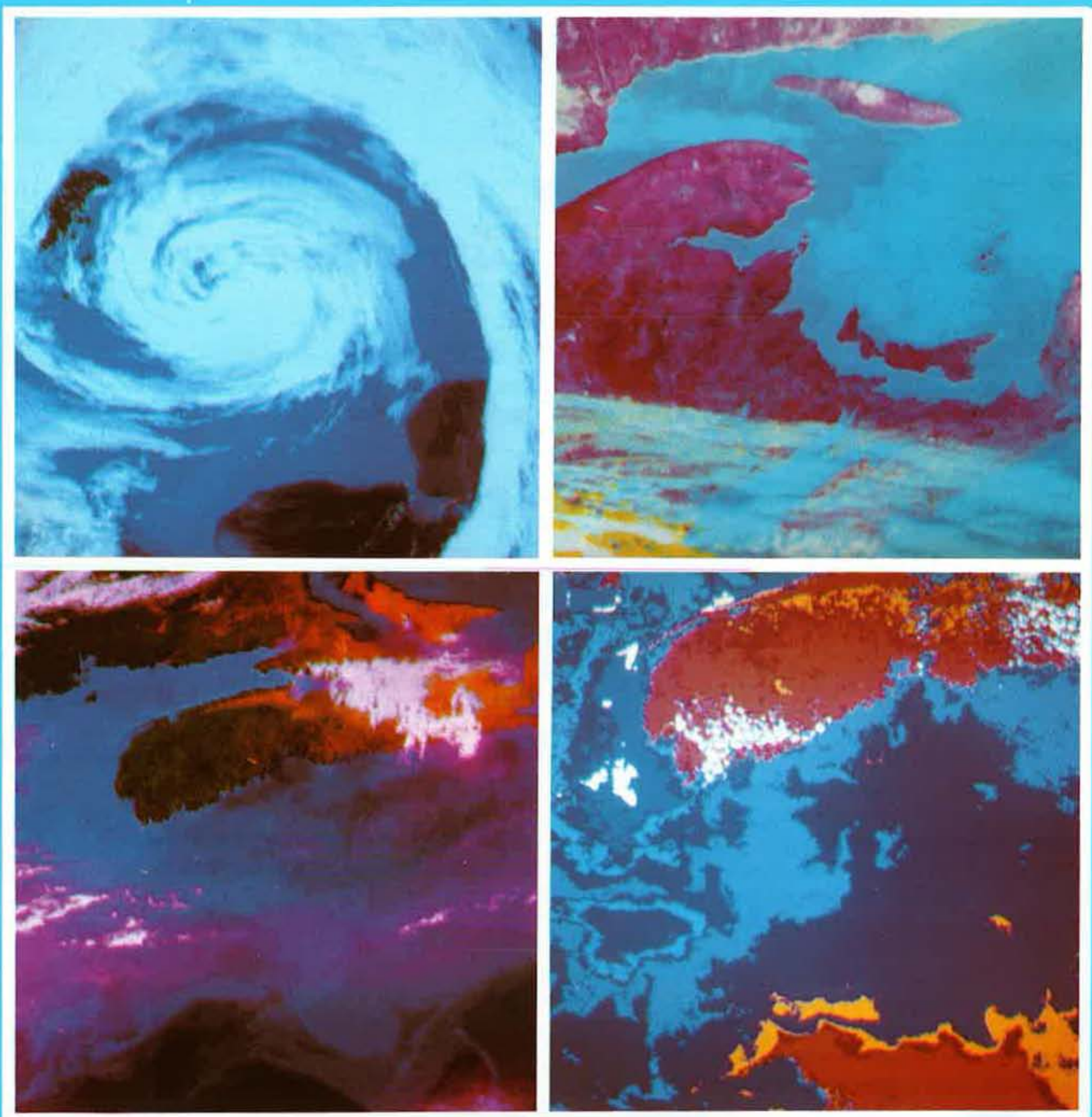
Chinook

THE CANADIAN MAGAZINE OF WEATHER AND OCEANS

LA REVUE CANADIENNE DE LA MÉTÉO ET DES OCÉANS

VOL.7 NO.3

SUMMER/ÉTÉ 1985



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CORRESPONDENCE

Industrial Regions Misrepresented

I just received the Summer 1984 issue of *Chinook*, and continue to be impressed with the quality of articles directed toward a general audience. However, I would like to comment on a misleading impression in the article on *Carbon Dioxide and Climatic Change.* The photograph showing emissions from industrial regions is of a row of cooling towers emitting clouds of steam, which would not contribute to "the continued increase of $C0_2$ concentration levels", as implied. Needless to say, there is no shortage of photo opportunities which could have been matched appropriately to the title.

R.B.B. Dickison
U.N.B. Faculty of Forestry

Atlantic Canada Viewed From Space

False colour satellite imagery on the cover indicates various ocean, terrain and cloud-temperature regimes. Imagery was obtained from the NOAA Polar Orbiting Satellites and processed by the Atmospheric Environment Service's Satellite Laboratory in Downsview, Ontario. *Upper Left*: spiralling low pressure centre 400 km east of Newfoundland (1712 GMT May 21 1985) *Upper Right*: Nova Scotia and the Gulf of St. Lawrence (1208 GMT 29 April 1980) *Lower Left*: the Scotian Shelf area (1855 GMT 24 June 1983) *Lower Right*: Enhanced sea surface temperature gradients south of Nova Scotia (1817 GMT 28 April 1981).

Région Atlantique du Canada vue de l'espace

Les images satellitaires en fausses couleurs (sur la page couverture) montrent différents régimes de température des océans, des terrains et des nuages. Ces images, qui proviennent des satellites à orbite polaire de NOAA, sont traitées au laboratoire de données satellitaires du Service de l'environnement atmosphérique à Downsview, Ontario. *En haut, à gauche* : Centre de dépression en spirale, 400 km à l'est de Terre-Neuve. (1712TMG, 21 mai 1985) *En haut, à droite* : Nouvelle-Écosse et golfe du St-Laurent (1208 TMG, 29 avril 1980) *En bas, à gauche* : Plateau continental Scotian (1855 TMG, 24 juin 1983) *En bas, à droite* : Gradients accentués de température à la surface de la mer, au sud de la Nouvelle-Écosse (1817 TMG, 28 avril 1981)

Chinook

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COVER

The areas depicted lie within the Canadian Atlantic region, which is the subject next year of intense meteorological study (see article on page 36). Further details about the imagery are given on this page.

COUVERTURE

Les zones représentées se limitent à la région atlantique du Canada qui, l'an prochain, sera le sujet d'une recherche météorologique en profondeur (voir l'article à la page 36). Cette page-ci donne de plus amples détails au sujet des images.

