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Climatic Perspectives

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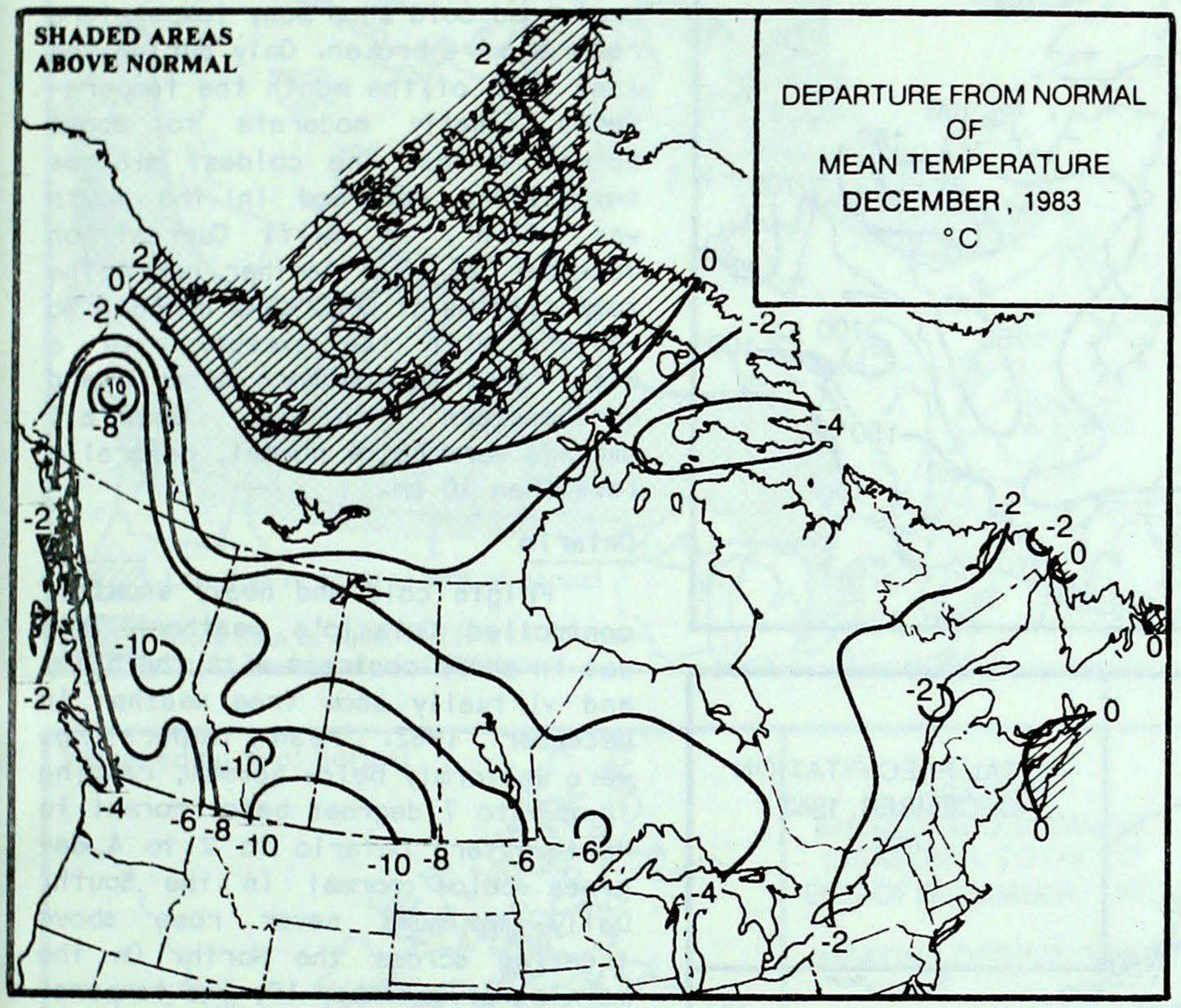
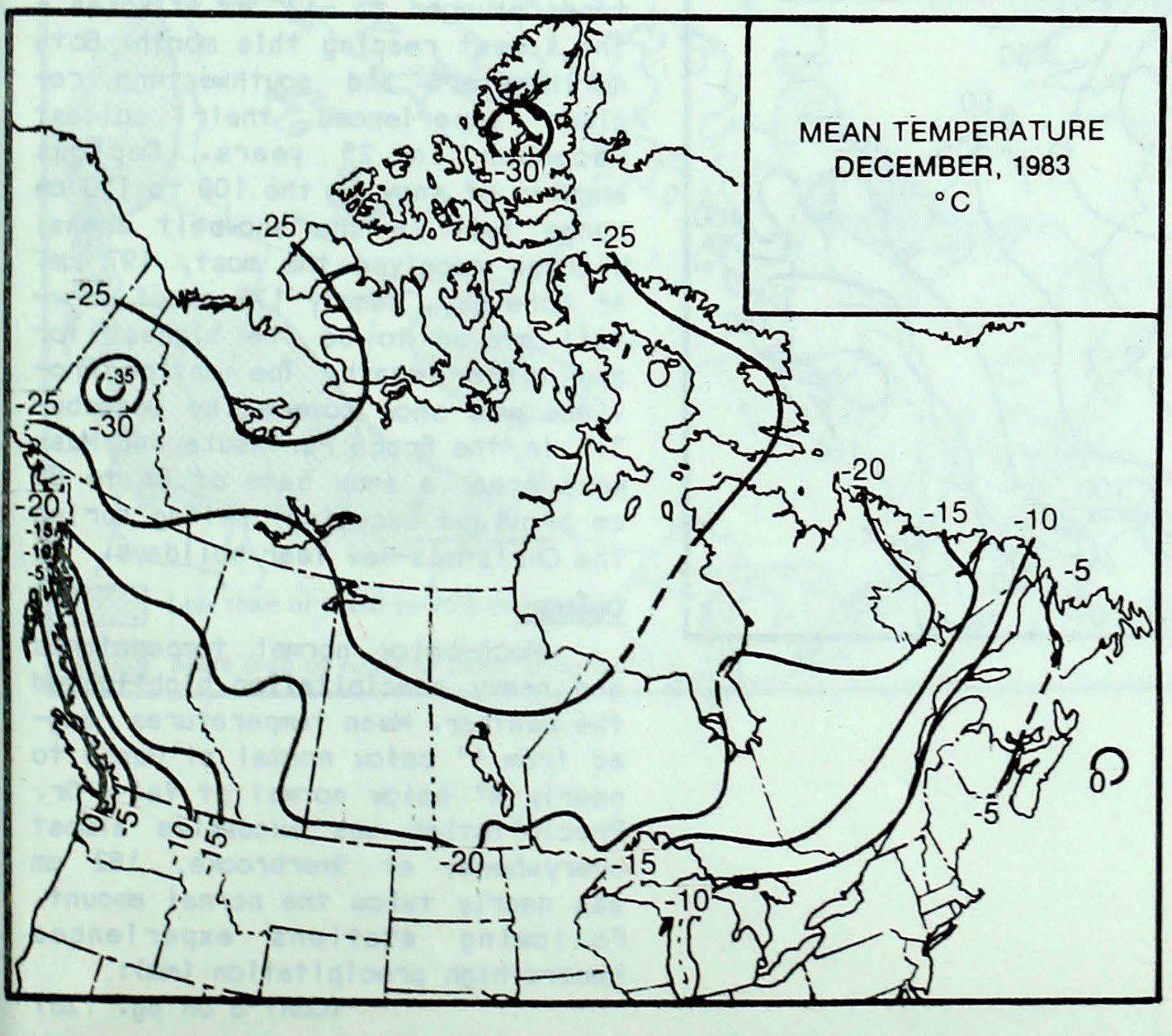


DEPARTURE FROM NORMAL OF MEAN TEMPERATURE DECEMBER, 1983 °C



MEAN TEMPERATURE DECEMBER, 1983 °C

ACROSS THE COUNTRY ...

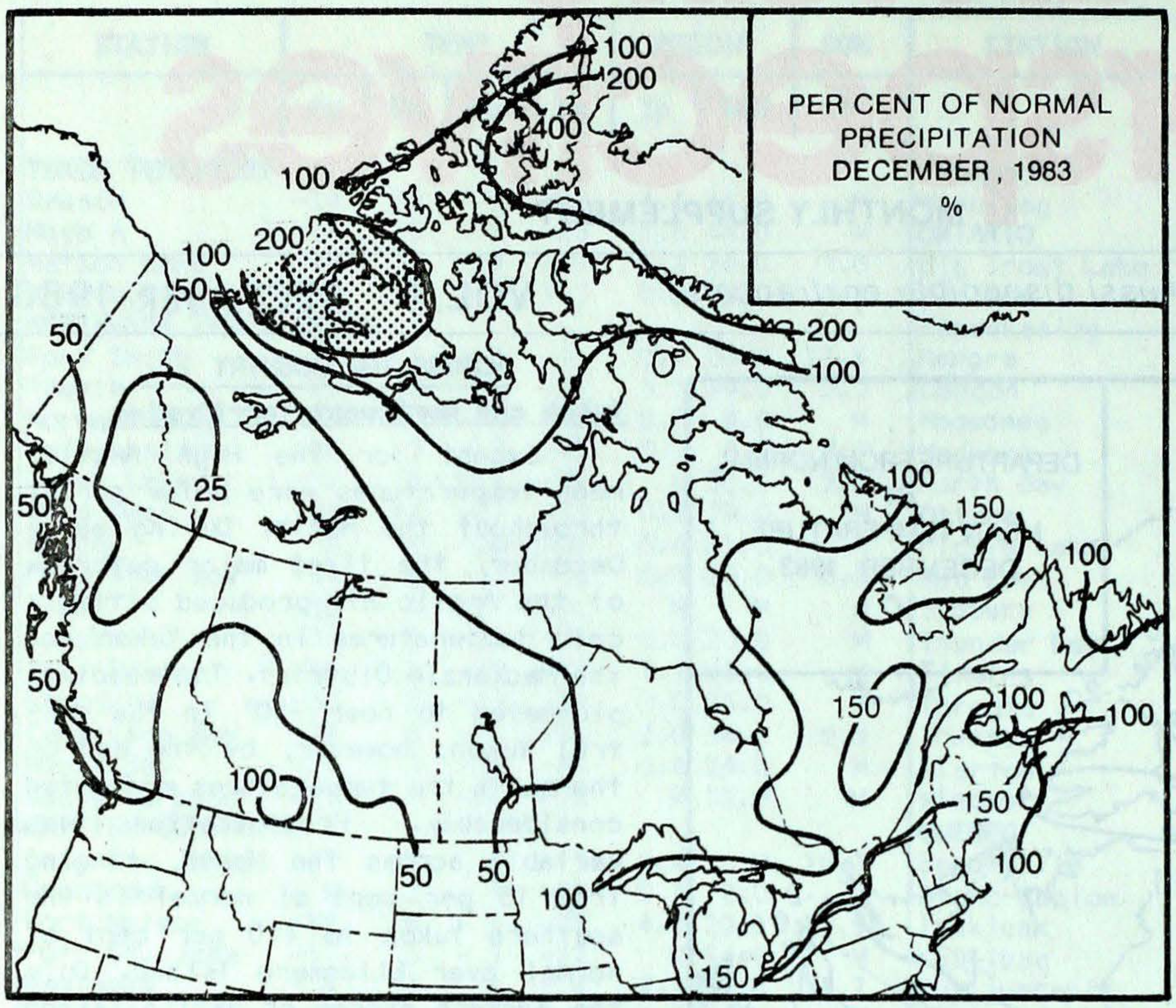
Yukon and Northwest Territories

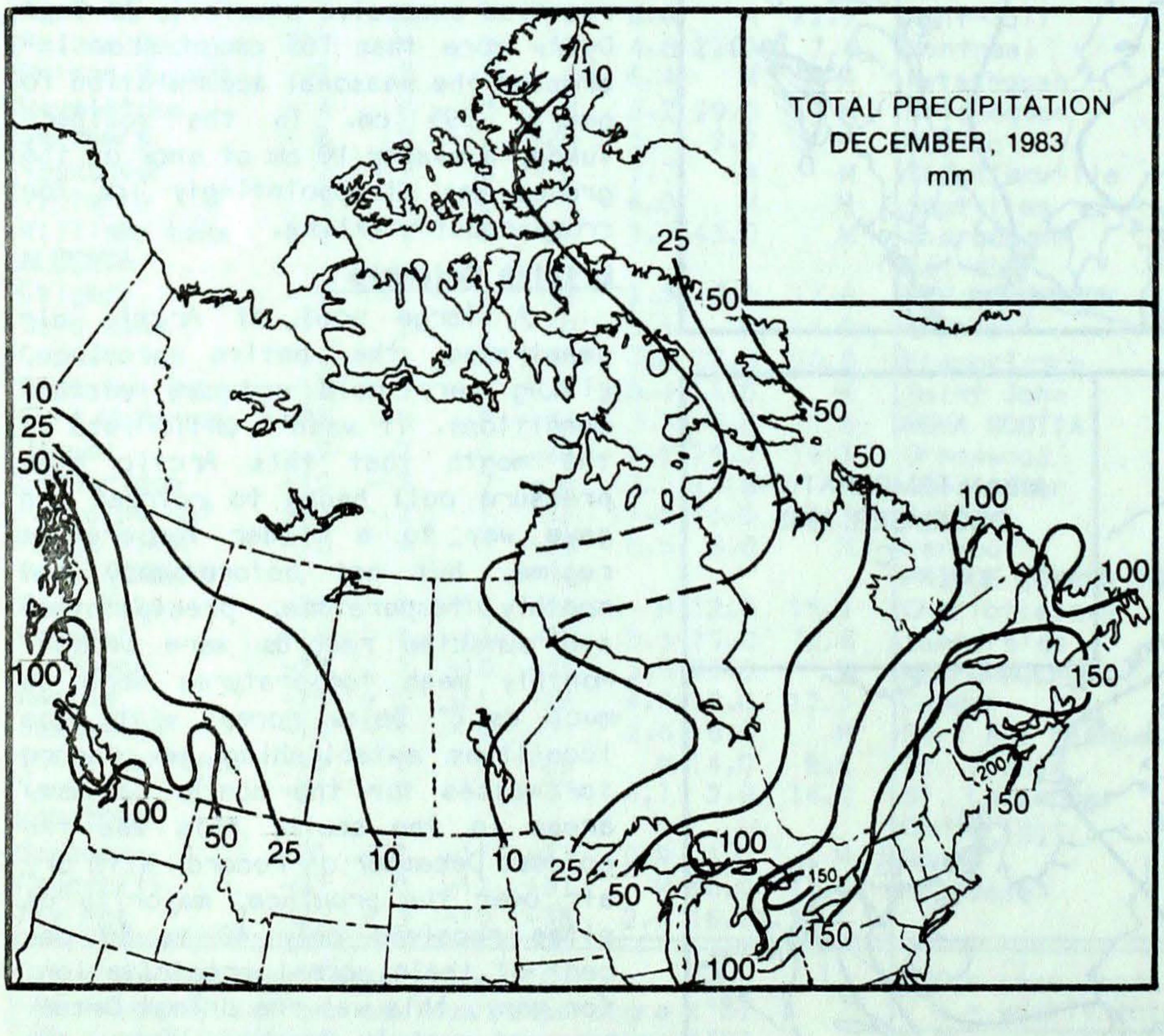
Except for the High Arctic, mean temperatures were below normal throughout the North. During early December, the first major outbreak of the Arctic air produced bitterly cold temperatures in the Yukon and the Mackenzie District. The readings plummeted to near -50° in the central Yukon; however, by the end of the month the temperatures moderated considerably. Precipitation was variable across the North, ranging from 15 per cent of normal in the southern Yukon to 410 per cent of normal over Ellesmere Island. Only the eastern shores of Baffin Island received excessive snowfall. At Cape Dyer, more than 165 cm of snow increased the seasonal accumulation to nearly 395 cm. In the southern Yukon, a meager 10 cm of snow on the ground was disappointingly low for cross-country skiing.

