O causes them to hesitate before submitting their best articles, or any article whatsoever, some claiming that many US scientists have never even heard of A-O, others that A-O is perceived as Canadian in content and therefore not suitable for international research. Whether the perception is real or hypothetical is difficult to determine. Of real concern, however, is that some of the decline in submissions over the past few years may be clearly attributed to factors that are government-related. Whether this decline is due to the reduced number of scientists, lack of funding or an increasing pressure by management that research is to be "more relevant and applied" is impossible to ascertain. It is, nevertheless, hoped that this situation is not a trend and that an adjustment will be forthcoming.

Additional information

Publishing - The journal will continue to be published by the University of Toronto Press (UTP), which is considered to be one of the best scientific publishing houses in Canada. A favourable typesetting and printing contract has been negotiated with UTP. However, additional options for a more wide-spread exposure of A-O are also being considered.

Electronic publication - One of the initiatives taken by the Director of Publications was to prepare a demonstration of an electronic version of one issue of A-O. The method selected for the demonstration was to place an identical copy of an issue of A-O on the CMOS homepage. Volume 36-1 was so chosen and can be viewed at the following URL:

http://www.cisti.nrc.ca/cisti/journals/cmos/cmos36/c98-004.pdf.

Should this option continue to be considered by CMOS, the model for determining the added costs for producing the on-line version of A-O could be based on the strategy used by NRC (CISTI) in pricing an electronic version at 90% of the printed version. Both versions could then be offered for 115% of the regular price. This level of pricing is required to retain an adequate subscription revenue. Despite the cost, there appeared to be strong support at the Congress for continuing this initiative.

Additional concerns - Following the presentation of the evaluation at the Congress, participants were invited to comment, raise questions, or express their concerns about the future of A-O. Some of the questions posed were:

- Is there a need for A-O? Why submit to A-O?
- How can A-O grow? more articles? more subscribers? more readers?
- What is the purpose of A-O? regional? for Canadians only? original research?development? technical?
- Should A-O expand into related fields? Marine biology? Ocean chemistry or other?

These issues were briefly discussed and debated. However, the audience remained unequivocal in one respect: the Society must continue to maintain a scientific publication presence.

Conclusion

The presentation of the citations report, performance statistics and electronic publication generated considerable interest and a better appreciation for the status of Atmosphere-Ocean. This information alone may help to increase the number of submissions, thereby affecting, hopefully, the size of readership. The reciprocal is probably also true. Informing potential readers of the titles being published, making the list of past articles more available, and publishing an on-line version were all deemed to be worthwhile projects. The fact that A-O plays a valuable role in our Society was equally clear to those attending the Congress.

However, new avenues and potential changes are needed to ensure the future of A-O. There are, evidently, one or two niche-markets within the meteorological and oceanographic fields that are presently unrepresented by a suitable journal. Atmosphere-ocean interactions and atmosphere-ocean environmental prediction are examples of expanding fields of activity that do not presently have dedicated journals. CMOS may thus have an opportunity to assume a leadership role. The question that arises, however, is whether or not A-O should reorient itself along these lines, with the added requirement of a change in name and the establishment of an international editorial board and aggressive marketing policies. It may equally be decided that it would be preferable to retain its current, more diversified, Canadian orientation.

Of equal interest is the possibility of producing A-O electronically in the next millennium, in which case each aricle would be published as an issue in a very timely manner. Publishing all the articles at the end of the year would constitute a volume which could be sold to libraries and used for archival purposes.

There is no denying that much remains for discussion. However, the Halifax Congress has allowed the Society to address at least the tip of the iceberg.

Comments

Comments from the presentation itself are currently being reviewed but readers are invited to add their views to any of the information that has been presented in this article. All submissions are welcome. It is our membership that can, and must, make the difference. Thank you.

Comments regarding the future of A-O should be sent to:

Richard Asselin
Director of Publications, CMOS
Suite 112, 150 Louis Pasteur
Ottawa, ON
Canada, K1N 6N5
CMOS2@ottmed.meds.dfo.ca
Tel: (613) 991-0151; Fax: (613) 993-4658