CANADIAN ATLANTIC STORMS PROGRAM THE METEOROLOGICAL COMPONENT

by Ronald Stewart

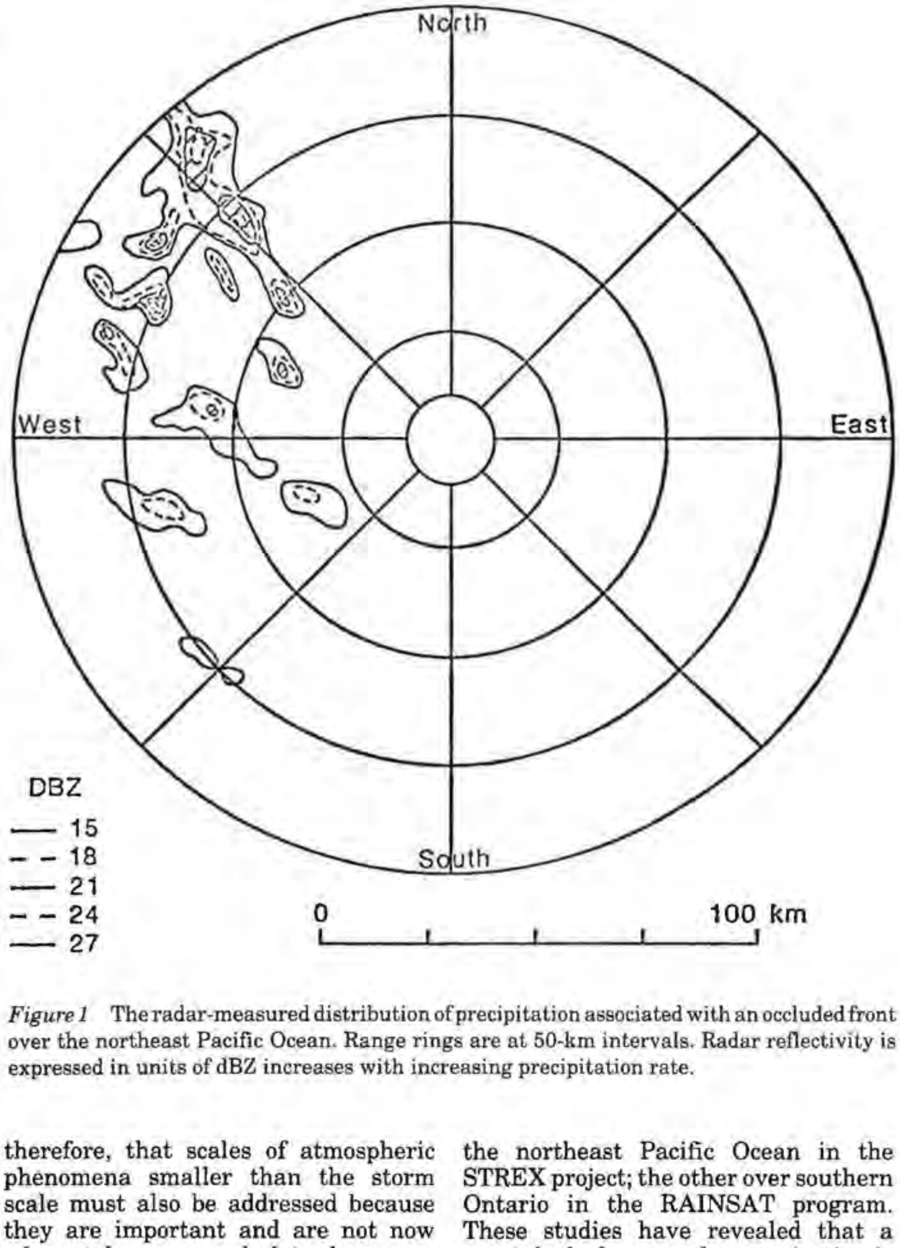


Figure 1 The radar-measured distribution of precipitation associated with an occluded front over the northeast Pacific Ocean. Range rings are at 50-km intervals. Radar reflectivity is expressed in units of dBZ increases with increasing precipitation rate.

The East Coast of Canada is frequently lashed by severe cyclonic winter storms. In many of these, winds reach gale force speeds, precipitation rates are high, and precipitation type can be either snow, rain or freezing rain. These storms consequently cause great hardship in the region. Not only do they affect highways and people's lives on the mainland, but they also disrupt fishing and drilling activities on the ocean where drifting ice is also frequent during this season. A recent example of the impact of such storms is the *Ocean Ranger* disaster of February 1982.

Although forecasts of such storms have improved markedly in the last few decades, considerable uncertainty still exists. In particular, the tracks, movement and intensification of the storms are not adequately handled by existing weather prediction models. In many cases, the speed as well as the intensification rate of a storm is underpredicted. At least partially as a consequence of these problems, winds and precipitation areas and intensities are not predicted adequately.

Important aspects of storms are also related to embedded features having dimensions less than the approximate 2000-km size of the storms themselves. For example, winds at sea often exhibit large fluctuations in direction and speed over intervals of about an hour. Such fluctuations can be crucial to offshore activities. It needs to be recognized, therefore, that scales of atmospheric phenomena smaller than the storm scale must also be addressed because they are important and are not now adequately measured, let alone predicted.

Little work has been devoted to improving our understanding of storms and their embedded features in Canadian East Coast areas. Studies of convective summer systems are continuing in Alberta, and two recent studies of winter storms and their structure have been carried out elsewhere – one over the northeast Pacific Ocean in the STREX project; the other over southern Ontario in the RAINSAT program. These studies have revealed that a great deal of mesoscale organization is present within the storms. The mesoscale is typically manifested by precipitation bands that are moving relative to the frontal surfaces and are also evolving. Some of the surface wind and precipitation fluctuations are coupled to the circulations within these bands (Figure 1).

More work on the internal organization and characteristics of winter cyclonic storm systems has been conducted in other countries, particularly in the State of Washington and the United Kingdom. The focus of these programs, which have continued for more than a decade, has recently shifted from understanding the organization of the storms towards understanding the driving mechanisms responsible for their mesoscale features. These studies confirm that considerable organization occurs within the storms (Figure 2).

It has been recognized in the United States, as well as in Canada, that it is opportune for atmospheric scientists to tackle fundamental questions about storms and their embedded features. It is opportune both because instrumentation platforms are now available to measure the important atmospheric parameters and because our scientific understanding has reached the point where significant progress can realistically be made. In the United States the next generation of field projects is described in term of the "STORM" program. In Canada a similar approach to storm research is nearing reality and is being stimulated by the Scientific Committee of the Canadian Meteorological and Oceanographic Society.

As a forerunner of the continent-scale programs envisioned for the STORM project, the Americans are launching the Genesis of Atlantic Lows Experiment (GALE) to examine features of East Coast storms. This project, scheduled for January 15–March 15 of 1986 and centred in the vicinity of Cape Hatteras, will focus on mesoscale circulations and precipitation bands within the storms and will stress the oceanographic aspects. GALE will utilize a variety of atmospheric and oceanographic instruments, including special satellite observations.

The existence of GALE represents an opportunity for Canada. Many of the storms that affect the Canadian East Coast have moved along the U.S. Atlantic coastline. Measurements and a physical understanding of the storms gained from the American program may then be used as "upwind" information to improve the prediction of the storms over Canada.

Canada has undertaken a long-term program, the Canadian Atlantic Storms Program (CASP), in coordination with GALE to study winter storms in the Atlantic region. The general objectives of the first CASP field experiment to take place from January 15 to March 15, 1986 are to study storm behaviour, embedded mesoscale features and complementary oceanographic phenomena. Attention will also be given to the relation between surface observations and storm characteristics.