British Columbia

A large pool of Arctic air penetrated the entire province, giving very cold and dry weather conditions. It wasn't until late in the month that this Arctic high pressure cell began to retreat and gave way to a milder temperature regime, but not before many new monthly temperature, precipitation and sunshine records were broken. Monthly mean temperatures were as much as 8° below normal with nine localities establishing new record low values for the month. In many areas in the south, this was the coldest December on record. With dry air over the province, majority of sites received only 40 to 50 per cent of their normal precipitation; for many, this was the driest December on record. Sunshine hours for the month were also high, with no less than ten stations indicating their sunniest December ever. Port Alberni, on the west coast of Vancouver Island, had more than three times their normal sunshine for the month.

Canada





Prairie Provinces

It was a bitterly cold month everywhere. Mean temperatures were as much as 12° below normal and many communities recorded their coldest December ever. The lowest temperature readings occurred before Christmas, frequently dropping in to the -40° range at night. During this prolonged cold snap many temperature records were broken. Only during the last week of the month the temperatures finally moderate to above normal values. The coldest minimum temperature recorded in the south was -42.6°, at Swift Current on December 23. But farther north the temperatures at Cree Lake dropped to -45.6°. With the exception of a small area in southern Alberta and northeastern Manitoba, snowfall amounts were below normal, generally less than 10 cm.

Ontario

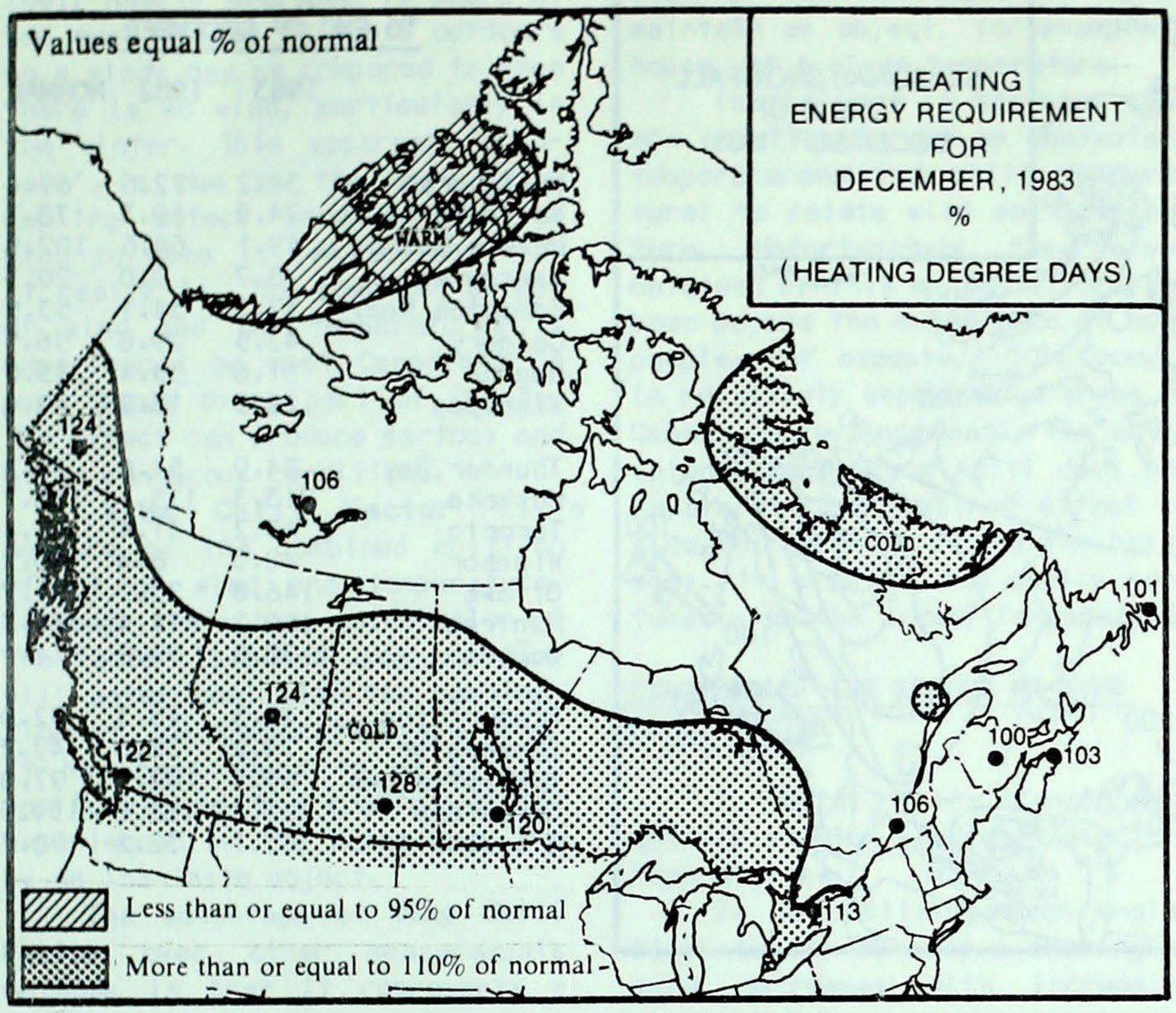
Frigid cold and heavy snowfall controlled Ontario's weather. This was in sharp contrast with the balmy and virtually snow free weather in December 1982. Mean temperatures were uniformly below normal, ranging from 5 to 7 degrees below normal in Northwestern Ontario to 2 to 4 degrees below normal in the South. Daily maximums never rose above freezing across the North. On the morning of December 19, the temperatures plunged to -42° at Atikokan - the lowest reading this month. Both northwestern and southwestern regions experienced their coldest December in 25 years. Copious amounts of snow in the 100 to 150 cm range fell in the snowbelt areas; Wiarton received the most, 197 cm. At Gore Bay, nearly 175 cm of snowfall proved to be the highest for any winter month. The entire Province was snow covered by December 31. In the Bruce Peninsula and Muskoka area, a snow base of 65 to 85 cm provided excellent skiing during the Christmas-New Year holidays.

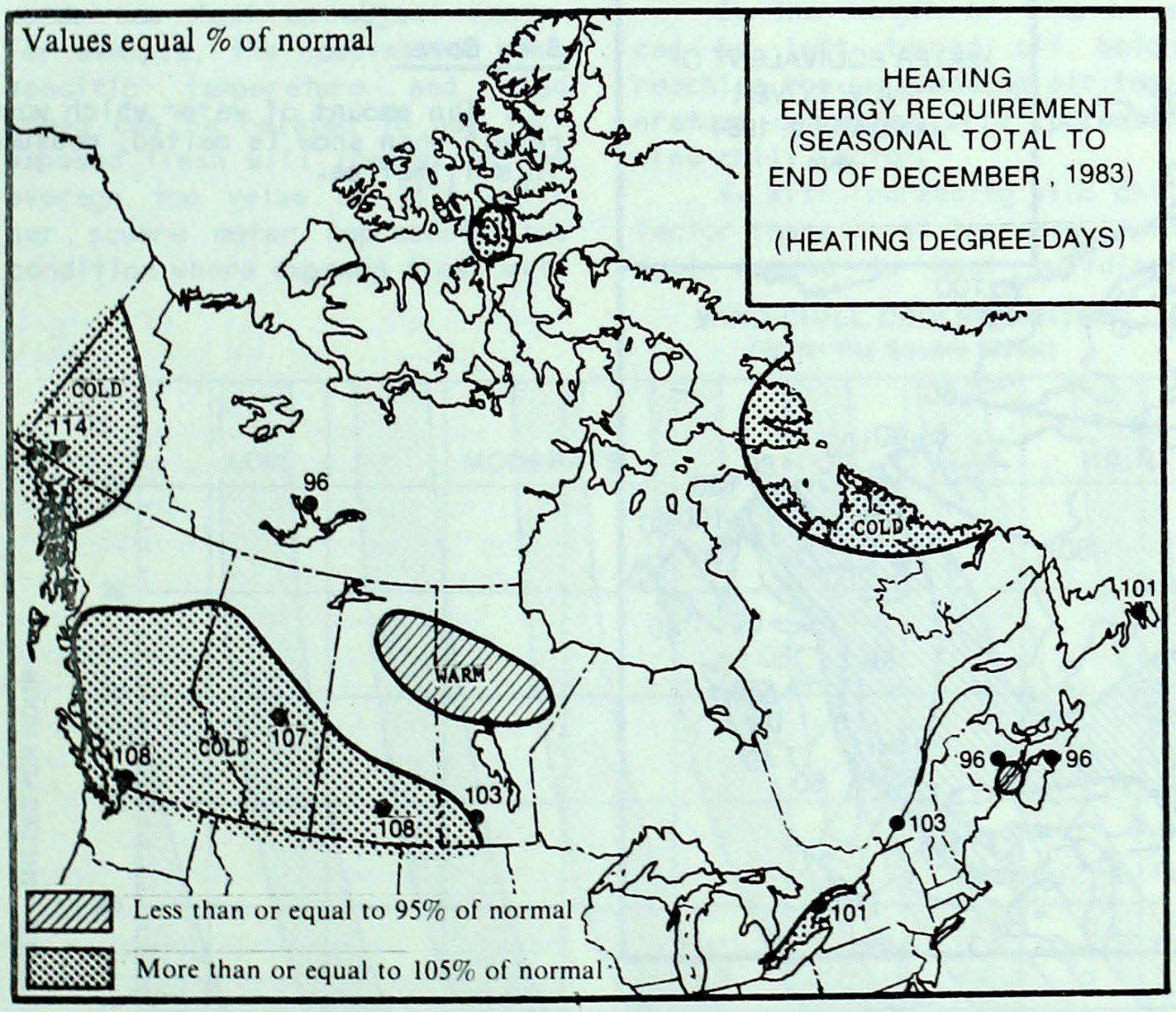
Québec

Much-below normal temperatures and heavy precipitation highlighted the weather. Mean temperatures ranged from 1° below normal at Gaspé to nearly 4° below normal at Val-d'Or. Precipitation was excessive almost everywhere; at Sherbrooke, 182 mm was nearly twice the normal amount. Following stations experienced record-high precipitation (mm):

(Cont'd on pg. 12B)

ENERGY REQUIREMENT

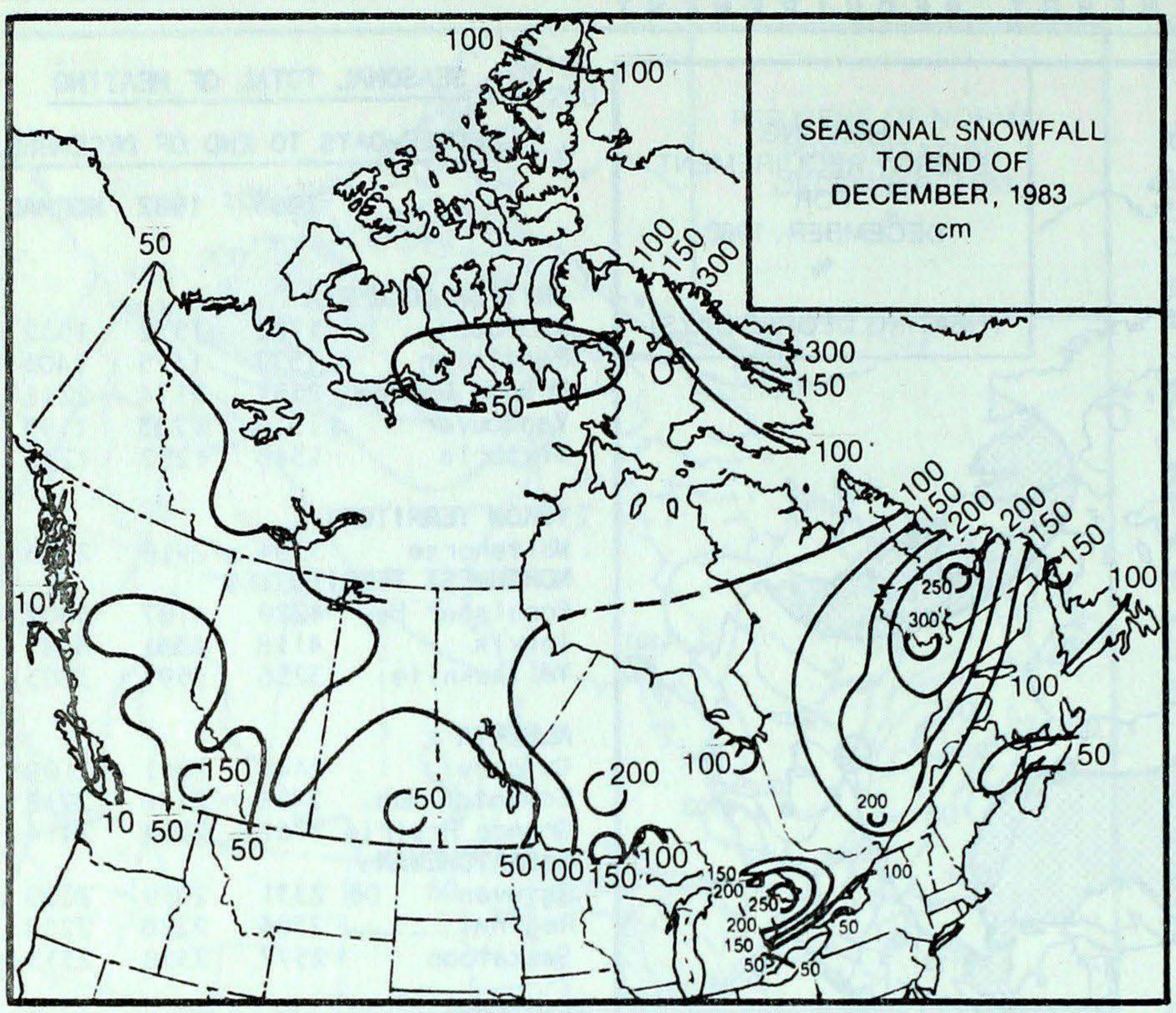

HEATING ENERGY REQUIREMENT FOR DECEMBER, 1983 % (HEATING DEGREE DAYS)