Table I: PAPERS PUBLISHED IN A-O

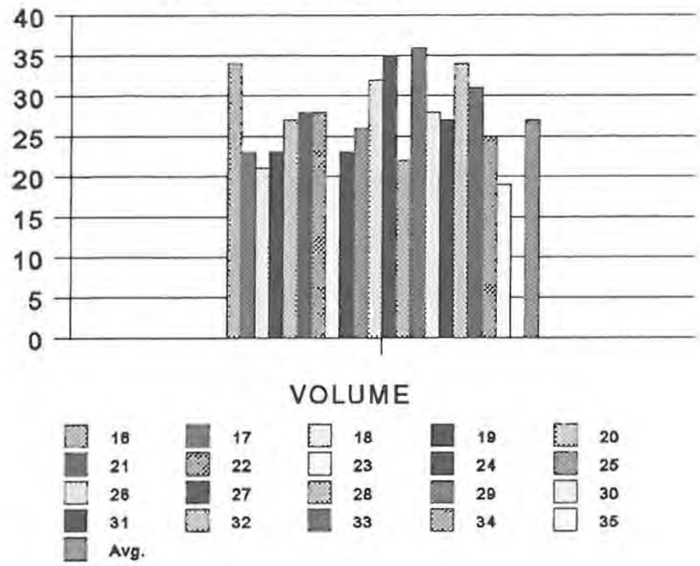


Table II: Competing **Meteorology & Atmospheric Sciences** journals, and their impact rank

	'96	'95	'94	'93	'92
GLOBAL BIOGEOCHEM CY	1	1			
CLIM DYNAM	2	3	2	4	3
J CLIMATE	3	2	1	1	6
B AM METEOROL SOC	4	4	5	3	5
J GEOPHYS RES	5	5	3	2	4
J ATMOS SCI	6	7	7	6	9
TELLUS B	7	11	4	10	1
J ATMOS CHEM	8	8	8	5	2
Q J ROY METEOR SOC	9	6	6	7	10
MON WEATHER REV	10	9	10	9	11
AGR FOREST METEOROL	11	19	13	13	16
TELLUS A	12	10	21	11	7
J APPL METEOROL	13	12	12	19	19
ATMOS ENVIRON	14	13	11	12	13
CLIMATIC CHANGE	15	14	14	8	8
J ATMOS OCEAN TECH	16	21	18	22	21
BOUND-LAY METEOROL	17	15	15	18	17
J AEROSOL SCI	18		9	23	29
INT J CLIMATOL	19	16	24	15	15
ANN GEOPHYS-ATM HYDR	20	18	16	16	14
METEOROL ATMOS PHYS	21	23	25	27	24
Table II (Cont)	**'96**	**'95**	**'94**	**'93**	**'92**
J AIR WASTE MANAGE	22	26	19	20	22
ATMPOSPHERE-OCEAN	**23**	**22**	**23**	**14**	**26**
J METEOROL SOC JPN	24	24	20	26	
J ATMOS TERR PHYS	25	20	17	21	20
WEATHER FORECAST	26	32	27	25	25
DYNAM ATMOS OCEANS	27	27	22	17	18
INT J BIOMETEOROL	28	28	30	24	28
PHYS GEOGR	29				
AUST METEOROL MAG	30	30	29		
THEOR APPL CLIMATOL	31	31	28		27
ADV SPACE RES	32	29		29	
NAT HAZARDS	33				
IZV AN FIZ ATMOS OK+	34	35	32	31	

Table III: Competing **Oceanography** journals, and their impact rank

	'96	'95	'94	'93	'92
PALEOCEANOGRAPHY	1	1			
LIMNOL OCENOGR	2	5	4	4	2
OCENOGR MAR BIOL	3	11	1	1	
PROG OCEANOGR	4	3	6	2	8
J GEOPHYS RES	5	2	3	6	1
MAR CHEM	6	7	8	12	9
J PHYS OCENOGR	7	4	7	6	6
DEEP-SEA RES PT 1	8	6	2	5	3
MAR GEOL	9	13	14	13	18
J MAR RES	10	8	10	8	5
TELLUS A	11	9	19	9	4
ESTUAR COAST SHELF S	12	17	18	15	11
MAR GEOPHYS RES	13	10	9	10	7
J MARINE SYST	14	22	28		
CONT SHELF RES	15	16	13	18	
ICES J MAR SCI	16	19	22	20	26
NEW ZEAL J FRESH RES	17	20	25	29	25
DEEP-SEA RES PT 2	18	14	15		
AUST J MAR FRESH RES	19	25	26	21	16
NETH J SEA RES	20	12	5	19	12
ATMOSPHERE-OCEAN	**21**	**15**	**21**	**14**	**21**
IEEE J OCEANIC ENG	22	28	27	25	