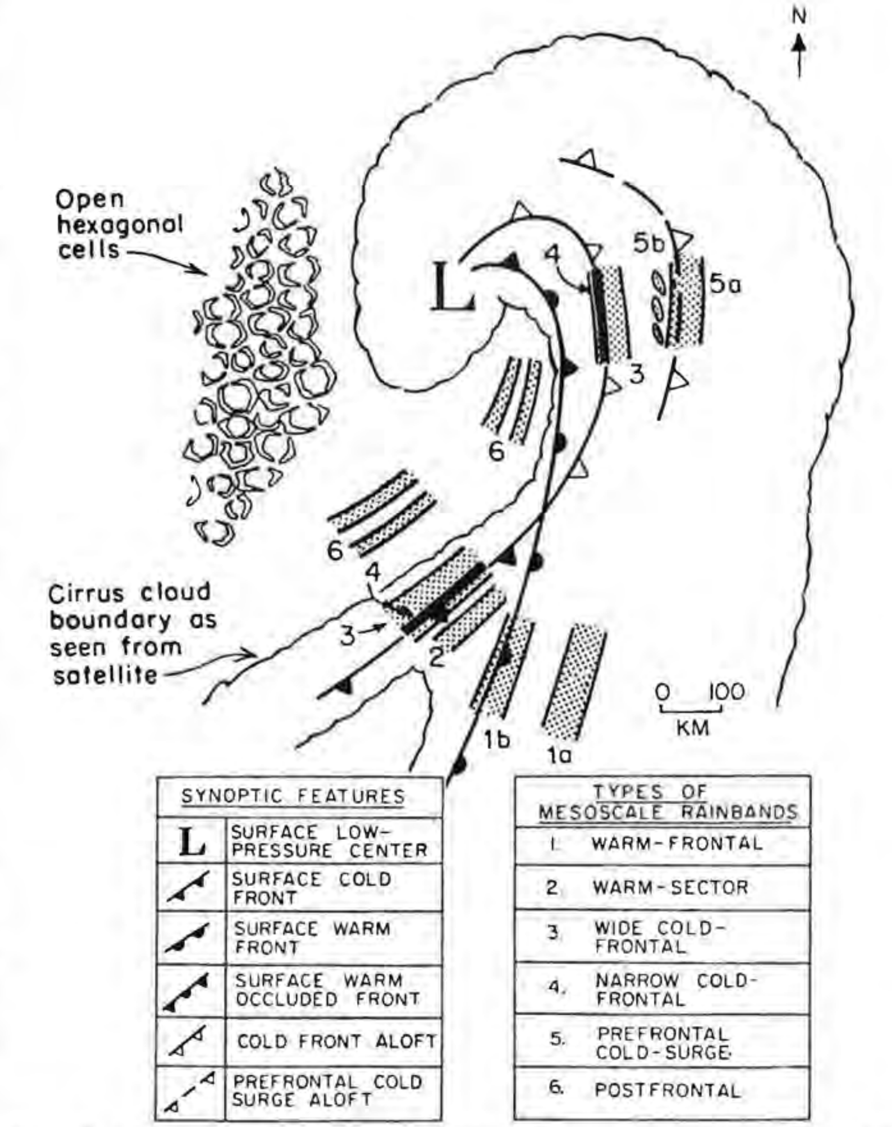


Figure 2 Schematic depiction of the types of mesoscale bands that have been observed in winter storms off the coast of the State of Washington by Peter Hobbs and his colleagues at the University of Washington (After Hobbs, 1981: European Space Agency Report SP-165, p. 30).

To fully predict the behaviour and characteristics of the storms themselves, in addition to their mesoscale features, a lengthy period will be required. This first CASP field project must be considered as the initial step towards realizing our goals of predictability at the needed temporal (a few hours to a couple of days) and spatial (site-specific forecasts) resolutions. Improvements in long-term forecasts (a few days) will, for example, probably depend upon cooperation with even larger American projects planned for the early 1990s that encompass the entire eastern portion of North America, as well as the adjacent Atlantic Ocean.

RESEARCH OBJECTIVES

Four areas need to be examined in the CASP program, and progress will commence in the first field project. These areas and some of the questions that should be addressed in each area are described below:

Storm Movement and Evolution

Ongoing and future work must tackle the storm scale. Initial progress can be made by addressing the following questions:

- Are the storms occurring during the project typical of the long-term trends?
- How do the storms occurring during the project evolve?
- When, where and by how much do the storms intensify over the region?
- Why do the storms evolve?

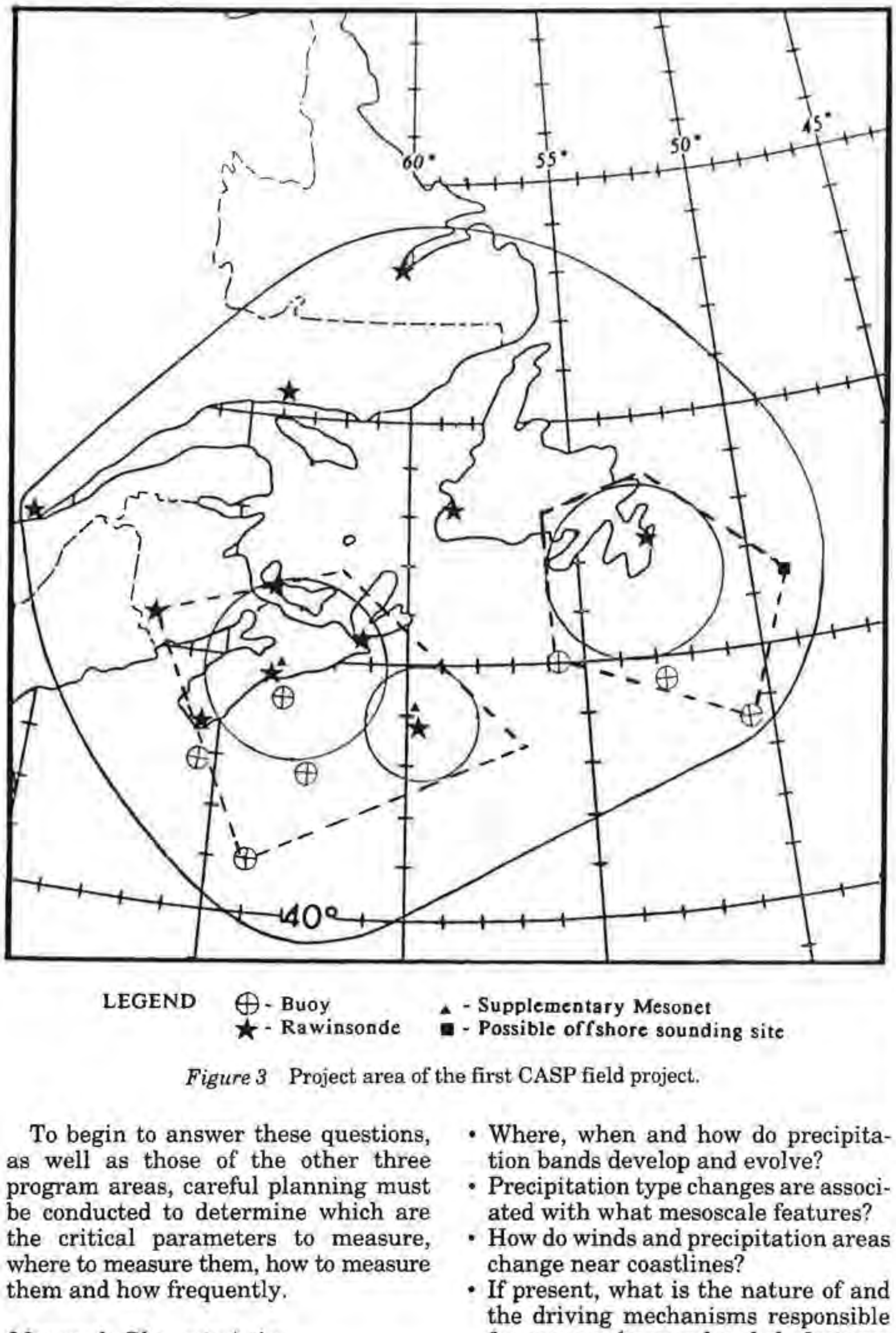


Figure 3 Project area of the first CASP field project.

To begin to answer these questions, as well as those of the other three program areas, careful planning must be conducted to determine which are the critical parameters to measure, where to measure them, how to measure them and how frequently.

Mesoscale Characteristics
Other studies have documented that mesoscale organization typically exists within cyclonic storms. Some radar observations of Atlantic Canada storms indicate that they also contain mesoscale features, such as precipitation bands. In addition, wind circulations over the ocean but not associated with bands may also occur. A number of questions can then be posed:

- Are mesoscale circulations associated with the different phenomena large enough to affect low-level features such as winds?
- What is the mesoscale structure of the fronts?
- Where, when and how do precipitation bands develop and evolve?
- Precipitation type changes are associated with what mesoscale features?
- How do winds and precipitation areas change near coastlines?
- If present, what is the nature of and the driving mechanisms responsible for mesoscale, non-banded, features over the ocean?

Oceanographic and Ice-Field Studies
The Atlantic Ocean strongly affects the development of the storms. In addition, the ocean and its ice-fields are strongly influenced by the storms. The main research on oceanographic/meteorological interactions during the first CASP field project is being directed by the Bedford Institute of Oceanography. Many questions concerning the three media (atmosphere, ocean and ice) can be pursued, in particular:

- How does sea surface temperature influence storms and their mesoscale features?
- How do ocean circulations and sea state depend upon storm structure?
- How do ice-fields move during storm episodes?