HEATING ENERGY REQUIREMENT (SEASONAL TOTAL TO END OF DECEMBER, 1983) (HEATING DEGREE-DAYS)

SEASONAL TOTAL OF HEATING DEGREE-DAYS TO END OF DECEMBER

	1983	1982	NORMAL
BRITISH COLUMBIA			
Kamloops	1702	1532	1532
Penticton	1577	1475	1403
Prince George	2537	2174	2246
Vancouver	1319	1233	1195
Victoria	1348	1257	1238
YUKON TERRITORY			
Whitehorse	3394	2918	2913
NORTHWEST TERRITORIES			
Frobisher Bay	4229	4187	3802
Inuvik	4118	4331	4081
Yellowknife	3256	3595	3283
ALBERTA			
Calgary	2441	2051	2109
Edmonton Mun.	2438	2146	2218
Grande Prairie	2761	2514	2474
SASKATCHEWAN			
Estevan	2331	2039	2089
Regina	2506	2228	2258
Saskatoon	2577	2358	2333
MANITOBA			
Brandon	2466	2220	2272
Churchill	3315	3649	3384
The Pas	2580	2620	2577
Winnipeg	2374	2134	2190
ONTARIO			
Kapuskasing	2490	2407	2400
London	1542	1306	1464
Ottawa	1741	1556	1410
Sudbury	2091	1868	1999
Thunder Bay	2230	2125	2133
Toronto	1581	1343	1451
Windsor	1627	1111	1282
QUÉBEC			
Baie Comeau	2270	2254	2302
Montréal	1687	1509	1595
Quebec	1913	1774	1854
Sept-Iles	2423	2447	1311
Sherbrooke	1951	1790	1957
Val-d'Or	2347	2207	2305
NEW BRUNSWICK			
Charlo	1907	1982	1873
Fredericton	1698	1622	1711
Moncton	1670	1618	1668
NOVA SCOTIA			
Halifax	1345	1317	1365
Sydney	1495	1494	1469
Yarmouth	1377	1356	1386
PRINCE EDWARD ISLAND			
Charlottetown	1522	1520	1550
NEWFOUNDLAND			
Gander	1873	1879	1795
St. John's	1729	1699	1683

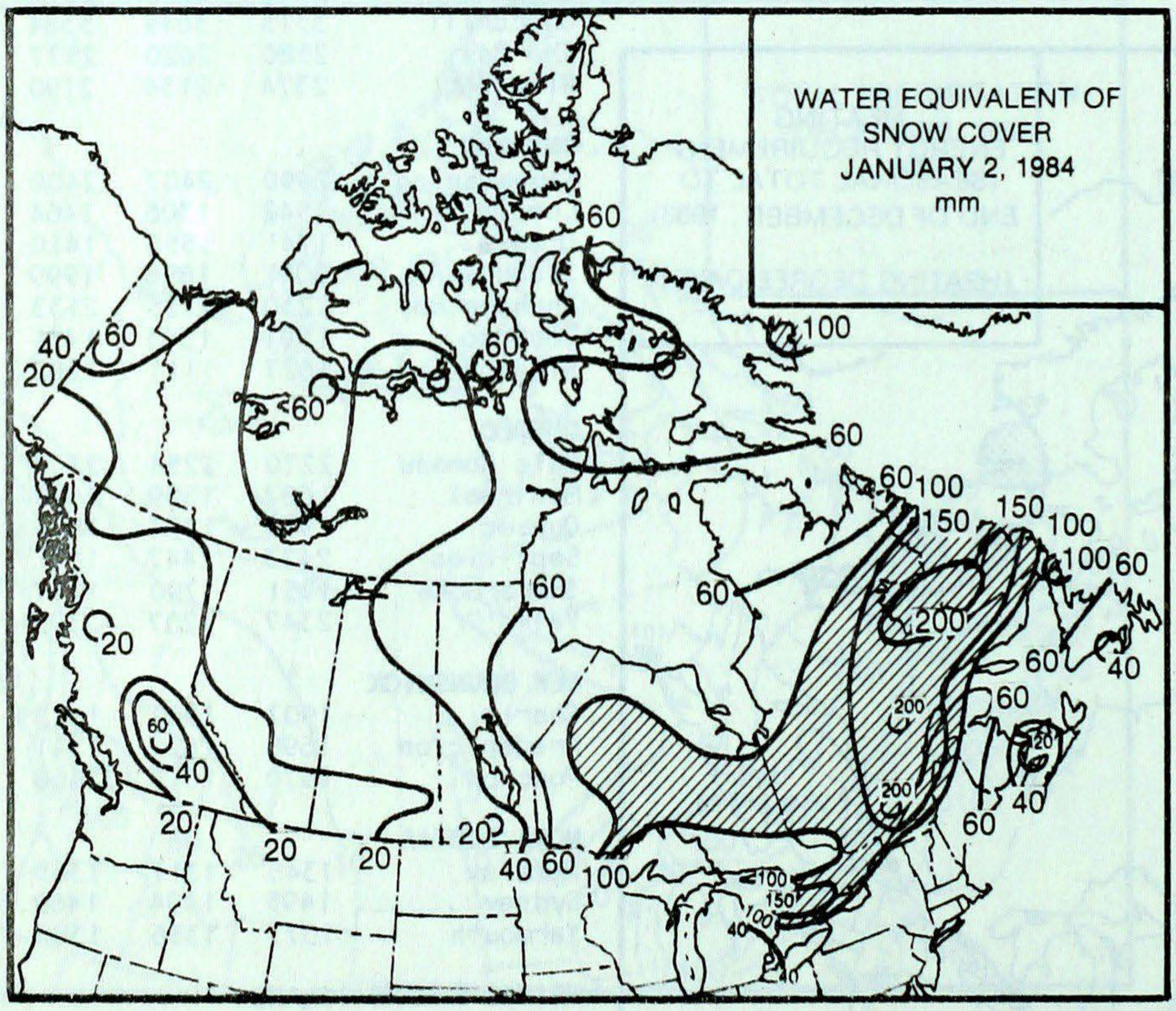
SNOWFALL



SEASONAL SNOWFALL TOTALS (CM)

TO END OF DECEMBER

	1983	1982	NORMAL
Whitehorse	38.2	72.6	69.4
Yellowknife	74.8	69.3	78.7
Prince George	49.1	64.6	102.9
Vancouver	8.7	0.0	20.3
Edmonton Nam.	37.3	34.1	53.5
Calgary	43.5	29.8	56.5
Regina	31.6	35.4	45.0
Winnipeg	28.5	16.2	48.0
Thunder Bay	84.9	54.6	79.3
Muskoka	213.3	115.1	116.7
Toronto	48.2	31.4	41.4
Windsor	48.0	8.4	40.2
Ottawa	146.8	23.2	81.7
Montréal	150.2	15.4	81.7
Québec	170.6	59.8	124.4
Fredericton	45.3	45.3	92.0
Shearwater	74.2	38.6	47.2
Charlottetown	65.3	102.3	97.0
Goose Bay	333.8	185.8	159.3
St. John's	53.1	32.2	90.7



Snow Cover

The amount of water which would result when snow is melted, measured in millimetres.

WIND CHILL FACTOR

But how cold does it really feel? Nearly everyone is aware of how much colder it feels outdoors on a windy day as compared to when there is no wind, particularly in the winter. This apparent 'coldness' is due to the more rapid cooling effect produced by the wind to make it feel colder than it really is. The combined effect of wind and low temperatures is experienced by most Canadians in just about every part of Canada. The effect can produce serious and often dangerous conditions.

Wind Chill Factor is a measure of the combined chilling effect of wind and temperature. Although the actual calculation of the factor is based upon how fast will water cool with the combination of low temperature and wind, it has been found to be equally applicable to the cooling effect experienced by the human body and by an inanimate object.

The advantage of **Wind Chill Factor** over other measurements methods is that it represents a real rate of cooling, in other words how fast an object cools. For example, the combination of a specific temperature and wind speed can be related to how fast exposed flesh will freeze. On the average the value of 1625 watts per square meter represents the condition where exposed flesh will freeze. It also gives an indication of how difficult it is to maintain an object, for example a house, at a given temperature.

In the past it has been common practice to use an equivalent temperature (wind chill temperature) to relate wind and temperature. Unfortunately the values obtained by this method often have been beyond the experience of most people. For example, -50°C occurs in relatively unpopulated areas of Canada. More importantly the equivalent temperature still does not relate to the combined effect of wind and temperature on the human body. It also is too easily confused with the actual temperature.

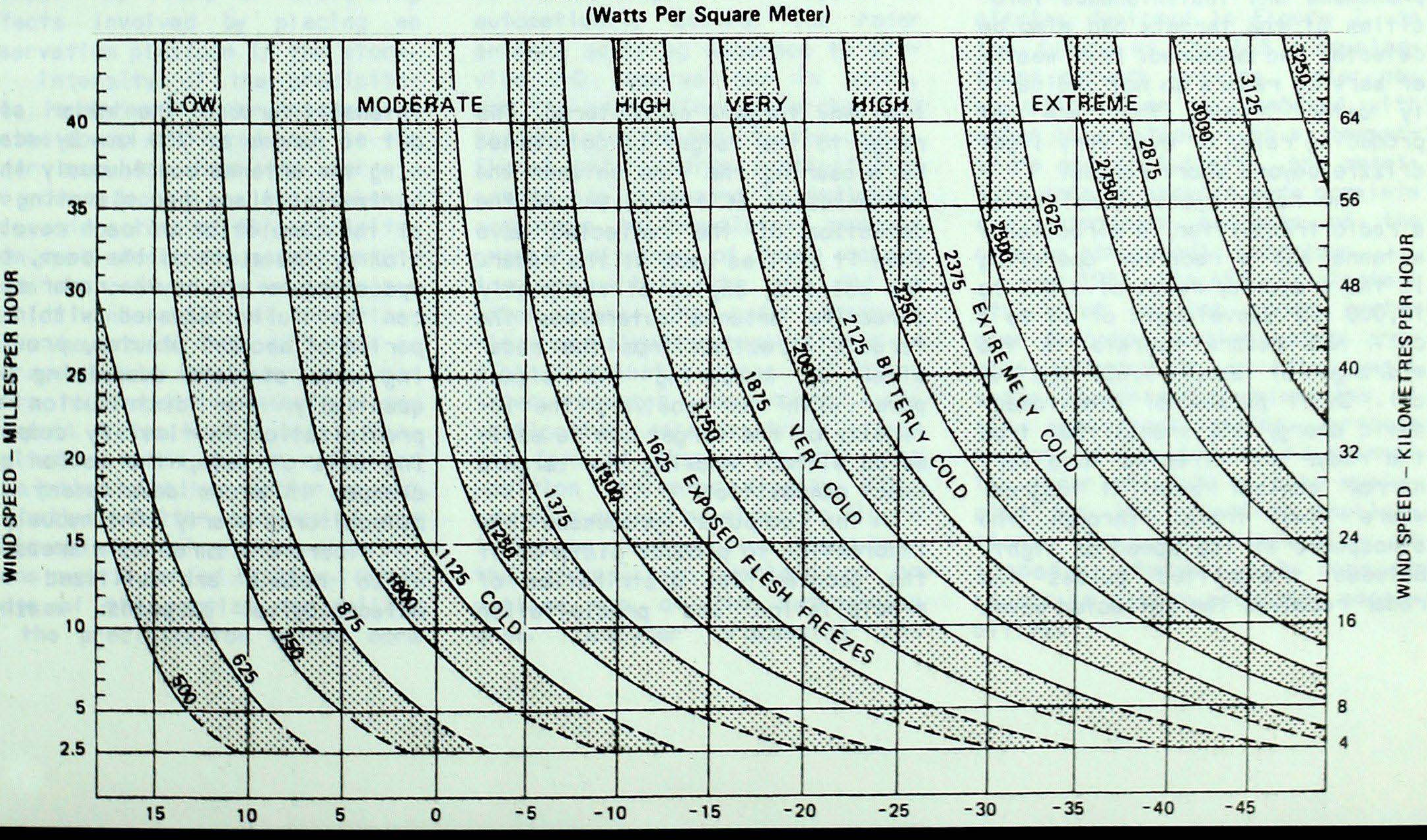
EXAMPLES OF THE EFFECT OF WIND CHILL FACTOR

1. Water will freeze more quickly at high wind chill factors than at low.
2. The ability of an engine block heater to keep a car engine warm decreases with increasing wind chill factor.
3. The length of time a car can be left turned off before reaching the surrounding air temperature decreases with increasing wind chill factor.
4. With increasing wind chill factor there is an increase in the fuel needed to heat buildings, particularly when the building is poorly insulated.
5. Exposed flesh freezes more rapidly with higher wind chill factors.

EXAMPLES OF WIND CHILL FACTOR

Wind Chill Factor	Comments
700	Conditions considered comfortable when dressed for skiing
1200	Conditions no longer pleasant for outdoor activities on overcast days
1400	Conditions no longer pleasant for outdoor activities on sunny days
1600	Freezing of exposed skin begins for most people depending on the degree of activity and the amount of sunshine
2300	Conditions for outdoor travel such as walking become dangerous. Exposed areas of the face freeze in less than 1 minute for the average person
2700	Exposed flesh will freeze within half a minute for the average person.

The units of **Wind Chill Factor** are watts per square meter.



WIND CHILL COOLING RATES
(Watts Per Square Meter)

WEATHER RADAR IN THE ATMOSPHERIC ENVIRONMENT SERVICE

by
C.L. Crozier
Atmospheric Environment Service

Weather radars have been part of the Atmospheric Environment Service (AES) weather observing system for many years. Recently, five new radars were added to bring the network total to fifteen. A program is underway to equip all radars with a computer based system to control the radar operation, digitally process and record the observations and transmit the information to remote user locations. This advancement will provide not only better and increased services, but more rapid and greater accessibility of the information to an increasing number and variety of users.

From the weather service standpoint, the radar is a remote sensing instrument which provides information concerning the location, extend and intensity of hydrometeor targets in the atmosphere out to a nominal radius of about 250 km from the radar site. Precipitation in the form of rain and/or snow and hail is of principal interest. Under certain circumstances and with some special radars (Doppler type) clear air phenomena and instantaneous velocities of the targets can also be detected and measured. Most weather service radars do not ordinarily detect clouds that are not producing rain, or even very light drizzle beyond short ranges.