Table III (Cont)	'96	'95	'94	'93	'92
GEO-MAR LETT	23	26	16	23	23
DYNAM ATMOS OCEANS	24	18	20	16	13
B MAR SCI	25	23	24	26	20
OCEANOL ACTA	26	27	23	17	15
HELGOLANDER MEERESUN	27	24	17	24	24
MAR FRESHWATER RES	28				
APPL OCEAN RES	29	32	35	34	29
MAR GEORESOUR GEOTEC	30	34	36		
POLAR RES	31	21	29	22	
J NAVIGATION	32	38	41	39	36
ANN I OCEANOGR PARIS	33	32	32	28	37
OKEANOLOGIYA+	34	31	33	30	28
OCEAN ENG	35	30	31	32	30
MAR TECHOL SNAME N	36	40	39	39	
INT HYDROGR REV	37	37	40	37	37
INDIAN J MAR SCI	38	39	38	35	34
IZV AN FIZ ATMOS OK+	39	36	34	33	
OCEANUS	40	35	37	31	32
MAR TECHNOL SOC J	41	29	30	36	32
NAV ENG J	42	41	42	38	
J SEA RES	43				

The emerging La Niña

by William W. Hsieh and Benyang Tang[1]
Department of Earth and Ocean Sciences,
University of British Columbia

Using data available at the end of October 1997, the 12-month leadtime forecast of the equatorial Pacific sea surface temperature by the UBC neural network model first indicated the possibility of a cold (La Niña) event forming by the second half of 1998. By the time the December 1997 data became available, we felt confident enough to issue the statement on our web site that our "9 - and 12 - month forecasts also indicate that a La Niña event (cold condition in the tropical Pacific) will come by the end of 1998".

As late as March 1998, the dozen or so El Niño forecast models featured in the Experimental Long-Lead Forecast Bulletin (ELLFB), edited by Dr. Ben Kirtman of COLA (http://www.iges.org/ellfb), were fairly evenly split between a La Niña by late 1998, or a continuation of warm to normal conditions. By the time the June 1998 issue of ELLFB came out, the vast majority of the forecast models were calling for a La Niña winter.

The observed sea surface temperature (http://nic.fb4.noaa.gov:8000/research/cmb/gif/oisst_trop.gif) by 1 July 1998 also suggested an emerging La Niña pattern. For Canada, a La Niña is usually associated with below normal air temperatures and above normal precipitation during winter.

Our neural network forecast model has evolved from version 1.1 to the present version 2.3, with the latest forecasts available on the web at http://www.ocgy.ubc.ca/projects/clim.pred/neural/NINO34.html, where all our past forecasts are also available.

1 Oceanography/EOS, University of British Columbia
Vancouver, B.C., Canada V6T 1Z4
Tel: (604) 822-2821; fax: (604) 822-6091
e-mail: william@ocgy.ubc.ca
web:
http://www.ocgy.ubc.ca/projects/clim.pred/index.html

CMOS-ACCREDITED CONSULTANTS
EXPERTS-CONSEILS ACCRÉDITÉS de la SCMO

Mory Hirt

Applied Aviation & Operational Meteorology

Meteorology and Environmental Planning
401 Bently Street, Unit 4
Markham, Ontario, L3R 9T2 Canada
Tel: (416) 477-4120
Telex: 06-966599 (MEP MKHM)

Richard J. Kolomeychuk

Applied Climatology and Meteorology
Hydrometeorology, Instrumentation

Envirometrex Corporation
14A Hazelton Ave., Suite 302
Toronto, Ontario, M5R 2E2 Canada
Tel: (416) 928-0917 Fax: (416) 928-0714
e-mail: kolomey@ibm.net

Tom B. Low, Ph.D., P.Eng

Research and Development Meteorology

KelResearch Corporation
850-A Alness Street, Suite 9
Downsview, Ontario, M3J 2H5 Canada
Tel: (416) 736-0521 Fax: (416) 661-7171
E-mail: kel@nexus.yorku.ca

Ian J. Miller, M.Sc.

Marine Meteorology and Climatology
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Météomédia / The Weather Network
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Tel: (604) 822-6407
Home: (604) 222-1266

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Dr. Harold Ritchie harold.ritchie@ec.gc.ca ☎	Président Comité du programme scientifique	Chairman, Scientific Program Committee
Jean-Guy Cantin jean-guy.cantin@sympatico.ca ☎ (514) 748-9480	Président Comité local d'organisation	Chairman, Local Arrangements Committee
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