Development of Forecast Techniques
The field project represents a unique opportunity to develop forecasting techniques. The project offices will be collocated with the Maritimes Weather Office in Bedford N.S., and forecasting will be done largely by operational meteorologists. In turn, the operational forecasters will benefit from the large amount of real-time or near real-time information gathered during the project. This may provide answers to the following questions about improving forecasts:

- How can the real-time radar and satellite information be best used to improve short-term forecasting?
- Are forecasts of storm motion and development improved by a denser network of rawinsondes and buoys?
- How can our improved understanding of storms and their mesoscale features as well as oceanographic and ice-field behaviour be best translated into improved forecasts?

FACILITIES

Instrumentation platforms will be deployed in the first field project to supplement the regular observing network (Figure 3). All information from polar orbiting and geostationary satellites will be recorded. Rawinsondes will generally be released every 3 hours from the regular and portable stations, three radars will provide information on areas of precipitation, buoys as well as ships will enhance offshore observations, and arrays of special portable weather stations will detail the surface manifestations of the weather system. These observations will be augmented by instrumented aircraft that will measure winds, temperature, and precipitation characteristics in the storms (Figure 4). Additional special observing instruments include a radiometer situated near Halifax to measure remotely humidity and temperature profiles in the atmosphere, a collocated ground laser probe to measure precipitation characteristics, and special apparatus to sample and photograph precipitation particles.

The complete area encompassed by both the GALE and CASP projects is shown in Figure 5. The area spans much of eastern North America allowing detailed studies of storm development to be made over several days.

Figure 4 Twin Otter instrumented aircraft operated by the National Aeronautical Establishment of the National Research Council of Canada (Photograph: Courtesy of the NRC Flight Research Establishment).

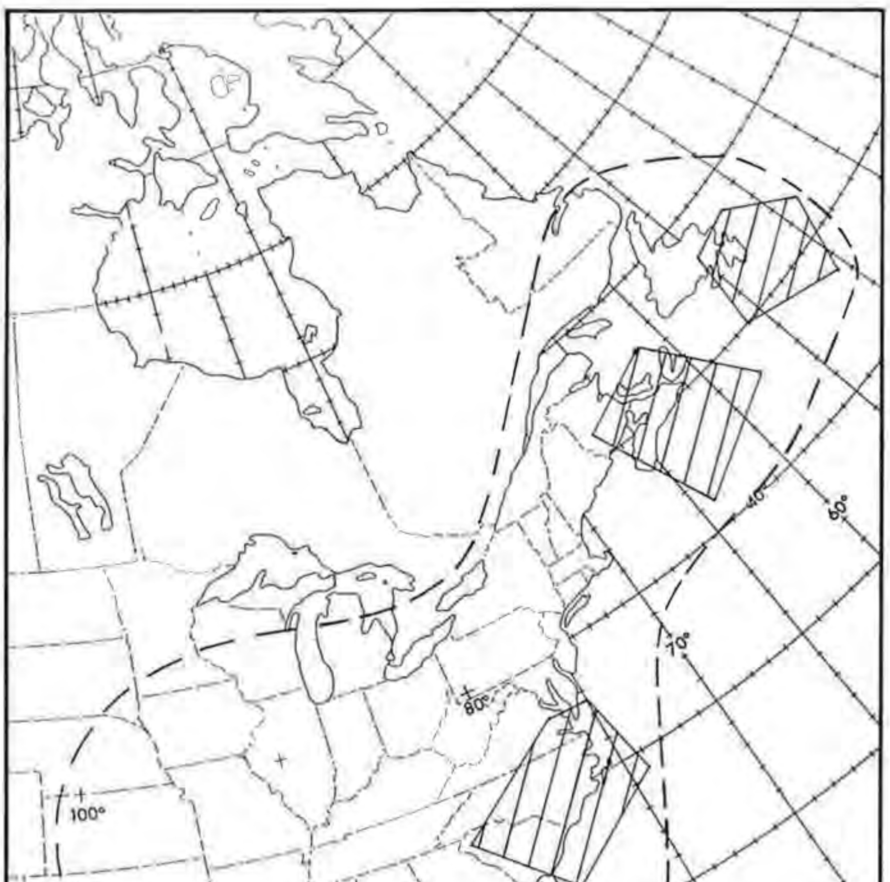


Figure 5 Combined area of the American GALE and the Canadian CASP projects.

PARTICIPANTS

The success of CASP depends upon different groups and agencies. The Atmospheric Environment Service is playing a key role, which is greatly enhanced through cooperation with universities, private industry, the Department of Defence and the Department of Fisheries and Oceans. It is anticipated, that a number of university graduate degrees in mesoscale processes will result from this project.

DEFINITIONS

Cyclonic Winter Storms: Organized storm systems characterized by frontal surfaces. These systems dominate the weather patterns in mid-latitudes.
Driving Mechanisms: The physical processes and instabilities that are responsible for the mesoscale features.
Mesoscale: Dimensions in the atmosphere less than 2000 km.
Parameters: The physical quantites such as temperature, wind, pressure, and precipitation characteristics that describe the storms and their embedded features.
RAINSAT Program: A program designed to. use radar and satellite information for short-term forcasting.
Rawinsonde: An instrumented package carried aloft by a balloon and tracked by a ground station in order to yield vertical profiles of temperature, humidity, pressure and wind.
STREX Project: Storm Transfer and Response Experiment, conducted during November and December 1980.
Summer Convective Systems: Thunderstorms and complexes of these that are common on the Prairies during the summer.

Ronald Stewart is a Research Scientist with the Atmospheric Environment Service's Cloud Physics Research Division, whose current responsibilities include that of CASP Chief Scientist (Meteorology). Among his other scientific activities, he has carried out research at the National Center for Atmospheric Research in Colorado, and at the University of Wyoming and the University of Toronto.

RÉSUMÉ *On a lancé le Programme canadien d'étude des tempêtes dans l'Atlantique (CASP), visant à améliorer les prévisions des tempêtes d'hiver et de leurs caractéristiques sur la côte est du Canada. La première expérience sur le terrain de ce programme d'étude à long terme aura lieu du 15 janvier au 15 mars 1986, et sera associée à un projet américain important dans la région du cap Hatteras. Les instruments requis pour cette première expérience sont énumérés en détail et les projets devant faire partie de ce programme d'étude sont décrits. Pour mener à bien le programme d'étude à long terme et la première expérience sur le terrain, les gouvernements, les universités et le secteur privé devront coopérer.*