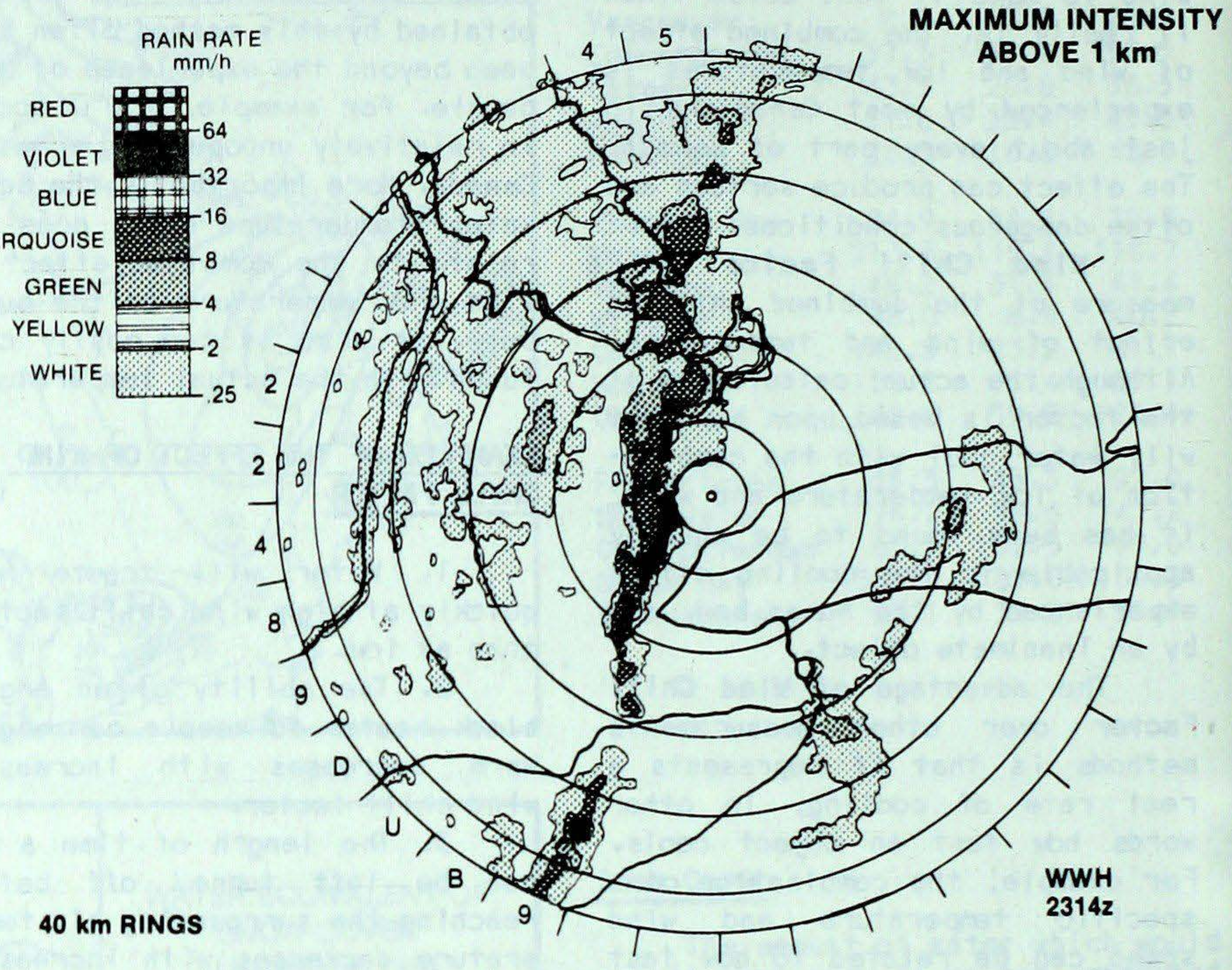


Fig. 1 Example of a weather radar display on a video screen.

The radar system consists of a radio transmitter, a directional antenna and a receiver operating in the frequency range of 3,000 to 10,000 MHz (wavelength of 10 to 3 cm). AES radars operate in the midrange at about 5,600 MHz (5 cm). Short pulses of electromagnetic energy are transmitted from the radar and directed in a very narrow conical beam (1 degree) where they travel through the atmosphere at the speed of light. Between transmitted pulses the radar receives the reflected waves from any targets encountered. The range to the target is determined by measuring the time between the transmission of the pulse and the detection of the reflected wave when it arrives back at the radar. The pointing angles of the highly directive antenna determines the targets direction from the radar site. By measuring the signal power with the receiver, the intensity of the target can be estimated without knowing the targets exact composition.

The computer processes the information to produce pictures of the geographical distribution of precipitation and precipitation intensity around the radar site out to ranges of 250 km. By scanning the antenna continuously in a horizontal plane and elevating it at the completion of each revolution by the width of the beam, the space volume around the radar site can be fully scanned within a period of about 5 minutes, providing sets of data describing sequentially the distribution of precipitation in time. By comparing sets of data, the motion and changes in storm development can be monitored nearly continuously.

There are three main areas in which radars are utilized for meteorological purposes: weather analyses and prediction, hydrological application and research in cloud and precipitation physics. Forecast meteorologists use radar observations to map areas of precipitation, determine intensity, development and motion, and then make short term weather forecasts for public, aviation, marine and industrial interests. Radar is particularly well suited to detect, locate and identify severe weather areas associated with thunderstorms and tornado producing storm systems. Hydrologists can use radar observations to aid in production of flash flood warnings. A unique feature of the radar is the ability to view precipitation over large areas almost continuously, even over mountainous and water areas where rain gauges are difficult to locate. Weather radars at present can provide areal mappings of precipitation amount with significant accuracy. Skillful use and interpretation of the observations in conjunction with a small number of precipitation gauges, can provide hydrological data which is more accurate and of more benefit than data obtained by any other means.

Radar is used to improve our knowledge and understanding of precipitation generating processes in the atmosphere. Finely detailed structures of storms can be quantitatively observed at all heights without the risks or disturbing effects involved by placing an observation platform in the storm.

Intensity of the precipitation is determined by measurement of the power scattered back to the radar receiver from the target. The power depends on the numbers, sizes and nature of the precipitation particles. Fortunately nature tends to behave in an organized fashion and empirical relationships have been deduced which on average relate the radar measurements to respective snowfall and rainfall rates quite well. Precipitation rates can be estimated at a point within a factor or two or better. Better accuracies are achievable by integrating observations over a period of time. Knowledge of the spatial variability of the precipitation allows more accurate estimates to be made over larger areas such as watersheds or drainage basins.

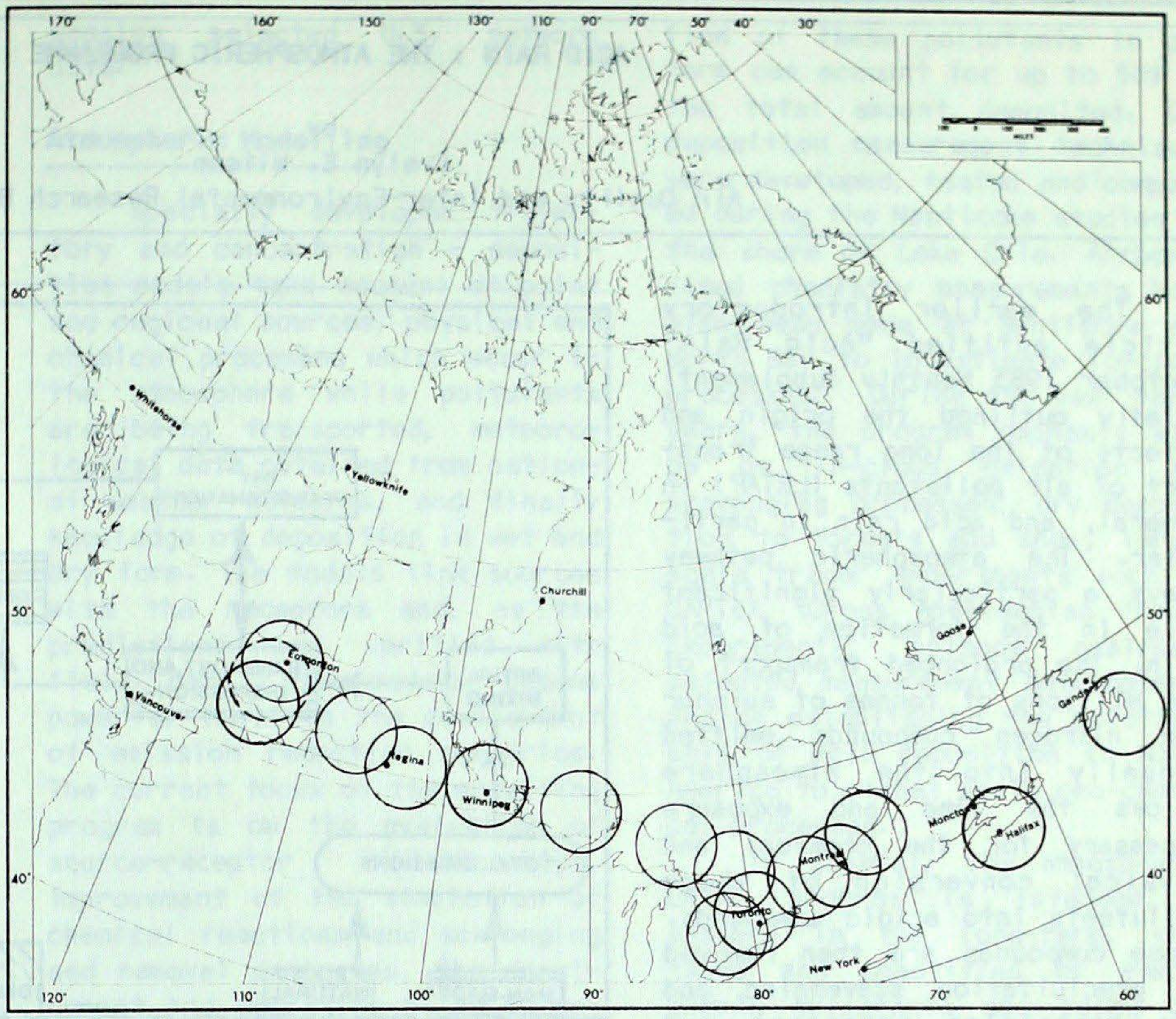


Fig. 2 Locations of radars in the AES national network.

The AES radar program includes the development of a system to automatically control the radar antenna scanning sequence to provide 3-D observations in space, and the processing, recording and transmission of data to the users. Signal returns from precipitation echoes are processed by dedicated computers to immediately produce graphic displays of those echoes for use within the AES and by other users. The radar observations are simultaneously stored on digital magnetic tapes for other later research, development, investigative, and analysis uses. One form of display is the plan position indicator display (PPI) or radar echoes as shown in Figure 1. Echoes observed in a layer near the ground are overlaid on an outline map of the surrounding area. Computer processing can readily produce many other types of display.

Locations of radars in the AES national network are at the centres of the 400 km diameter circles depicted in Figure 2. In the future as the AES communications network evolves, radar observations can be combined with other observations such as temperature and wind fields, and satellite data to provide more complete and integrated pictures of the complex atmospheric behaviour.

In 1984, the AES will install its first Doppler radar system near Toronto. Doppler radars provide information on the small scale instantenous velocities of air and precipitation particle motions within and around storms. The radar and data will be evaluated for its potential applications. The early detection of tornadic storms with Doppler radars is a very promising possibility.

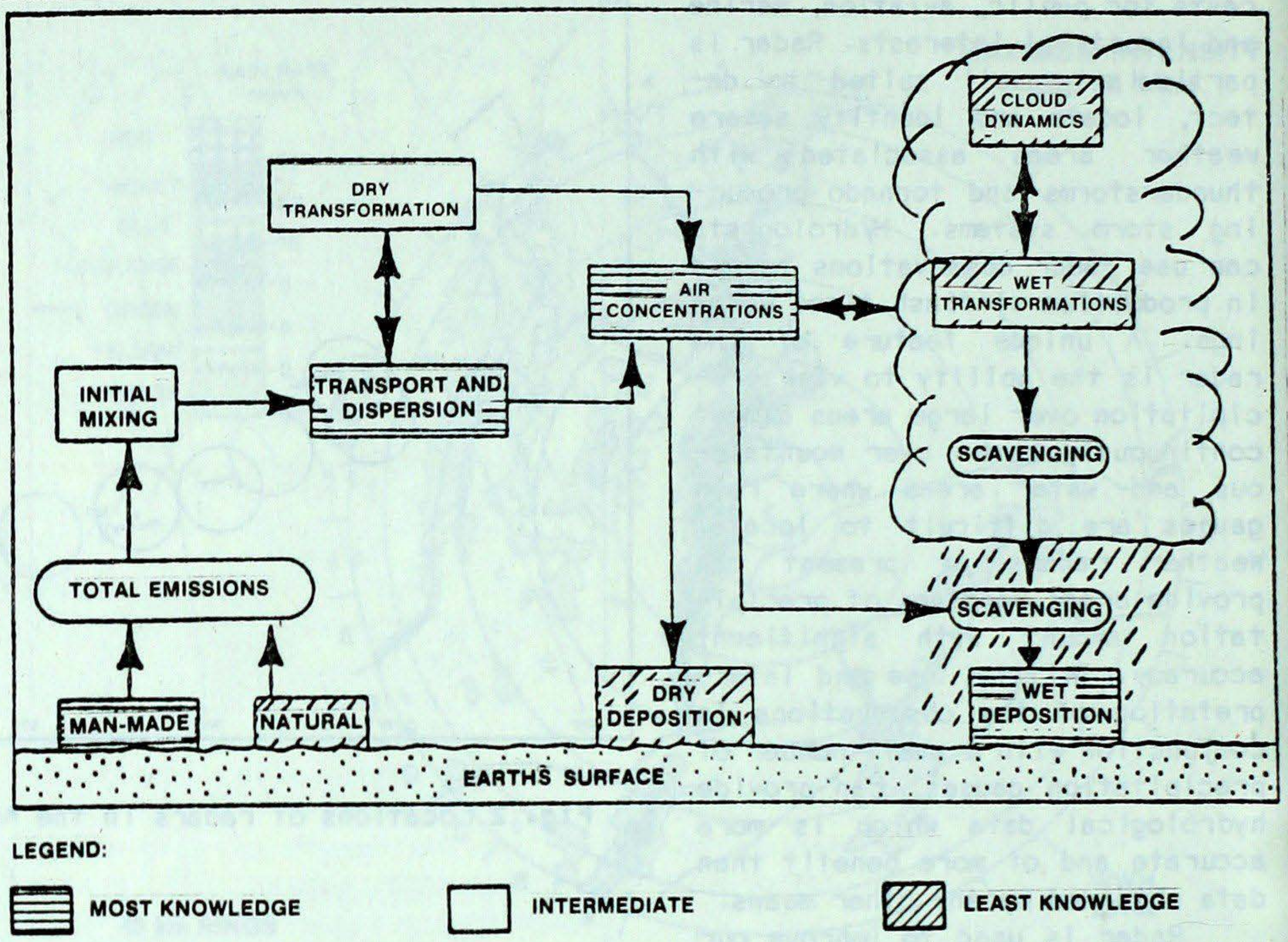
ACID RAIN : THE ATMOSPHERIC PROGRAMME

by

Evelyn E. Wilson
Air Quality and Inter-Environmental Research Branch

The earlier introductory article entitled "Acid Rain" (October 1983 Monthly Supplement) briefly outlined the origin and effects of the long range transport of air pollutants (LRTAP) in general, and acid rain in particular. The atmospheric pathway plays a particularly significant role in the formation of acid rain. The prolonged transport of the millions of tonnes of sulphur and nitrogen compounds emitted annually into the atmosphere allows the time and exposure necessary for the chemical and physical conversion of these pollutants into acidic compounds. These compounds are then removed by precipitation scavenging and dry deposition processes and deposited onto distant receptor ecosystems, hundreds of kilometres downwind. Across eastern North America, prevailing weather conditions permit the large-scale movement of these acidic pollutants from their precursor sources in industrialized regions such as the Ohio Valley, the lower Great Lakes and the Sudbury area, to sensitive lakes and forests of the Appalachians in the east and the Canadian Shield in the north. As an indication of the magnitude of the problem, in eastern United States, an estimated 36,000 square kilometres of lakes and rivers are at risk while in eastern Canada, the comparative area is 52,000 square kilometres.