EAST COAST WEATHER OBSERVED FROM SPACE

by Oscar Koren

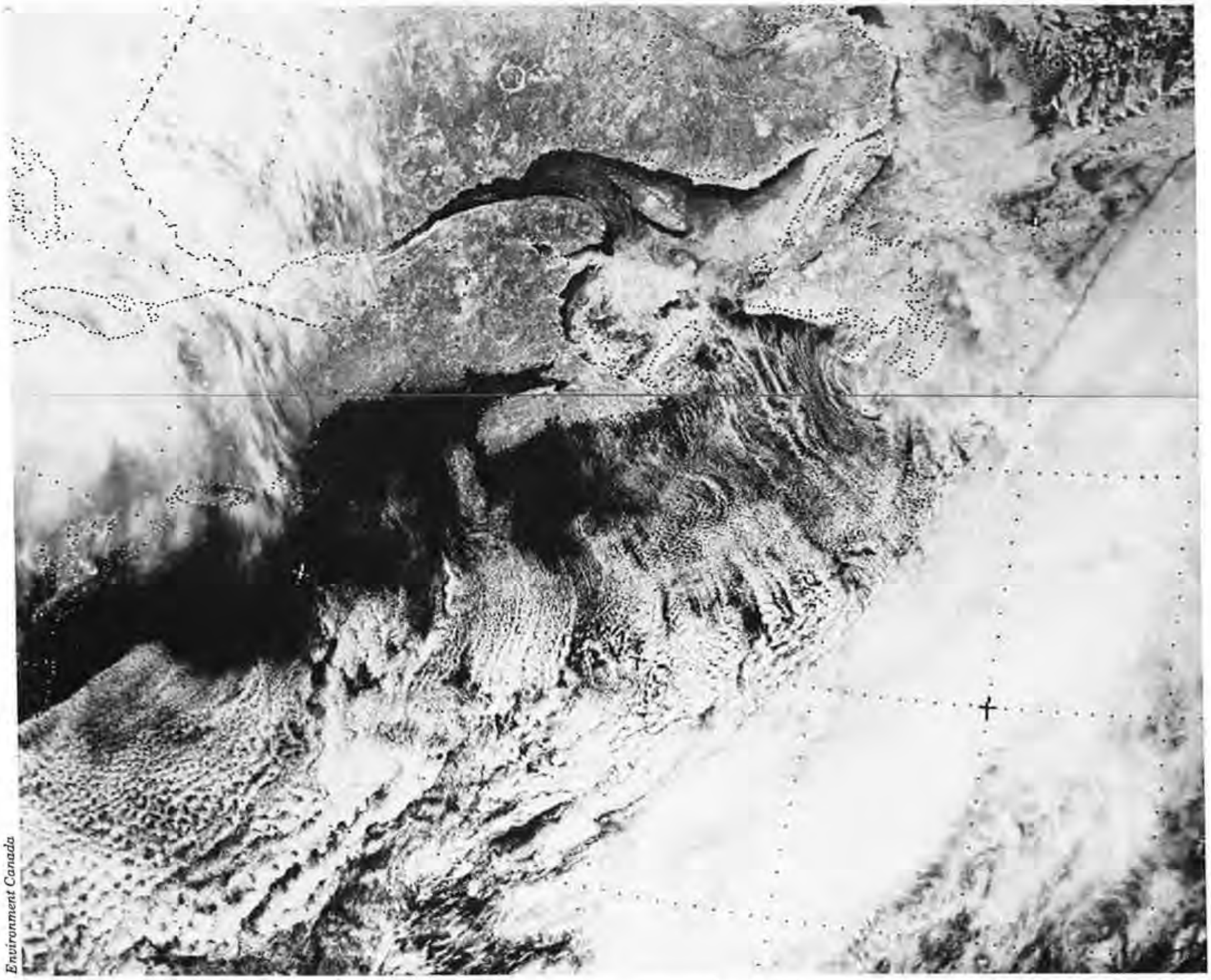


Figure 1 Near-infrared image of the cellular cloud patterns that form as a result of a cold northwesterly flow moving over a relatively warmer ocean surface. The image was taken on 21 February 1985 at 1800 GMT.

Imagery from the current polar orbiting meteorological satellites provides means by which weather systems of all scales can be monitored every 6 hours on a 24-hour basis. This observing capability is uniquely suited to ocean areas where conventional weather observations are scarce. In the hands of an experienced weather forecaster satellite images are a powerful tool for preparing short-range weather forecasts and identifiying areas affected by hazardous weather. Occasionally, these images reveal the onset of unforecast weather phenomena and result in revised forecasts of such hazards as thunderstorms, surface gust fronts, fog banks, and significant changes in wind directions.

Two examples of satellite images received from the NOAA-9 polar orbiting satellite on 21 February 1985 at 1800 GMT are shown in Figures 1 and 2. The image in Figure 1 was taken by the near-infrared detector sensitive to radiation with a wavelength of 1.1 micrometres, whereas, the image in Figure 2 was taken by the infrared detector sensitive to radiation with a wavelength of 11 micrometres.

On the day the images were taken a high pressure area was centred south of New York City with a ridge extending northward across eastern Québec and Labrador to Ungava Bay. The images indicate that generally clear skies prevailed over these areas.

Almost parallel to the ridge but located approximately 970 km to the southeast, a well-defined frontal zone extended over the ocean. The infrared image in Figure 2, which provides

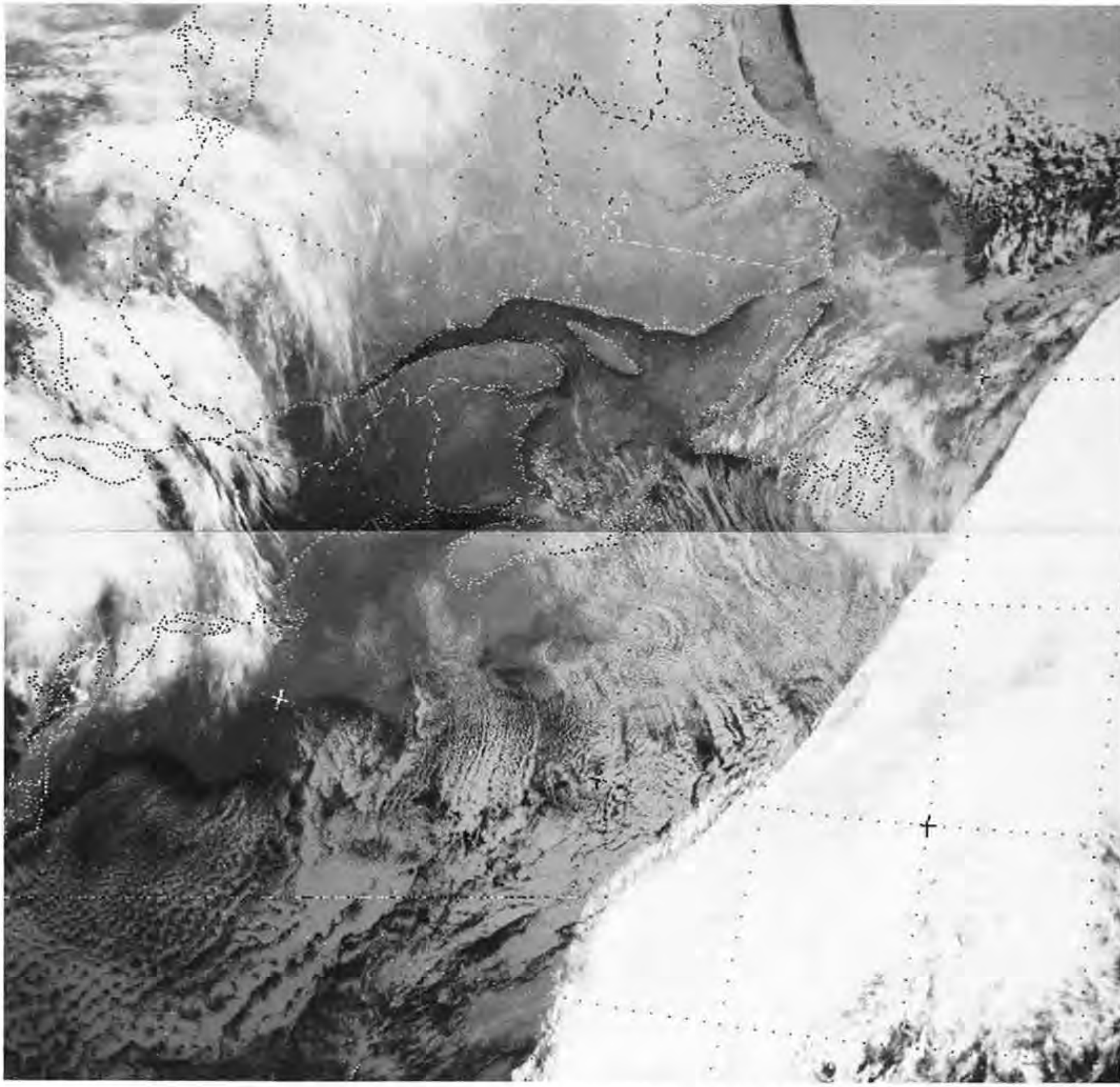


Figure 2 Infrared image of a well-defined frontal zone at the lower right composed of cold (high) clouds, and the cellular cloud patterns containing cumulus and stratocumulus clouds with relatively lower cloud tops. The image was taken on 21 February 1985 at 1800 GMT.

temperature information (white areas are cold and dark areas warm), shows that the frontal zone is composed of cold (high) clouds. The northwestern edge of the frontal zone appears fairly straight except for a protrusion that is frequently associated with a developing surface low pressure centre.