Since the problem of acid rain was first recognized in North America over a decade ago, atmospheric scientists are continuing to examine and model the transport, dispersion, transformation and removal processes of pollutants released into the atmosphere. Understanding these complex physical-chemical processes is necessary to be able to define, quantify and predict the problem in terms of source to receptor relationships.



Current level of knowledge and understanding of the various links in the LRTAP source to receptor chain.

The current objective of the federal LRTAP Scientific Program being conducted by Environment Canada is to reduce wet sulphate loadings (i.e., amount of sulphates that are deposited in precipitation) towards an interim target of 20 kilograms per hectare per year, and to validate and refine the adequacy of this target with respect to ecosystem processes. Towards this goal, the atmospheric scientific-technical program activities carried out by the Atmospheric Environment Service are directed at developing the following capabilities:

1) to measure (determine) wet and dry deposition with approriate spatial and temporal resolution, to within specified accuracies, and

2) to model where emission reductions must be made to achieve the desired target loading, within specified accuracies.

Over the next three years, high priority activities are based on the current level of knowledge and understanding of the various links in the source to receptor pathway shown in Figure 1. These activities are divided into monitoring, modelling and processes and are briefly described here.

Atmospheric Monitoring

Since 1977, the Canadian Network for Sampling Precipitation (CANSAP) has consisted of 55 monthly sampling sites across Canada. High levels of acidic wet deposition in eastern Canada, moderate levels on the Pacific coast and low levels elsewhere across Canada were observed. A daily (event) sampling network, the Air and Precipitation Network (APN), also began operations at the end of 1978 with stations in eastern and central Canada, (9 at present) where selected air and precipitation trace constituents associated with both dry and wet deposition processes were sampled. Recently, CANSAP and APN have been combined into a single network known as CAPMoN (Canadian Air and Precipitation Monitoring Network) which began daily operation in the east this year and will shortly become operational in the west. In addition to the operation and upgrade of the network, over the next three years monitoring program activities will include: 1) operating a quality assurance program, 2) detection of emission changes and trends, 3) examining historical data, 4) developing a capability to determine dry deposition routinely, and, 5) assessing selected U.S. network data.

Atmospheric Modelling

Specially developed trajectory and concentration - deposition models take account of point and regional sources, physical and chemical processes which occur in the atmosphere while pollutants are being transported, meteorological data obtained from national weather networks, and finally knowledge of deposition in wet and dry form. The models link sources with the receptors and, as the predictions are verified with field data, the models become powerful tools in the development of emission reduction scenarios. The current focus of the modelling program is on the evaluation of source-receptor relationships, improvement of the simulation of chemical reactions and scavenging and removal processes, the development and operation of an Eulerian model and the expansion of control strategy modelling.

Atmospheric Processes

The atmospheric processes research program has focussed mainly on two groups of compounds, sulphur and nitrogen. The deposition of these pollutants in dry form can account for up to 50% of the total amount deposited. Dry deposition measurement techniques were developed, tested and compared during the Nanticoke studies on the shore of Lake Erie. Airborne cloud chemistry measurements have also been made at Nanticoke and North Bay to investigate in-cloud processes. During the next three years, the program emphasis will be on in-cloud oxidation and scavenging processes, dry deposition to forests and snow, large-scale tracer experiments such as CAPTEX (Cross Appalachian Tracer Experiment), episode analyses, selected measurement development, and on establishing the relationship of acid deposition in North America to global scale geo-chemical processes.

In general, the atmospheric LRTAP program is intended to answer, in the long-term, what types and quantities of atmospheric pollutants are being deposited to ecosystems from the atmosphere, and from where they originate. The acid rain portion of the program relates to sulphur and nitrogen compounds transported over long distances. Specific activities such as CAPTEX and Eulerian modelling will be discussed in future articles.

Lowest Official Temperature by Province - °C

Province	Temperature	Place	Date
Alberta	-61.1	Fort Vermillion	Jan. 11, 1911
British Columbia	-58.9	Smith River	Jan. 31, 1947
Manitoba	-52.8	Norway House	Jan. 9, 1899
New Brunswick	-47.2	Sisson Dam	Feb. 2, 1955
Newfoundland	-51.1	Esker 2	Feb. 17, 1973
Northwest Territories	-57.2	Fort Smith	Dec. 26, 1917
Nova Scotia	-41.1	Upper Stewiacke	Jan. 31, 1920
Ontario	-58.3	Iroquois Falls	Jan. 23, 1935
Prince Edward Island	-37.2	Kilmahumaig	Jan. 26, 1884
Quebec	-54.4	Doucet	Feb. 5, 1923
Saskatchewan	-56.7	Prince Albert	Feb. 1, 1893
Yukon Territory	-63.0	Snag	Feb. 3, 1947

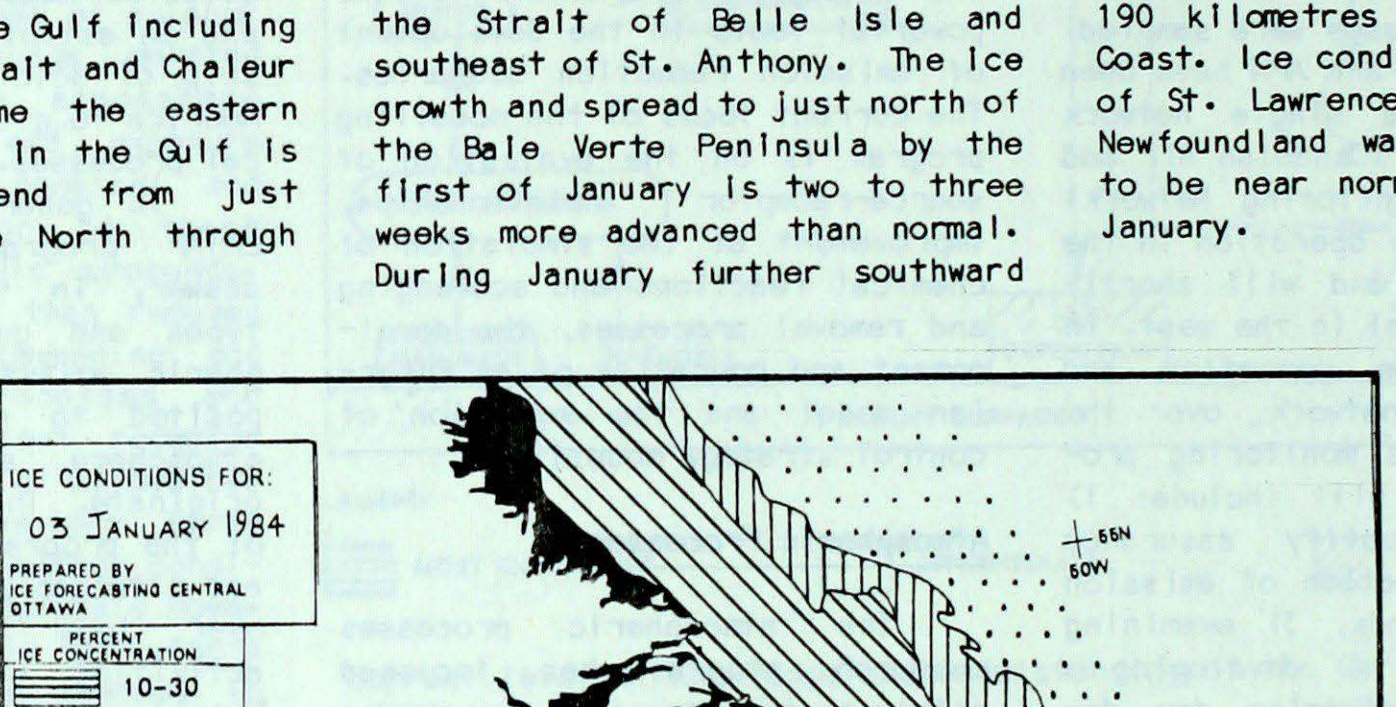
SYNOPSIS OF 30 DAY OUTLOOK FOR JANUARY 1984

At the end of December the extent of ice in the St. Lawrence River and Gulf of St. Lawrence was about normal. Mainly new ice had spread eastward from the River into the Estuary. Ice was well established in Chaleur Bay and ice growth along the New Brunswick coast and in Northumberland Strait had become extensive.

During January, ice growth and spread are expected to continue to follow normal patterns.

By the end of January, thin first year ice (30-35 cm) will predominate in southern and western sections of the Gulf including Northumberland Strait and Chaleur Bay. At that time the eastern limit of the ice in the Gulf is expected to extend from just southeast of Cape North through western Cabot Strait and northward well off the west coast of Newfoundland. The usual leads along the south coast of Anticosti Island, along the north shore of the River and River Estuary, and in northern Chaleur Bay should continue to be evident. Open water routes into west Newfoundland and east Nova Scotian ports including Sydney will continue through January.

Very cold temperatures along the Labrador Coast during the latter half of December accelerated ice growth in the approaches to the Strait of Belle Isle and southeast of St. Anthony. The ice growth and spread to just north of the Baie Verte Peninsula by the first of January is two to three weeks more advanced than normal. During January further southward growth and spread are expected to be intermittent due to periods of southerly winds and milder temperatures. After mid-month periodic congestion can be expected west of Fogo Island with mainly thin and new ice lying in Notre Dame Bay with thicker ice (30-40 cm) lying just to the north within the main pack. At the end of January, the southern and eastern limit of the pack is expected to extend from central Bonavista Bay to about 65 kilometres east of Fogo Island to about 160 kilometres east of St. Anthony then northward at about 190 kilometres off the Labrador Coast. Ice conditions in the Gulf of St. Lawrence and in the east Newfoundland waters are expected to be near normal by the end of January.



A REVIEW OF 1983

by

Amir Shabbar
Canadian Climate Centre

Many Canadians will remember 1983 for having both a mild winter and a summer of near perfect vacation weather. The picture was somewhat spoiled however, by disastrously heavy winter rains on the West Coast and a summer drought on the Prairies and in parts of Ontario and Québec.

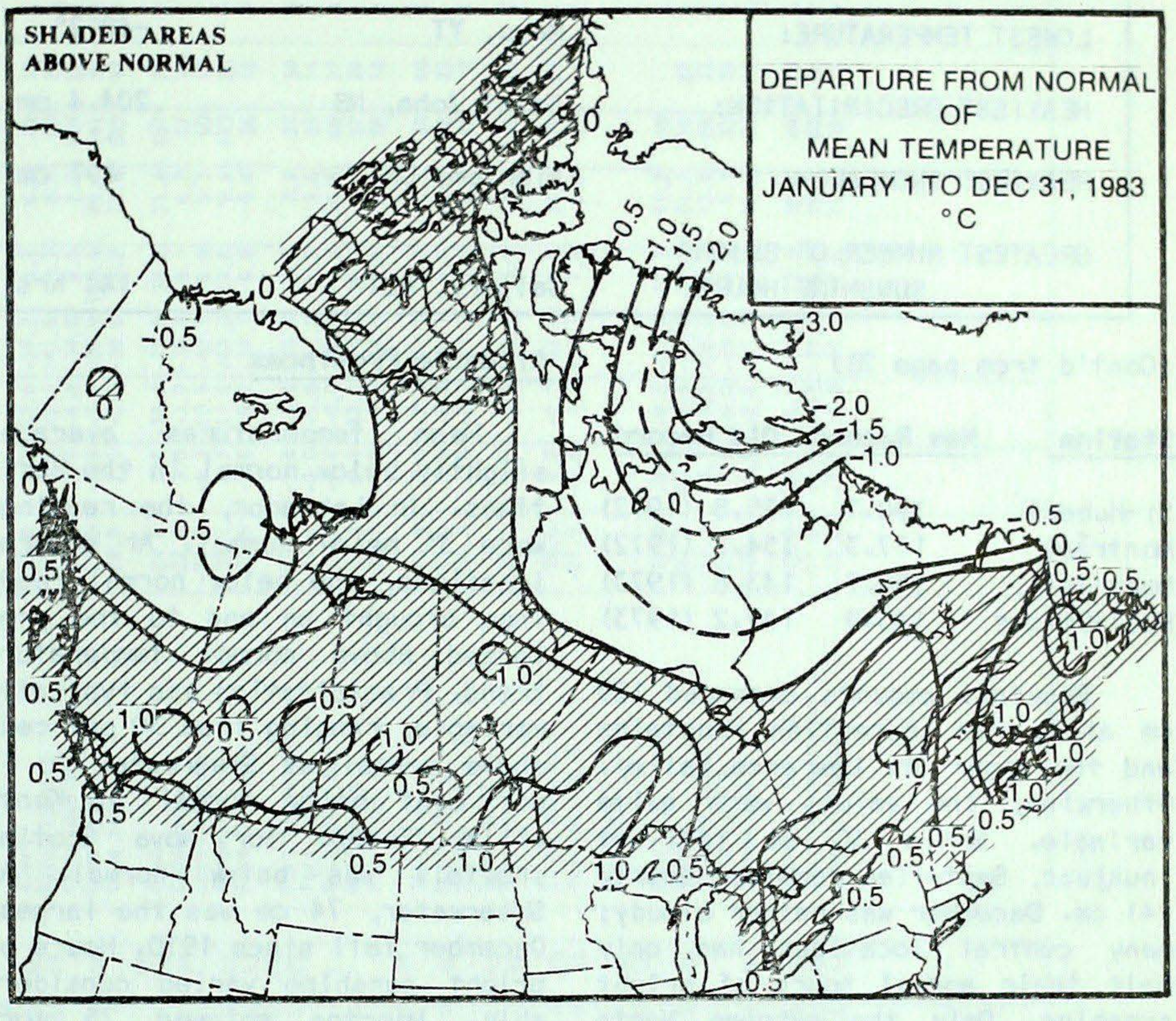
The "winter without a sting" included three months of record warmth in southern Canada and the highest mean temperatures in many southern Ontario locations. Temperatures in southern Manitoba were the mildest in over half a century in the December to February period.

There was also a remarkable lack of snow with seasonal accumulations being about half the normal from British Columbia to Québec. Many southern Ontario places had the lowest seasonal snowfall since records began and Montréal's seasonal snowfall of 69 cm was only 36 per cent of normal. Needless to say, Ontario and Québec had one of their worst skiing seasons in years.

A big advantage of the mild winter was nationwide saving of heating fuel in the hundreds of millions of dollars. On the minus side, major storms plagued the West Coast and torrential rain caused disastrous mud slides north of Vancouver.

The Atlantic Coast also fared badly: during three days in January about 250 mm of rain fell in central Newfoundland causing millions of dollars of damage in a dam burst. Ice cover in the Atlantic was more extensive than normal. The southern limit of pack ice normally reaching within 70 km of St. John's, Newfoundland, extended over 320 km farther south, hampering navigation as far as the Hibernia oilfields. Ice on the Great Lakes was much below normal, however.

After the mild winter, the spring chill came as something of a surprise. It was generally cold from the Rockies to the St. Lawrence Valley and very wet from southern Ontario to New Brunswick. The Prairies had blizzards as late as mid-May when nearly 50 cm of snow fell south of Regina in one days - the worst in half a century. Spring in Ontario arrived with a major snow storm, creating the greatest snow cover of the season and bringing relief to hard-pressed ski resort operators.



Areas from Ontario to New Brunswick also had record spring rainfall causing spring seeding to be delayed for up to three weeks. Deluges of 70 to 100 cm caused widespread flooding south of Montréal when the Richelieu River overflowed. On the other hand the Yukon had an unusually mild spring.

On May 2, southern Ontario was ransacked by 8 or 9 tornadoes which caused multi-million dollar property damage and left many residents homeless. Reeces Corners, east of Sarnia was nearly demolished and 12 people were injured.

From the Rockies to the Atlantic, summer was the hottest in decades and it allowed millions of Canadians to enjoy near-perfect vacation weather. Mean summer temperatures on the southern Prairies were about three degrees above normal with readings up to 40 degrees recorded in some places. On the Prairies, relentless heat and below normal rainfall matured crops a few weeks early and crop yeild were 10 to 20 per cent below last year's,

(Cont'd on page 12)

CLIMATIC EXTREMES - DECEMBER, 1983

MEAN TEMPERATURE:		
WARMEST	Cape St. James, BC	4.3°
COLDEST	Mayo, YT	-35.9°
HIGHEST TEMPERATURE:	Greenwood, NS	16.1°
LOWEST TEMPERATURE:	Mayo, YT	-48.2°
HEAVIEST PRECIPITATION:	Saint John, NB	204.4 mm
HEAVIEST SNOWFALL:	Wiarton, ONT	197 cm
GREATEST NUMBER OF BRIGHT SUNSHINE HOURS:	Calgary, ALTA	141 hrs

(Cont'd from page 2B)

Station	**New Record**	**Old Record**
St-Hubert	190.7	175.8 (1972)
Montréal	157.3	154.2 (1972)
Mont-Joli	150.7	143.8 (1973)
Hull-Ottawa	143.5	137.2 (1973)

Snowfall amounts exceeded 125 cm along the Laurentian Mountains and the upper St. Lawrence Valley. Otherwise, the values were quite variable. While 30 cm fell at Inukjuac, Sept-Iles received nearly 141 cm. December was rather cloudy; many central locations had only half their normal hours of bright sunshine. Only the extreme North enjoyed more than its normal share. A major storm lashed eastern Québec on December 6. High tides, over 7 metres, driven by winds in excess of 100 km/h battered the coastal areas, causing flooding and mud slides. Considering the damages, it was the worst storm to hit eastern Québec since Donna on December 17, 1960. A severe ice storm struck southwestern Québec on December 13, creating the worst ice conditions in over 22 years in the Montréal area. Transportation throughout the South came to a standstill and about half a million homes and businesses experienced lengthy power failures.

Atlantic Provinces

Mean temperatures averaged slightly below normal in the Maritimes. In Labrador, the readings were 3° below normal. At several locations, the below normal readings brought an end to the prolonged above normal temperature trend. Precipitation was typically variable, ranging from 30 per cent above normal at Shearwater to 11 per cent below normal at Kentville. Except for Nova Scotia, snowfall was below normal. At Shearwater, 74 cm was the largest December fall since 1970. Hours of bright sunshine varied considerably. Moncton enjoyed 23 more hours of sunshine than normal. However, Shelburne was 25 hours duller than normal. Several major storms crossed the Maritimes. On December 7, heavy snow and strong winds disrupted both marine and air traffic throughout the Provinces. Streets and basements were flooded and gale force winds caused extensive property damage. On the north shores of Chaleur Bay, a ship broke up and sank. On December 23, freezing rain and snow contributed to numerous traffic accidents in New Brunswick, two of them fatal. A major snow storm swept the East Coast on December 25, Shearwater received about 43 cm of snow. The added snow provided excellent skiing at many resorts.

1983 Weather...

(Cont'd from page 11B)

but the barley and wheat crops were of exceptionally high quality.

The Prairies also experienced more summer severe weather than usual. Tornadoes, sudden downpours, hail storms and strong winds struck many communities. On one June day Saskatoon had 100 mm of rain; 75 mm of it in one hour, constituting a once in a century occurrence.

Ontario's summer was the first with above normal temperatures in about a decade. Toronto had several days of near record 35-36 degree C readings and a humidex (an index of human discomfort) or 42 degrees C.

Of great concern was Ontario's June-July drought. The corn harvest was down by about 25 per cent but many crops were saved by the arrival of August rains. Québec's summer resembled Ontario's with the hot, dry weather helping create the worst forest fire situation in 50 years.

Fall in much of Canada was mild and was regarded by many as a prolongation of summer.

In November, however, snow storms struck Ontario and Québec, producing ample snow at the ski resorts. Major storms lashed the East Coast during November and early December. A late November snowstorm left two thirds of New Brunswick without electricity. There were signs of an early 1983-84 winter.

As for the mild winter of 1982-83, Environment Canada climatologists are more than ever convinced that the warming in equatorial waters off the coasts of Peru and Ecuador known as "El-Nino" had something to do with the higher winter temperatures in many parts of Canada. The reason for this is still obscure, but what is certain was that there were few incursions of cold Arctic air. Most of Canada's weather arrived from warmer source regions to the south and over the Pacific.

Canadian Climate Centre
Atmospheric Environment Service
4905 Dufferin Street
Downsview, Ontario
CANADA M3H 5T4 (416) 667-4711/4906

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EDITOR: A. Shabbar

STAFF WRITER: A. Radomski

Correspondants: T. Mullane, Ottawa; H. Wahl, Whitehorse; N. Penny, Vancouver; W. Prusak, Edmonton; F. Luciow, Winnipeg; B. Smith, Toronto; J. Miron, Montréal; F. Amirault, Halifax.

Subscription enquiries: Supply and Services Canada, Publishing Centre, Ottawa, Ontario, Canada K1A 0S9

DECEMBER 1983 DÉCEMBRE

STATION	Temperature °C Température °C				Snowfall (cm) Chute de neige (cm)	Total Precipitation (mm) Précipitation totale (mm)	% of Normal Precipitation % de précipitation normale	Snow on ground at end of month (cm) Neige au sol à la fin du mois (cm)	No. of days with Precip. 1.0 or more (mm) Nombre de jours de préc. 1.0 ou plus (mm)	Bright sunshine (hours) Durée de l'insolation (heures)	Degree Days below 18°C Degrés-jours au-dessous de 18°C	Mean Sea Level Pressure (kPa) Pression au niveau moyen de la mer (kPa)	Mean Vapour Pressure (kPa) Pression de vapeur moyenne (kPa)
	Mean Moyenne	Difference from Normal Écart à la normale	Maximum Maximale	Minimum Minimale									
BRITISH COLUMBIA COLOMBIE-BRITANNIQUE													
Abbotsford A	-0.9	-4.1	10.2	-11.0	3.8	98.3	43	0	12	100	584.4	101.8	.45
Alert Bay	1.7	-2.2	9.5	-8.3	2.4	108.3	46	0	10		506.7	101.8	.57
Blue River A	-13.0	-5.7	1.5	-35.8	66.2	39.4	37	36	10	47			
Bull Harbour													
Burns Lake													
Cape St. James	4.3	-0.7	8.7	-3.6	T	86.1	45	0	16	76	425.1	101.5	.67
Cape Scott	2.4	-2.7	9.3	6.7	0.4	185.8	54	0	21		485.2	101.6	.67
Castlegar A	-6.5	-4.6	3.6	-23.7	63.3	53.8	54	33	9	65	759.5	102.4	
Comox A	0.8	-2.9	9.5	-12.4	21.7	97.5	46	0	13		537.7	101.8	.55
Cranbrook A	-14.8	-8.7	1.3	-33.9	39.4	28.0	72	35	7	79	102.1	102.6	.19
Dease Lake	-23.1	-7.1	-7.8	-38.0	17.2	9.6	29	18	5	90	1274.7	102.9	.09
Ethelda Bay	0.7	-2.4	0.5	-7.6	2.2	152.8	42	0	11		537.6		
Fort Nelson A	-22.8	-1.8	-6.5	-40.7	17.8	6.7	31	16	3	51	1263.9		.09
Fort St. John A	-19.6	-6.4	2.3	-35.0	19.0	12.7	35	26	3		1165.3	102.7	.12
Hope A	-2.8	-4.4	8.4	-13.9	31.3	101.3	35	6	12		644.7	102.3	.39
Kamloops A	-9.3	-6.5	2.0	-26.8	29.3	26.8	83	20	8	65	847.2	102.5	.27
Kelowna A	-8.0	-5.5	3.8	-28.7	50.0	35.9	80	23	12	41	804.3	102.5	.33
Langara	2.9	-0.7	8.5	-2.2	8.9	72.7	35	0	16		469.3	101.6	.60
Lytton	-8.1	-7.1	5.5	-21.4	31.1	18.9	25	11	6	70	809.7	102.5	.29
Mackenzie A													
McInnes Island													
Merry Island	2.5	-2.6	8.9	-6.9	9.9	55.3	35	0	13	88	479.6		
Penticton A	-5.7	-5.3	3.4	-21.3	46.1	33.9	109	19	7	44	734.5	102.4	.34
Port Alberni A	0.2		9.6	-14.4	23.0	145.6	45	0	12	67	552.6		
Port Hardy A	1.1	-2.4	8.7	-10.9	3.0	120.1	43	0	12	82	524.8	101.7	.56
Prince George A	-16.4	-8.5	1.6	-33.0	33.7	21.2	37	24	7	58	1066.8	102.6	.18
Prince Rupert A	-1.6	-3.2	6.7	-15.6	12.5	92.9	33	0	10	75	608.5	101.7	.48
Princeton A	-11.8	-6.1	0.0	-35.9	43.9	34.8	66	29	7	78			
Quesnel A	-15.7	-8.6	1.4	-33.7	41.2	23.4	46	28	8		1043.4	102.7	.19
Revelstoke A	-7.9	-4.1	2.5	-24.2	148.0	88.8	62	54	11	57	802.1	102.5	.32
Sandspit A	2.5	-0.9	7.8	-3.5	2.5	85.2	48	0	11	64	481.7	101.7	.60
Smithers A	-14.8	-7.2	-2.3	-31.4	28.7	15.1	25	16	7	31	1017.1	102.5	.18
Stewart A													
Terrace A	-8.4	-5.0	3.5	-20.0	39.0	33.5	17	8	8	74	814.2	102.2	.26
Vancouver Harbour	1.9	-2.8	9.2	-9.8	6.8	111.4	46	0	12		500.9		
Vancouver Int'l A	0.7	-3.2	11.0	-13.2	8.7	83.9	46	0	13	111	538.3	101.9	.54
Victoria Gonzales Heights	2.5	-2.8	10.1	-7.9	16.5	67.8	57	0	12	95	481.9		
Victoria Int'l A	1.4	-2.8	10.8	-8.1	17.1	93.4	59	0	14	88	515.6	101.9	.57
Victoria Marine	1.9	-3.0	10.2	-10.7	5.5	127.2	56	0	15		501.5	101.8	.58
Williams Lake A	-15.5	-7.8	-0.4	-33.3	46.0	27.3	66	41	6	52	1039.4	102.5	.19

STATION	Temperature °C Température °C				Snowfall (cm) Chute de neige (cm)	Total Precipitation (mm) Précipitation totale (mm)	% of Normal Precipitation % de précipitation normale	Snow on ground at end of month (cm) Neige au sol à la fin du mois (cm)	No. of days with Precip. 1.0 or more (mm) Nombre de jours de préc. 1.0 ou plus (mm)	Bright sunshine (hours) Durée de l'insolation (heures)	Degree Days below 18°C Degrés-jours au-dessous de 18°C	Mean Sea Level Pressure (kPa) Pression au niveau moyen de la mer (kPa)	Mean Vapour Pressure (kPa) Pression de vapeur moyenne (kPa)
	Mean Moyenne	Difference from Normal Écart à la normale	Maximum Maximale	Minimum Minimale									
YUKON TERRITORY TERRITOIRE DU YUKON													
Burwash A	-25.5	-3.5	-1.0	-40.9	9.6	6.8	49	12	2		1348.3	102.8	.09
Dawson A	-33.7	-7.8	-13.9	-45.6	6.2	5.8	14	35	3		1601.6	103.6	.04
Mayo A	-35.9	-11.7	-12.5	-48.2	16.4	5.5	24	20	2		1677.4	103.6	.03
Watson Lake A	-30.2	-6.7	-12.2	-45.0	4.8	4.5	12	19	2	52	1515.7	103.2	.04
Whitehorse A	-23.9	-7.3	-5.3	-38.1	9.2	3.0	15	9	1	37	1299.4	103.0	.08
NORTHWEST TERRITORIES TERRITOIRES DU NORD-OUEST													
Alert	-28.8	1.2	-12.6	-39.2	8.1	6.5	82	14	3	0	1450.1	101.4	.05
Baker Lake	-29.1	-0.9	-5.1	-41.5	8.1	8.1	99	24	3	0	1456.2	101.4	.05
Cambridge Bay	-26.3	3.7	-4.8	-39.0	8.1	7.8	144	22	4		1372.0	101.5	.08
Cape Dyer A	-23.3	-3.0	-7.7	-39.0	168.4	79.7	141	39	10		1279.6	100.5	.07
Cape Parry A	-22.9	2.1	-2.6	-38.6	18.2	17.8	262	17	3		1269.8	102.4	.10
Clyde	-24.0	0.4	-12.2	-35.0	38.2	31.8	407	75	7	0	1303.5	100.6	.06
Coppermine	-22.6	3.3	-3.9	-38.0	8.1	6.3	57	18	2	0	1259.6	102.3	.10
Coral Harbour A	-29.8	-4.3	-10.5	-42.1	6.9	5.1	50	15	1	6	1485.8	100.8	.04
Eureka	-32.1	2.7	-11.6	-42.0	19.6	9.9	413	25	2	0	1551.7	101.3	.04
Fort Reliance	-25.5	-1.6	-5.7	-34.1	9.2	5.4	36	16	3		1346.6	102.4	.07
Fort Simpson A	-25.8	-1.4	-4.5	-43.4	8.8	7.9	37	34	3	18	1354.1	102.9	.09
Fort Smith A	-24.6	-3.0	-5.0	-41.2	11.9	5.6	25	15	1	14	1283.4	102.6	.09
Frobisher Bay A	-26.2	-4.4	-9.0	-40.4	17.8	14.6	66	27	3	27	1368.3	100.8	.07
Hall Beach A	-27.3	0.1	-12.6	-44.9	5.2	5.0	57	24	1		1418.1	100.5	.06
Hay River A	-22.7	-1.8	-5.5	-39.0	6.4	6.4	26	14	2		1261.3	102.7	.09
Inuvik A	-23.4	3.8	-2.9	-43.1	8.6	6.6	38	50	4	0	1284.8	102.8	.10
Mould Bay A	-27.6	3.6	-2.6	-45.1	2.8	2.6	72	25	1	0	1415.2	102.0	.08
Norman Wells A	-24.7	1.8	-2.7	-41.8	10.3	8.2	44	9	4	6	1304.7	102.9	.09
Pond Inlet A													
Resolute A	-26.5	2.8	-4.3	-39.6	13.5	7.2	147	25	3	0	1347.2	101.0	.06
Sachs Harbour A	-24.6	2.8	-4.0	-42.7	11.8	11.3	276	21	3	0	1318.6	102.4	.10
Yellowknife A	-25.9	-1.9	4.8	-39.1	7.0	5.0	27	4	3	25	1360.0	102.6	.06
ALBERTA													
Banff	-17.6	-8.7	-0.5	-37.0	22.1	11.2	30						
Brooks	-20.1	-10.6	-2.5	-42.0	35.1	21.7	114	22		99			
Calgary Int'l A	-17.1	-9.3	4.9	-36.5	22.2	13.4	84	13	6	141	1088.1	102.5	.12
Cold Lake A	-22.1	-7.9	-6.0	-39.5	13.8	8.3	33	19	2		1242.4	102.6	.09
Coronation A	-21.7	-9.9	-2.6	-41.1	23.8	16.2	83	17	5	108	1230.1	102.6	.11
Edmonton Int'l A	-19.5	-6.4	1.8	-37.3	12.3	10.6	48	20	3	84	1162.9	102.6	.12
Edmonton Municipal A	-17.6	-7.2	3.2	-35.1	16.7	15.9	64	22	7	81	1102.9	102.6	.13
Edmonton Namao A	-19.0	-7.2	2.5	-36.3	17.6	11.1	42	13	5		1145.9	102.5	.12