The ocean area between the ridge and the frontal zone is predominently covered with cellular cloud patterns composed of numerous cloud "streets" whose orientations usually indicate the surface wind direction. These cloud patterns form as a result of cold air moving over warmer waters, and are composed of cumulus and stratocumulus clouds. The medium grey shade on the infrared image indicates relatively lower cloud tops. Detailed examination of the near-infrared image in Figure 1 reveals both open and closed cells within the cellular cloud patterns. Open cells with cloudless or less cloudy centres form where a large air-sea temperature difference exists; closed-cells form where a weaker air-sea temperature contrast exists. Cellular cloud patterns provide the meteorologist with information on surface wind direction and speed, atmospheric stability and other atmospheric properties. Further studies of such patterns will undoubtedly yield new insights into this fascinating phenomenon.

Oscar Koren is a meteorologist with the Field Services Directorate of the Atmospheric Environment Service in Toronto who is interested in the meteorological applications of satellite data.

METEOROLOGY GOES OFFSHORE

by Mike MacNeil

The search for oil and gas off the coasts of Newfoundland and Nova Scotia has increased the demand for meteorological and oceanographic data for the East Coast. In most marine areas outside the major shipping routes (where observations are regularly made), the marine weather data base is lacking. Fortunately, oil and gas exploration has not only created a demand for more data but is also feeding a great deal of data back to the system. Oil rigs are proving to be data collection platforms that are as reliable as the survey ships criss-crossing the exploration area. Future production platforms may also help in filling some of the voids in the marine weather data base.

Increased offshore activity has re-emphasized the need for controlling the quality of the data received from these new observing sites. The responsibility for ensuring that standards are met in the Atlantic Region of the Atmospheric Environment Service (AES) has been delegated to the region's two Port Meteorological Officers (PMOs), one in Halifax, N.S., the other in St. John's, Nfld. The PMO is responsible for recruiting various ships to participate in the Voluntary Marine Weather Observing Program. The PMO trains obervers in weather observing techniques and coding procedures. He installs, calibrates and maintains a variety of weather monitoring instruments aboard participating ships. The PMO usually visits participating ships when they are in port discharging or loading cargo. However, he must travel to the drill sites to carry out his inspections on the oil rigs.

Unlike the voluntary ship observing program, weather observations aboard oil rigs are mandatory under the Canada Oil and Gas Drilling Regulations. Observers must possess valid weather observers' certificates issued by AES. Oil rig observations are used by the AES to prepare terminal forecasts, which allow helicopters to operate under Instrument Flight Rules when servicing the rigs, and by private meteorological consulting companies, also serving offshore exploration operations, to provide marine site-specific weather forecasts.

Marine Synoptic Observations are taken every three hours at all rigs. The observations are coded using the international synoptic code and are distributed internationally. At certain rigs, depending on their location, *Supplementary Aviation Weather Observations* are taken hourly to support helicopter operations. In addition, observations are made to obtain data on waves and swells, sea currents, ice conditions and icebergs.

To ensure the weather observing program is being carried out to AES standards, the PMO visits the rigs every six months, either via helicopter (a two-hour flight) or supply ship (an eighteen-hour cruise.) Safety comes first, so before boarding, all passengers must watch a video on the safety features and survival equipment found on board. The flight is not first class: passengers must dress in survival suits and are squeezed into a compartment with up to twenty others. By using the most modern helicopters, flying times are kept to a minimum.

As the helicopter nears the rig, eyes strain to catch a glimpse of the object that has been producing the "blip" on the pilot's radar screen. At a distance, the rig looks insignificant and out of place perched on spindly legs, with the waves beating against it in a vain attempt to remove the unwanted intruder. The first impression of the rig soon changes as the helicopter approaches for touchdown. The rig takes on new dimensions – the drilling derrick looms seventy metres above the sea surface; the helicopter pad occupies only a corner of the deck. Suddenly the rig has been transformed from a fragile, spindly-legged structure into a solid, man-made, iron island tethered to the ocean floor.

Once safely on deck, non-crew passengers are ushered to the living quarters and are assigned rooms by the rig's safety officer. A safety demonstration on immersion suits and life-jackets is presented, and lifeboat stations are assigned.

The PMO's contact is the on-duty weather observer, whose office is normally located near the control room, or on the bridge. The first item of business is answering the observer's questions on observing, coding data, or basic meteorology. The weather logs are checked for recurring errors, and if any are found, they are brought to the observer's attention. While on board, the PMO also monitors the current weather observations to ensure proper procedures and observing techniques

Fenco Newfoundland Ltd.

Observer transmitting weather observation.

Fenco Newfoundland Ltd.

Observer checking wind speed at helo-deck level.

Bow Drill 2.

are being followed. The calibration of the barometer is checked, the barograph is inspected, the anemometer vanes are checked for orientation, and the condition of the marine screens, thermometers, raingauges, sea bucket and ceiling balloon equipment is checked. There are two observers, and the PMO will make himself available to both.

To visit as many rigs as possible while offshore, the PMO has to be ready to travel on short notice if a supply ship is ready to sail to a neighbouring rig. Often he must get out of his bunk at any hour and stuff himself into a life-jacket before being lowered twenty-five metres over the side of the rig while hanging onto a personnel bucket, hoping the crane operator will coordinate his arrival on the supply boat with the movement of the swell. After a two- or three-hour cruise, the procedure is repeated in reverse.

The length of the PMO's visit depends on weather and the availability of a seat on a regular crew-change helicopter. There are normally two crew-change flights a week, but often special trips are made to the rig and spare seats can be found. Fog is always a threat to flight operations and visitors should be prepared for extended stays. These layovers often provide a chance to view whales, dolphins and sea-birds, and talk to the personnel on board.

Occasionally, the PMO experiences some of the risks involved in offshore exploration, while sitting in a life-jacket and survival suit with off-duty crew and other visitors. A team of men on the drill floor hurriedly follow procedures to stop a back flow of gas and drilling fluid from the well, "a kick". All other activity ceases and a silence envelops the rig as motors and engines are shut down. To pass the time, crew members tell jokes or try to catch up on lost sleep. Only when the kick is contained and the threatened blowout prevented, can anyone relax.

The gentle roll of the rig and the occasional shudder caused by the drilling is a continual reminder of the drillers' battle with nature for the oil hidden somewhere in the depths. Occasionally, the drillers win and a pocket of oil is discovered. More often they lose and the well is dry.

With the help of the offshore weather observers, the additional input into the marine data base and the continuous weather watch, the Atmospheric Environment Service is gaining more knowledge about the forces controlling the movement of weather systems off Canada's East Coast. Researchers have more data to improve computer models that are used to forecast sea state and ice and weather conditions. The duties of a Port Meteorological Officer in training observers, siting, installing, calibrating and maintaining instruments and checking the quality of data is an important step in the ongoing program to improve data quality and the accuracy of forecasts dealing with marine weather and sea conditions.

Mike MacNeil is Port Meteorological Officer for the Atlantic Region, based at the Atmospheric Environment Service office in Bedford, N.S. Previously he has served as an Ice Observer and a Meteorological Research Technician.

RÉSUMÉ *La prospection du pétrole et du gaz naturel au large de la côte est du Canada a fait augmenter les besoins en données météorologiques et océanographiques. En retour, cette prospection a apporté un grand nombre de données utiles au Service de l'environnement atmosphérique (SEA) et à d'autres usagers intéressés par ce type de données.*

Les programmes météorologiques d'observation continue sont obligatoires sur les plates-formes de forage des Grands bancs; deux agents météorologiques portuaires de la région de l'Atlantique du Service de l'environnement atmosphérique doivent s'assurer que les programmes sont conformes aux normes du SEA.