DECEMBER 1983 DÉCEMBRE

STATION	Temperature °C *Température °C*												
	Mean *Moyenne*	Difference from Normal *Écart à la normale*	Maximum *Maximale*	Minimum *Minimale*	Snowfall (cm) *Chute de neige (cm)*	Total Precipitation (mm) *Précipitation totale (mm)*	% of Normal Precipitation *% de précipitation normale*	Snow on ground at end of month (cm) *Neige au sol à la fin du mois (cm)*	No. of days with Precip. 1.0 or more (mm) *Nombre de jours de préc. 1.0 ou plus (mm)*	Bright sunshine (hours) *Durée de l'insolation (heures)*	Degree Days below 18°C *Degrés-jours au-dessous de 18°C*	Mean Sea Level Pressure (kPa) *Pression au niveau moyen de la mer (kPa)*	Mean Vapour Pressure (kPa) *Pression de vapeur moyenne (kPa)*
Edson A	-18.8	-6.8	-1.1	-39.4	33.1	20.8	130	33	8	68	1142.0	102.6	.14
Fort Chipewyan A	-24.8	-4.1	-6.0	-43.0	15.4	15.4	62	16					
Fort McMurray A	-22.3	-5.3	-6.5	-39.3	17.4	7.9	32	13	6	79	1253.8	102.7	.09
Grande Prairie	-21.1	-7.7	4.0	-39.7	28.9	16.8	53	21	5	91	1211.2	102.7	.12
High Level A	-25.6	-5.3	-6.8	-40.1	12.4	9.2	37	27	3	28	1378.2	102.8	.07
Jasper	-17.2	-8.0	-1.2	-35.4	23.6	18.8	57	14	6	66	1092.4	102.7	.15
Lethbridge A	-17.2	-11.4	4.4	-39.2	20.9	20.0	91	5	5	122	1091.9	102.6	.16
Medicine Hat A	-20.1	-12.5	0.7	-40.4	18.3	16.0	98	24	6	104	1186.8	102.6	.12
Peace River A	-21.9	-6.6	1.2	-35.5	13.7	13.4	62	16	3		1223.1	102.7	.10
Red Deer A	-19.4	-8.0	1.8	-38.9	17.5	14.3	70	17	5		1164.2	102.6	.11
Rocky Mountain House	-19.4	-10.3	1.2	-41.0	25.1	16.0	72	28	6		1159.2	102.6	.13
Slave Lake A	-19.5	-5.4	1.7	-34.9	25.2	14.3	52	19	4	74	1159.6	102.6	.13
Suffield A	-21.3	-12.5	-3.2	-41.5	25.7	20.9	121	19	4	86	1219		
Whitecourt	-18.8	-5.7	3.0	-34.7	19.4	17.2	64	25	6		1123.0	102.6	.14
SASKATCHEWAN													
Broadview	-21.7	-8.2	-6.9	-41.7	13.1	8.9	49	5	2	116	1232.2	102.5	.10
Collins Bay	-25.6	-3.5	-8.8	-40.1	10.5	10.5	34	38	4	83	1331.5	102.2	.07
Cree Lake	-25.7	-5.6	-8.7	-45.6	11.6	6.2	26	10	2	80	1317.1	99.2	.07
Estevan A	-19.5	-8.4	-5.1	-39.5	10.6	8.3	43	12	2	85	1167.7	102.6	.13
Hudson Bay	-23.0	-6.8	-7.7	-39.6	29.8	13.6	61	16	4	117	1127.7	102.4	.09
Kindersley KY	-22.0	-9.2	-3.8	-41.2	15.8	10.7	55	14	4		1239.3	102.6	.13
La Ronge A	-23.7	-6.3	-8.0	-40.2	9.5	8.3	38	19	2		1292.9	102.4	.08
Meadow Lake	-23.8	-8.8	-6.5	-43.6	10.9	10.3	39	14	2	112	1297.2	102.6	.08
Moose Jaw A	-20.2	-9.5	-4.0	-40.7	7.3	7.5	35	7	2	99	1184.2	102.6	.13
Nipawin A	-23.6		-8.0	-37.9	12.2	10.9		25	4	96	1291.1	102.5	.09
North Battleford A	-23.1	-9.0	-6.5	-40.9	6.5	5.8	28	14	2		1275.3	102.7	.09
Prince Albert A	-23.6	-7.1	-8.6	-39.5	8.3	8.3	38	20	2	105	1288.8	102.6	.08
Regina A	-21.6	-8.8	-7.6	-42.2	11.3	9.3	56	17	2	89	1227.6	102.6	.10
Saskatoon A	-23.0	-8.9	-7.0	-41.1	7.2	5.2	26	12	1		1270.2	102.6	.09
Swift Current A	-20.8	-10.9	-1.5	-42.3	11.1	10.7	54	18	5	77	1202.8		
Uranium City A													
Wynyard	-22.7	-9.0	-7.0	-40.4	11.2	7.8	35	9	2	94	1262.1	102.5	.10
Yorkton	-22.3	-7.9	-8.0	-39.6	6.9	6.9	31	10	2	130	1251.3	102.5	.08
MANITOBA													
Bissett	-21.4	-5.3	-7.7	-37.0	15.5	12.7	57	27	5	115	1222.5	102.3	.11
Brandon A	-21.0	-6.6	-6.6	-40.4	9.4	7.8	41	5	4		1212.5	102.5	.10
Churchill A	-25.2	-3.0	-5.4	-37.9	32.7	24.0	115	51	9	41	1339.6	101.7	.07
Dauphin A	-20.6	-6.3	-7.0	-37.3	8.2	7.8	32	5	3	115	1197.8	102.4	.10
Gillam A	-26.3	-3.5	-8.3	-41.1	16.8	9.6	23	45	4		1373.5	101.9	.07
Gimli	-20.4	-4.9	-8.0	-32.7	13.4	11.0	47	10	5	131	1189.9	102.3	.11
Island Lake	-23.8	-4.0	-6.4	-35.8	31.2	15.1	34	33	3		1293.5	102.1	.09
Lynn Lake A	-25.7	-3.9	-8.3	-38.9	12.6	9.3	33	27	2	89	1332.5	102.2	.07
Norway House A	-23.5		-7.1	-37.2	25.2	21.5		38	4		1285.9	102.8	.08
Pilot Mound	-20.6	-6.8	-6.3	-39.0	6.8	7.2	35	21	3		1198.0	102.5	.11
Portage la Prairie A	-19.8	-6.7	-5.5	-35.1	12.2	6.5	30	17	3		1171.4		
The Pas A	-22.5	-4.9	-7.6	-34.2	12.2	8.8	40	18	2	99	1253.6	102.4	.09
Thompson A	-26.0	-4.3	-9.0	-42.6	9.7	9.5	25	28	4	65	1366.6	102.1	.06
Winnipeg Int'l A	-20.3	-6.3	-8.3	-33.0	8.8	5.7	30	4	3	139	1187.8	102.4	.11
ONTARIO													
Atikokan	-20.7	-6.6	-3.4	-42.0	43.0	31.8	93	50	7	78	1198.7	102.1	
Earlton A	-16.5	-3.9	-2.6	-41.3	79.4	72.1	128	61	16		107.2	101.7	
Geraldton	-21.5	-6.2	-2.2	-37.9	38.0	26.5	68	35	6		1226.7	101.9	.11
Gore Bay A	-9.2	-3.7	1.5	-28.0	174.0	90.3	121	78	17		841.9	101.7	.29
Hamilton	-4.5	-2.6	6.9	-18.6	33.6	100.2	136	10	18	72	697.1		
Hamilton A	-6.1	-2.7	5.7	-19.4	61.6	124.7	160	12	15		746.6		
Kapuskasing A	-19.7	-5.0	-1.1	-36.4	50.9	39.4	74	42	11		1170.2	101.8	.12
Kenora A	-19.7	-5.6	-6.0	-34.1	23.9	22.4	72	40	9		1169.3	102.1	.12
Kingston A	-5.8	-1.6	6.5	-23.0	53.9	148.1	163	17	17	62	737.9	101.8	.37
Lansdowne House	-22.7	-4.4	-5.3	-36.4	19.6	16.6	53	53	7	126	1018.1		.10
London A	-6.8	-3.3	4.8	-21.6	63.0	113.2	129	12	16	53	769.3	101.9	.34
Moosonee	-19.7	-3.7	-1.3	-37.7	24.0	19.2	48	23	6	78	1169.0	101.7	.14
Mount Forest	-8.5	-3.1	2.5	-25.0	109.5	102.4	111	36	19	39	820.7	101.8	.33
Muskoka A	-9.7	-2.6	2.3	-35.2	158.7	148.6	152	85	20		860.4		
North Bay A	-12.6	-2.9	2.0	-31.0	76.7	60.2	80	45	16	61	938.4	101.7	.25
Ottawa Int'l A	-9.0	-1.3	4.2	-27.8	88.2	143.5	177	48	14	77	837.3	101.8	.31
Petawawa A													
Peterborough A	-8.1	-2.1	4.2	-26.2	50.8	99.0	133	28	10		808.5		
Pickle Lake	-22.5	-4.8	-5.5	-37.1	38.4	22.6	62	54	6		1264.4	102.0	.40
Red Lake A	-21.5	-5.7	-7.3	-37.9	20.0	13.9	49	46	5	92	1223.2	102.1	.11
St. Catharines A	-4.2	-3.2	7.5	-17.4	52.2	113.0	160	8	18		688.2		
Sarnia A	-6.3	-4.1	5.2	-22.1	46.0	71.1	87	14	13	57	753.3		
Sault Ste. Marie A													
Simcoe	-5.8	-3.6	5.0	-19.4	53.4	136.1	168		16		735.7		.38
Sioux Lookout A	-20.4	-5.3	-5.7	-36.6	35.2	33.2	99	53	7		1191.2	102.1	.12
Sudbury A	-13.6	-3.4	1.9	-32.6	99.7	62.4	96	49	14	73	980.8	101.7	.23
Thunder Bay A	-16.7	-5.6	-1.1	-33.3	46.0	37.7	90	22	6	118	1074.9	102.0	.15
Timmins A	-18.2	-4.2	-1.4	-39.9	78.5	69.1	108	85	13		1123.7	101.8	.15
Toronto	-4.2	-2.6	5.5	-20.6	34.3	105.0	144	13	10	63	687.9		
Toronto Int'l A	-6.4	-2.9	4.5	-22.0	36.3	82.0	127	16	8		756.1	101.9	.37
Toronto Island A	-4.2	-2.3	5.9	-20.1	18.5	90.9	126	5	11		687.8	101.9	.38
Trenton A	-6.4	-1.9	5.2	-23.5	58.8	148.8	179	17	14		756.2	101.8	.36
Trout Lake (Big)	-24.7	-4.8	-7.9	-36.2	24.6	17.7	60	60	8		1323.3	102.1	.09
Waterloo-Wellington A	-7.2	-2.9	3.1	-21.1	74.4	106.6	151	21	15		781.1		
Wawa A	-15.1		0.8	-38.0	123.2	81.7		60	13		1033.4	101.8	.21
Wiarton A	-6.3	-2.6	4.3	-23.4	197.0	170.4	159	65	28	26	754.0	101.7	.40
Windsor A	-6.3	-4.4	6.7	-23.4	40.4	106.3	147	18	11		752.3	102.0	.36