L'agent météorologique portuaire doit se rendre aux lieux de forage afin d'installer, de réparer et d'étalonner les instruments météorologiques et pour contrôler la qualité des données recueillies.

Les visites d'inspection des lieux de forage permettent aux agents météorologiques portuaires de constater sur place quels sont les dangers du travail dans cet environnement hostile.

THE SPRING OF 1985 - A REVIEW

by Alain Caillet

Spring is a transitional season when extreme variations can be expected, one day being like winter, the next like summer. It is never certain how long the cold and hot days will continue to alternate. Although such changes occurred frequently in 1985 from March to May, well-marked temperature and precipitation patterns did result. In the northeastern Arctic, Québec and the Maritimes, spring was cool, but elsewhere was generally pleasant thanks to above-normal temperatures.

Lower than normal rainfall persisted in northeastern Canada. The Maritimes experienced dry weather as well during March and April, when numerous locations were in their seventh or eighth month of below-normal precipitation. Chatham had the driest March since 1950 and Moncton, the driest April since records began. At the end of April the water in Nova Scotia reservoirs was only 46% of full capacity. Fortunately, this situation was offset in early May by rain and heavy falls of late snow. In southern British Columbia and the Peace River area of Alberta very little precipitation fell as spring began, some places receiving the smallest amounts ever. However, this situation soon changed, alleviating the concerns of farmers.

Spring is the season par excellence for sudden showers, local disturbances, and thunderstorms accompanied by hail and tornadoes. But it is also the season for the last large-scale winter storms; and these did occur, mainly in Québec and Ontario. In March, the accumulation of snow in central Ontario following the storms on the 4th and 31st was the highest in 30 years, and in northwestern Québec the accumulation was as much as twice the normal amount. Strong winds inflicted damage in many diverse places. In mid-April a tornado touched down near Windsor, Ontario, 100 km per hour winds sank a fishing boat in the St. Lawrence with the loss of 5 lives, and 115 km per hour winds capsized some trawlers off the B.C. coast causing two deaths. In early May three more fishermen were drowned in the St. Lawrence after their boat capsized in stormy weather.

Hail that damaged greenhouses near Leamington, Ontario, on May 30, 1985 (*Windsor Star* photograph).

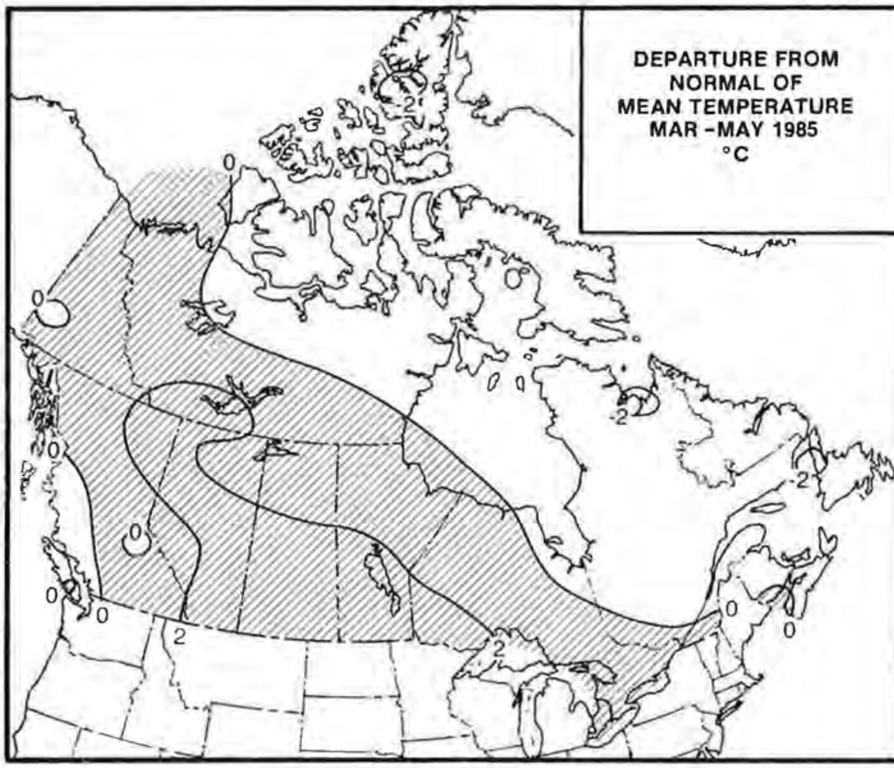
Large hailstone (compared to a tennis ball on the left and golf ball on the right) that fell near Lingwick, Québec, on May 13,1985 (Photograph: Paul-André Renaud, Sherbrooke Weather Office).

May was particularly notorious for severe storms in Eastern Canada. A line of violent thunderstorms accompanied by hail crossed northern Ontario on April 20, destroying greenhouses and ruining hundreds of acres of market gardens. In Québec's Eastern Townships, hailstones 7 cm in diameter (the size of tennis balls) fell on May 13 at Lingwick. Near St-Raphael in farmland east of Québec City, a tornado destroyed several buildings. On May 30, severe storms lashed southwestern Ontario, where golfball size hail struck a swath from Windsor to the Kingsville-Leamington area, smashing 70–90% of the area's greenhouses and ruining the tomato and cucumber crops. This event was overshadowed the following day when devastating tornadoes cut across southern Ontario causing twelve deaths and damage estimated at over 100 million dollars. Some property damage was suffered in Saint-Canute, Québec, at the tail end of this tornado outbreak, while the same storm system dumped over 100 mm of rain on Saint John, New Brunswick.

Central and Western Canada enjoyed much pleasanter weather, apart from a few snowstorms, one in April on the Prairies, another in May over the B.C. uplands and several in the Yukon. The weather was abnormally mild and dry, especially in the Yukon where daytime temperatures in mid-May began to exceed 20°C. Records were equalled or bettered west of Québec, reaching 30°C at Toronto on April 22 and 32°C at Winnipeg on the 28th, and exceeding 30°C in British Columbia and Alberta in mid-May.

In general, work in the fields began earlier than normal to the west of Québec, but had to be delayed to the east because of cool temperatures or precipitation or both. Spring was exceptional in having very few floods.

The melting of ice in navigable waterways proceeded normally, except on the northeast coast of Newfoundland where the break-up was three weeks late, and in the northeast arm of the Gulf of St. Lawrence where persistent winds pushed patches of ice into the Strait of Belle Isle, obstructing the near-shore waters of the Island even into late May.



Alain Caillet is a meteorologist with the Canadian Climate Centre and is a member of the editorial team of *Climatic Perspectives*.

NEWS AND NOTES

Man and the Biosphere Programme

The Canadian Committee for the Man and the Biosphere Programme (Canada/MAB), an international scientific programme of the United Nations Educational, Scientific and Cultural Organization (UNESCO), held its semi-annual meeting in Québec City on 15–16 January 1985. Members of the UNESCO Canada/MAB Committee represent federal and provincial departments, universities and industry from across Canada.

The Committee considered reports from its three working groups: (1) The Working Group on Biosphere Reserves is currently investigating the possibility of establishing biosphere reserves in Manitoba, Québec, Ontario and the northern regions to supplement the two existing reserves in Mont-Saint-Hilaire, Québec, and Waterton Lakes National Park, Alberta. (2) The Working Group on the Human Ecology of Coastal Areas proposes to hold its second workshop in June 1985, to examine specific case studies on traditional and community-based resource management in Canada. (3) The Working Group on Environmental Information and Training reported encouraging progress in establishing a national network to disseminate environmental information and assist curiculum development. The Committee was a major contributor to the Task Force on Northern Conservation created by Indian and Northern Affairs Canada in September 1983.