DECEMBER 1983 DÉCEMBRE

STATION	Temperature °C Température °C				Snowfall (cm) *Chute de neige (cm)*	Total Precipitation (mm) *Précipitation totale (mm)*	% of Normal Precipitation *% de précipitation normale*	Snow on ground at end of month (cm) *Neige au sol à la fin du mois (cm)*	No. of days with Precip. 1.0 or more (mm) *Nombre de jours de préc. 1.0 ou plus (mm)*	Bright sunshine (hours) *Durée de l'insolation (heures)*	Degree Days below 18°C *Degrés-jours au-dessous de 18°C*	Mean Sea Level Pressure (kPa) *Pression au niveau moyen de la mer (kPa)*	Mean Vapour Pressure (kPa) *Pression de vapeur moyenne (kPa)*
	Mean *Moyenne*	Difference from Normal *Ecart à la normale*	Maximum *Maximale*	Minimum *Minimale*									
QUEBEC													
Bagotville A	-13.3	-1.2	3.6	-32.2	132.9	114.1	145	64	15		969.9	101.6	.23
Baie Comeau A	-12.3	-1.9	2.2	-30.9	136.2	148.9	163	100	11	87	939.1	101.4	.25
Blanc Sablon	-9.3	-2.2	3.4	-24.8	80.5	87.0	82	20	13	64	817.8	100.9	.29
Chibougamau A	-18.5	-2.6	-2.6	-40.0	76.8	77.0	123	70	19	71	1130.2	101.5	
Kuujjuac A	-21.1	-2.7	-3.9	-38.6	31.8	28.8	75	29	8	35	1210.9	101.0	.41
Gaspe A	-8.5	-1.3	6.9	-27.1	85.8	135.0	116	36	11	3	819.6	101.3	.29
Inukjuac A	-20.2	-2.3	-4.2	-31.8	29.6	24.2	108	15	7	33	1184.0	101.0	.11
La Grande Riviere	-19.6		-4.2	-34.9	53.0	41.1		22	11	17	1164.9	101.3	.24
Maniwaki	-12.0	-2.0	3.2	-36.8	90.2	104.8	147	41	12	67	933.9	101.7	.26
Matagami A	-18.9	-2.7	-3.9	-37.2	61.8	61.8	112	53	13	76	1144.1		
Mont Joli A	-9.5	-1.2	3.8	-23.9	139.8	150.7	159	51	20	41	852.2	101.4	.28
Montreal Int'l A	-8.2	-1.3	5.0	-27.0	81.1	157.3	181	26	11	72	810.0	101.8	.33
Montreal Mirabel Int'l A	-9.8		3.8	-31.7	117.2	186.8		64	14	100	878.8	101.8	.29
Natashquan	-9.9	-0.7	4.7	-25.2	134.4	131.8	121	38	19	73	862.9	101.1	.29
Nitchequon	-20.9	-1.7	-4.1	-43.0	78.0	61.2	142	65	13	33	1204.6	101.3	.13
Kuujjuarapik A	-18.4	-2.5	-4.4	-34.6	46.3	46.3	110	24	13	41	1128	101.2	.14
Quebec A	-10.2	-1.2	2.5	-29.6	135.4	166.1	146	90	19	60	873.4	101.7	.27
Roberval A	-14.6	-1.9	1.9	-35.1	126.7	125.0	156	94	14	64	1010.6	101.4	.20
Ste. Agathe des Monts	-11.7	-1.3	3.0	-33.4	133.3	177.9	158	76	20	57	924.3	101.7	.25
St. Hubert A	-8.4	-1.4	5.1	-27.6	91.9	190.7	191	44	13		817.5	101.7	.33
Schefferville A	-21.7	-2.7	-4.4	-38.0	87.3	77.7	159	77	11	60	1220.3	101.1	.10
Spet-Iles A	-12.6	-1.6	3.0	-31.5	140.6	153.5	147	66	14	90	950.4	101.3	.23
Sherbrooke A	-9.6	-1.4	6.2	-31.4	81.2	181.6	198	34	19	65	852.6	101.8	.32
Val d'Or A	-16.8	-3.4	-0.5	-38.7	88.2	80.4	115	61	17	71	1079.6	101.7	.18
NEW BRUNSWICK NOUVEAU-BRUNSWICK													
Charlo A	-9.5	-1.1	7.9	-24.4	69.7	110.8	109	58	12	84	850.7	101.5	
Chatham A	-7.4	-0.5	9.3	-22.5	25.6	104.0	96	7	12	99	783.5	101.6	.34
Fredericton A	-6.5	0.0	11.7	-24.0	28.7	127.9	108	2	13	108	759.8	101.7	.34
Monton A	-5.9	-0.5	12.8	-24.7	35.6	122.6	101	T	14	113	744.5	101.6	.38
Saint John A	-4.9	-0.1	11.9	-24.0	58.0	204.4	123	2	15	101	711.3	101.6	.39
NOVA SCOTIA NOUVELLE-ECOSSE													
Eddy Point	-3.4	-1.9	11.1	-21.2	75.1	183.9	112	18	18	84	612.6	101.6	.50
Greenwood A	-2.6	-0.3	16.1	-20.6	73.2	121.6	101	5	16		629.3	101.7	.49
Halifax Int'l A	-2.5	0.4	13.3	-19.0	51.0	157.1	87	9	17		635.5	101.7	.49
Sable Island	2.7	0.1	12.7	-9.0	16.0	127.9	89	0	13	38	475.8	101.7	.62
Shearwater A	-1.7	-0.2	11.0	-18.2	74.0	192.3	131	9	15	103	602.7	101.7	.51
Sydney A	-2.0	-0.2	11.2	-17.7	100.6	199.6	122	14	15	84	620.6	101.5	.46
Truro	-3.6	0.1	14.5	-21.0	51.6	129.8	97	9	15	82	670.3	101.7	.47
Yarmouth A	-0.3	0.0	15.1	-15.0	61.0	137.1	96	T	21	57	570.0	101.7	.54
PRINCE EDWARD ISLAND ILE-DU-PRINCE-EDOUARD													
Charlottetown A	-3.9	0.0	11.7	-20.4	55.1	127.1	99	8	19		678.8	101.5	.44
Summerside A	-4.5	-0.5	11.1	-20.0	39.5	111.0	103	2	15	80	696.5	101.6	.41
NEWFOUNDLAND TERRE-NEUVE													
Argentia A	0.1	-0.2	10.8	-10.5	10.9	94.3	85		13		555.6	101.4	.48
Battle Harbour	-9.8	-3.0	4.4	-21.9	69.8	97.2	208	65	12		862.7	100.8	.28
Bonavista	-1.9	-0.4	9.0	-12.1	41.2	76.5	80	10	16		616.1	101.2	.46
Burgeo	-1.9	-0.3	7.0	-13.2	54.2	184.5	101	13	15	64	616.6	101.4	.45
Cartwright	-10.9	-1.8	3.0	-21.7	92.4	85.1	114	108	12	63	894.4	100.7	.23
Churchill Falls A	-20.4	-2.8	-1.0	-35.2	102.8	87.0	139	154	16	71	1191.1	101.1	.13
Comfort Cove	-4.6	-0.8	7.2	-15.2	59.0	74.5	70	18	14		704.9	101.1	.38
Daniel's Harbour	-4.6	-0.7	7.7	-16.2	116.3	110.6	121	8	22	15	701.1	101.0	.40
Deer Lake A	-5.3	0.0	7.6	-16.6	70.5	78.2	70	11	17		721.8	101.2	.38
Gander Int'l A	-4.4	-0.6	7.9	-15.0	64.9	84.4	78	27	15	80	691.8	101.1	.36
Goose A	-15.3	-2.3	3.2	-27.1	158.5	126.7	174	130	13	82	103.3	101.0	.17
Hopedale	-13.6	-2.3	1.7	-27.1	110.1	109.9	172	90	12		978.3	100.7	.19
Port-aux-Basques	-2.3	-0.6	8.0	-15.3	72.0	174.8	112	33	22	32	626.9	101.4	.50
St. Anthony	-7.1	-0.6	2.8	-21.4	128.5	117.3	114	43	20		752.6	100.8	.34
St. John's A	-1.5	0.0	10.6	-12.9	34.5	111.7	69	T	16	80	604.5	101.3	.47
St. Lawrence	-1.1	-0.3	9.5	-10.1	31.7	136.1	107	5	13		581.7		
Stephenville A	-3.3	-0.7	7.4	-11.0	107.1	169.8	149	25	26	21	665.6	100.4	.41
Wabush Lake A	-20.6	-2.0	-5.9	-37.9	117.9	96.8	133	133	14	62	1196.2	101.2	.11

DECEMBER 1983 DÉCEMBRE

STATION	Temperature °C *Température °C*				Snowfall (cm) *Chute de neige (cm)*	Total Precipitation (mm) *Précipitation totale (mm)*	% of Normal Precipitation *% de précipitation normale*	Snow on ground at end of month (cm) *Neige au sol à la fin du mois (cm)*	No. of days with Precip. 1.0 or more (mm) *Nombre de jours de préc. 1.0 ou plus (mm)*	Bright sunshine (hours) *Durée de l'insolation (heures)*	Degree Days above 5°C *Degrés-jours au-dessus de 5°C*		Mean Dew Point °C *Point de rosée moyen °C*
	Mean *Moyenne*	Difference from Normal *Ecart à la normale*	Maximum *Maximale*	Minimum *Minimale*							This Month *Présent mois*	Since Jan. 1st *Depuis le 1er janv.*	
AGROCLIMATOLOGICAL STATIONS AGROCLIMATOLOGIQUES													
BRITISH COLUMBIA COLOMBIE-BRITANNIQUE													
Agassiz	-0.8	-3.8	10.0	-11.0	8.0	70.6	27	0	9	86	0.0	2259.9	
Kamloops													
Sidney													
Summerland	-6.2	-5.1	3.5	-21.0	35.6	40.1	122	24	7	52	0.0	2087.5	
ALBERTA													
Beaverlodge	-18.8	-7.2	4.0	-41.0	27.5	27.0	84	24					
Ellerslie	-20.3		2.0	-39.0	15.7	11.9		19	4	81	0.0	1370.8	
Fort Vermilion													
Lacombe	-19.6	-8.3	-0.5	-39.5	18.6	13.0	70	13	4	92	0.0	1305.7	
Lethbridge	-16.4	-10.4	5.0	-38.0	29.0	19.0	86	5	6	122	0.0	1786.6	
Vauxhall	-21.5	-13.6	0.5	-43.5	25.8	19.0	91	14	6	103	0.0	1698.3	
Vegreville	-21.9	-7.9	-1.5	-42.0	16.2	16.2	96	20	9		0.0	1356.1	
SASKATCHEWAN													
Indian Head	-21.3	-8.3	-7.0	-41.5	13.2	9.4	44	18	3		0.0	1705.5	
Melfort	-23.0	-6.5	-2.0	-40.0	10.0	10.7	42	9	5	93	0.0	1536.5	
Regina	-22.1	-9.1	-9.0	-41.5	6.2	8.2	45	7	2		0.0	1551.3	
Saskatoon	-22.6		-6.0	-39.5	8.1	8.1		8	2	77		1637.5	
Scott	-23.3	-9.1	-4.0	-40.0	9.4	7.7	38	10	1	87	0.0	1437.8	
Swift Current South	-20.3	-10.0	-1.5	-42.0	11.9	10.1	63	8	5	70	0.0	1854.3	
MANITOBA													
Brandon	-21.4	-7.3	-9.0	-41.0	5.9	5.9	29	8	3	122	0.0	1748.6	
Glenlea	-20.0	-5.6	-8.0	-34.0	9.2	9.2	40	19	4	115	0.0	1359.5	
Morden	-18.9	-6.6	-6.5	-36.5	5.4	5.4	24	7	2	120	0.0	2025.7	
ONTARIO													
Delhi	-5.9	-3.0	6.0	-19.5	52.6	140.8	165	14	18	55	0.0	2313.0	
Elora	-8.0		2.0	-24.2	52.8	103.6		26	17	54	0.0	1974.5	
Guelph	-7.1	-3.0	3.0	-23.5	71.8	105.7	148	15	17	54	0.0	2044.5	
Harrow	-6.2	-4.5	6.5	-27.0	24.0	110.7	150	16	11	68	0.0	2395.1	
Kapuskasing													
Merivale													
Ottawa	-8.8	-1.3	4.7	-27.3	89.2	115.5	159	36	11	78	0.0	2163.3	
Smithfield	-6.1	-1.6	9.0	-23.0	46.6	191.2	198	10	17		0.0	2169.7	
Vineland Station	-3.9	-2.9	7.5	-17.0	43.2	111.2	152	12	15	63	0.0	2375.7	
Woodslee													
QUEBEC													
La Pocatiere	-9.9	-1.7	4.0	-28.0	147.7	188.7	209	8	13	100	0.0	1680.1	
L'Assomption	-9.6	-1.2	3.5	-33.5	32.6	193.1	212	58	12	73	0.0	2046.6	
Lavaltrie													
Lennoxville													
Normandin	-16.8	-2.7	-1.0	-42.5	86.6	93.3	132	52	13	83	0.0	1457.6	
St. Augustin													
Ste. Clothilde	-7.4	-0.7	7.0	-27.0	40.3	166.1		12	13	76	0.0	2112.8	
NEW BRUNSWICK NOUVEAU-BRUNSWICK													
Fredericton													
NOVA SCOTIA NOUVELLE-ECOSSE													
Kentville	-2.0	0.4	15.0	-19.0	36.8	115.6	89	5	14	64	18.0	2070.9	
Nappan	-3.8	0.2	14.5	-23.0	32.0	119.0	100	1	15	91	10.3	1832.5	
PRINCE EDWARD ISLAND ILE-DU-PRINCE-EDOUARD													
Charlottetown	-3.5	0.0	11.5	-20.0	50.4	135.2	122	13	14	81	6.1	1875.7	
NEWFOUNDLAND TERRE-NEUVE													
St. John's West	-1.2	0.2	10.0	-12.0	26.2	120.8	68	1	15	67	2.8	1392.6	

ACID RAIN REPORT ISSUED BY ENVIRONMENT CANADA FOR JANUARY 8-14, 1984

LONGWOODS NEAR LONDON ONTARIO	The region received slightly acidic snow on January 9, with a pH of 4.8. The air associated with the event came from the northwest over Lake Superior, Wisconsin, Lake Michigan and Michigan. Three days later on January 12, air which had passed over Lake Superior, Wisconsin, Lake Michigan, Michigan and southern Ontario produced strongly acidic snow with a pH of 3.9.
DORSET* MUSKOKA ONTARIO	The air associated with the strongly acidic snow (pH 3.7), which fell January 13, moved from northwestern Ontario into Pennsylvania and New York State and then travelled north to Dorset.
CHALK RIVER OTTAWA VALLEY ONTARIO	The moderately acidic snow, which fell on January 8 (pH 4.4) and on the following day, January 9 (pH 4.6), was associated with air that came from the northwest over Lake Superior and the Sudbury basin. The strongly acidic snow, which fell January 13, with a pH reading of 4.2, was produced in air that came from northwestern Ontario, moved south into New York State, and then travelled north to Chalk River.
MONTMORENCY QUEBEC CITY QUEBEC	Not available.
KEJIMKUJIK SOUTHWESTERN NOVA SCOTIA	Air which had passed over Pennsylvania, New York State and New England January 8, produced strongly acidic snow with a pH of 4.0. The rain the region received January 10 was moderately acidic with a pH of 4.4 and was associated with air which had passed over Kentucky, West Virginia and the Atlantic Ocean along the east coast of North America. The moderately acidic snow which fell January 13 had a pH reading of 4.3 and was produced in air which arrived from the northwest across Quebec, New England and New Brunswick.

*Data supplied by the Ontario Ministry of Environment.

Environmental damage to lakes and streams is usually observed in sensitive areas regularly receiving precipitaion with pH less than 4.7.

This report was prepared by the Federal Long Range Transport of Air Pollutants (LRTAP) Liaison Office. For further information please contact Dr. H.C. Martin at (416) 667-4803.