In addition, the UNESCO Canada/MAB Committee took action toward the establishment of an additional Working Group on Urban Ecosystems, in response to growing interest among Canadian scientists in this area, and discussed means of increasing the participation of government, industry and the scientific community in tackling present-day environmental problems.

Meteorology/Oceanography in the Curriculum.

A symbiotic function of both practising meteorologists/oceanographers and educators is liaison between these two groups for the betterment and enhancement of public knowledge and understanding. Teachers want and need up-to-date information and professionally designed activities covering topics in meteorology and oceanography, and everyone gains if these topics are an interesting component of a school's curriculum. The linkages required to achieve these aims are elusive owing to regional variations in the topics that are taught and in the discipline or subject department that teaches each one, and because of deficient knowledge about the depth of study devoted to the topic at the grade level in which it is taught.

The accompanying survey results are a small step toward rectifying the lack of information available, but will require additional correspondence at the provincial and regional levels before teachers and meteorologists/oceanographers can effectively bridge the gap.

The purpose of the survey was to clarify which school subject departments (subject discipline) had the responsibility (as outlined in provincial curriculum guidelines) for teaching the topics of meteorology and oceanography, and at which grades (K–12) and depth of understanding they were expected to do this. The disciplines and grade levels can be effectively summarized, but the number of topics in a discipline, and the time allotted to each, required that the depth to which each topic was taught had to be simply and subjectively categorized: either a topic was studied in detail, or related topics in meteorology or oceanography were looked at superficially. There were unfortunately no returns from Québec or New Brunswick.

The accompanying table clarifies the national variation that does exist. Both geography and science teachers across the country share the responsibility, but not equally. The grade level at which topics in meteorology/oceanography are taught exhibit a wide degree of national variation, but should be consistent within a particular province. Studies of meteorology and local weather patterns receive a fairly detailed treatment in all provinces, but the level of difficulty of the topics would vary as the grade level increased. As expected, studies in oceanography exhibit a pattern that correlates with the distance from our ocean borders. The interior provinces cover this topic only superficially (if at all) while the only region of detailed studies is found on the East Coast.

Teachers of meteorology and oceanography often do not know which government departments would be most useful to them in providing resources on these topics, or if teaching aid resources even exist. It is easier perhaps, for government and private meteorologists/oceanographers to contact the Curriculum Branch of the Department of Education in their own province and request copies of the curriculum dealing with the topics of meteorology and oceanography and/or the names of professional science and geography teacher associations whose mandate would include the promotion and dissemination of curriculum resources pertinent to the topics their teachers are responsible for teaching.

In all provinces the need exists for improved relationships between teachers and practitioners of meteorology and oceangraphy; in many regions print or media resources already exist to meet this need. Bridging the gap is just a matter of becoming familiar with another professional's domain.

Frank Boddy

Curriculum Survey Results

	Meteorology			*Oceanography*		
Province*	Discipline	Grades	Depth of Study	Discipline	Grades	Depth of Study
Ontario	Geography	11	Detailed	Geography	11	Superficial
B.C.	Geog./Sci	4, 6–8, 11,12	Detailed	Science	11	Superficial
Alberta	Science	8	Detailed	N.A.†	N.A.	N.A.
Sask.	Geog./Sci.	1–4, 8, 10	Detailed	Geog./Sci.	3, 8, 10	Superficial
Manitoba	Geography Climate only	7, 10	Superficial	N.A.	N.A.	N.A.
Nfld.	Social Studies	1–9, 12	Detailed	Social Studies	1–9, 12	Detailed
P.E.I.	Geog./Sci.	7, 8, 11, 12	Detailed	Geog./Sci.	4, 6, 8, 11, 12	Detailed
Nova Scotia	Science	1, 2, 5, 6	Detailed	Science	9, 11, 12	Detailed

* No response from Québec and New Brunswick. † N.A. Not available.

PRÉSENTATION D'ARTICLES POUR LE *CHINOOK* À L'INTENTION DES AUTEURS

1. Contenu de l'article, langue et lecteurs
On vous invite à présenter des articles d'ordre général, rédigés soit en anglais, soit en français, dans le domaine de la météorologie et de l'océanographie, et qui conviennent à des lecteurs du niveau scolaire secondaire. Les opinions exprimées dans le texte reflètent celles de l'auteur.

2. Longueur et format
La longueur suggérée d'un article est de 1500 à 3000 mots, avec deux à quatre figures (et légendes). La présentation de photographies et d'illustrations nettes est particulièrement encouragée. Les auteurs sont priés de fournir un résumé de 100 à 200 mots, de préférence dans l'autre langue officielle. Au besoin, les résumés seront traduits et publiés dans l'autre langue.

3. Références
Les citations littéraires dans le texte même sont à éviter. On suggère plutôt d'y indiquer le nom des auteurs ou de l'organisme à qui le mérite est attribué et d'ajouter, à la fin de l'article, les références sous forme d'une liste brève de « lectures recommandées ». Toute référence à un article de revue doit comporter le nom et les initiales du ou des auteurs, l'année de publication, le titre de l'article en entier, le nom de la revue, le numéro du volume et le numéro des pages concernées. La mention d'un livre doit arborer le nom et les initiales du ou des auteurs, l'année de publication, le titre du livre, et le nom et l'adresse de la maison d'édition. Toutes les références doivent être présentées dans l'ordre alphabétique selon le nom de famille de l'auteur principal.

4. Mode de présentation des articles
Le manuscrit doit être dactylographié à double interligne et soumis en deux exemplaires à : Rédacteur du *Chinook*, a/s de la Société canadienne de météorologie et d'océanographie, 151, rue Slater, suite 805, Ottawa (Ontario), Canada, K1P 5H3. Les épreuves finales des figures tracées et les photographies en noir et blanc de bonne qualité (l'original et deux photocopies de chacune) doivent accompagner le manuscrit. Nous faisons bon accueil aux illustrations ou photographies en couleurs qui pourraient paraître en page couverture du numéro. Les auteurs son priés de fournir une brève description (50 mots environ) de leur affiliation professionnelle (le cas échéant) et de leur intérêt en météorologie et en océanographie; ils devraient de plus indiquer si leur article a déjà été publié ailleurs ou le sera plus tard.

5. Politique de rédaction
Le rédacteur en chef décidera de la pertinence des articles à publier en consultation avec au moins un autre membre du comité de rédaction. On prêtera une attention toute particulière à la lisibilité des articles par des profanes.

6. Tirés à part
On ne pourra pas faire réimprimer les articles. L'auteur principal recevra quatre tirés à part du numéro de parution de l'article. Des exemplaires additionnels seront fournis au frais de l'auteur pourvu que la demande soit faite avant l'impression.

*Certains numéros du **Chinook**, maintenant épuisés, sont des pièces de collection (vol. 1, nos 1 et 2; vol. 3, no 1), mais vous pouvez encore vous procurer des exemplaires des numéros restants au prix unitaire d'origine de 1,50$.*

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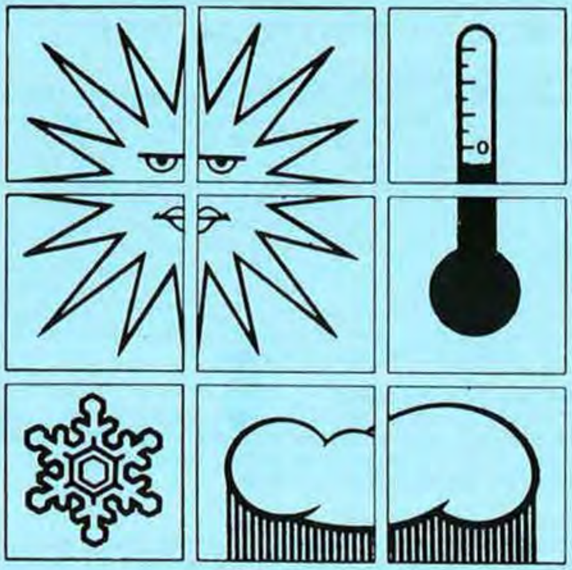

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