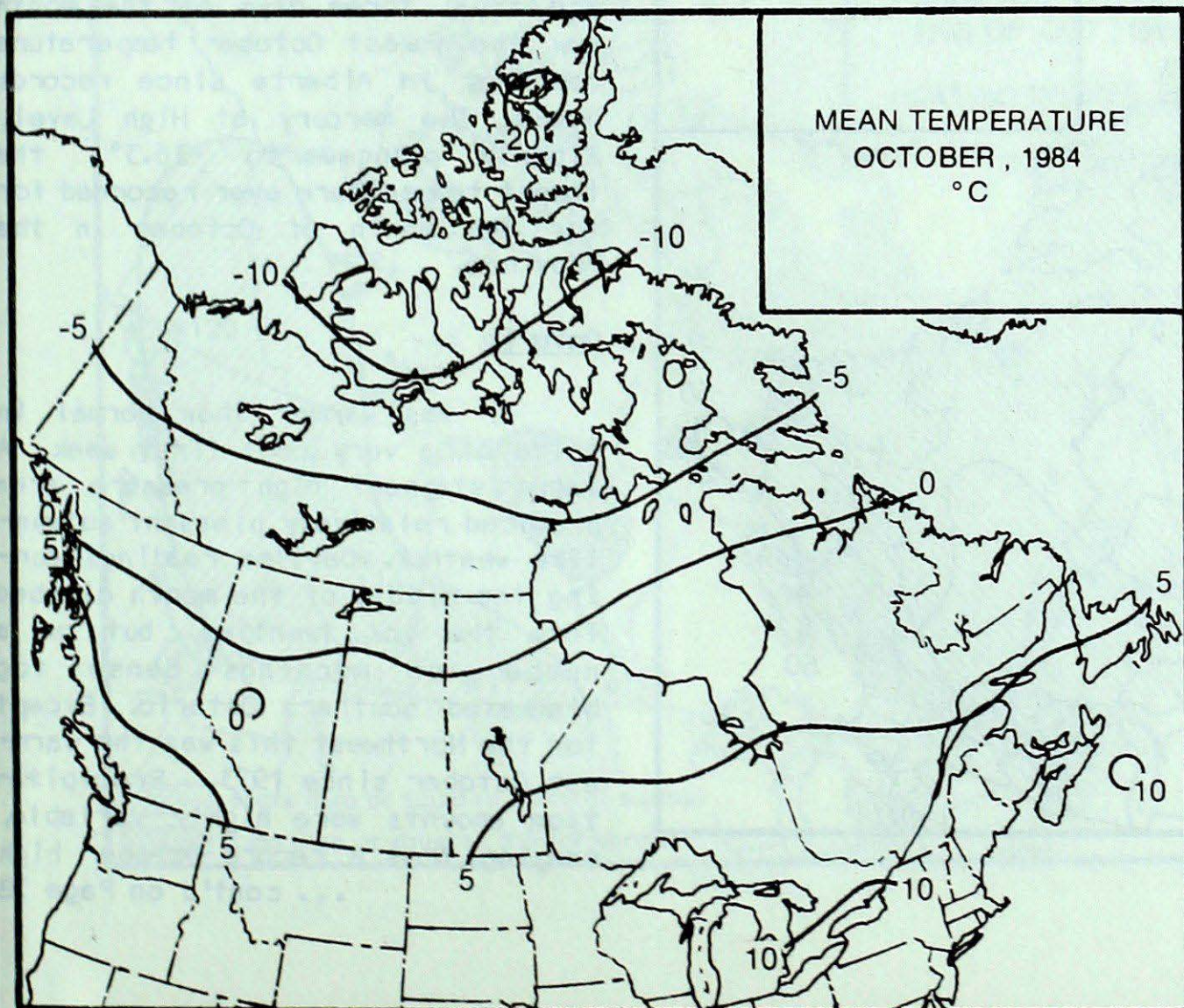
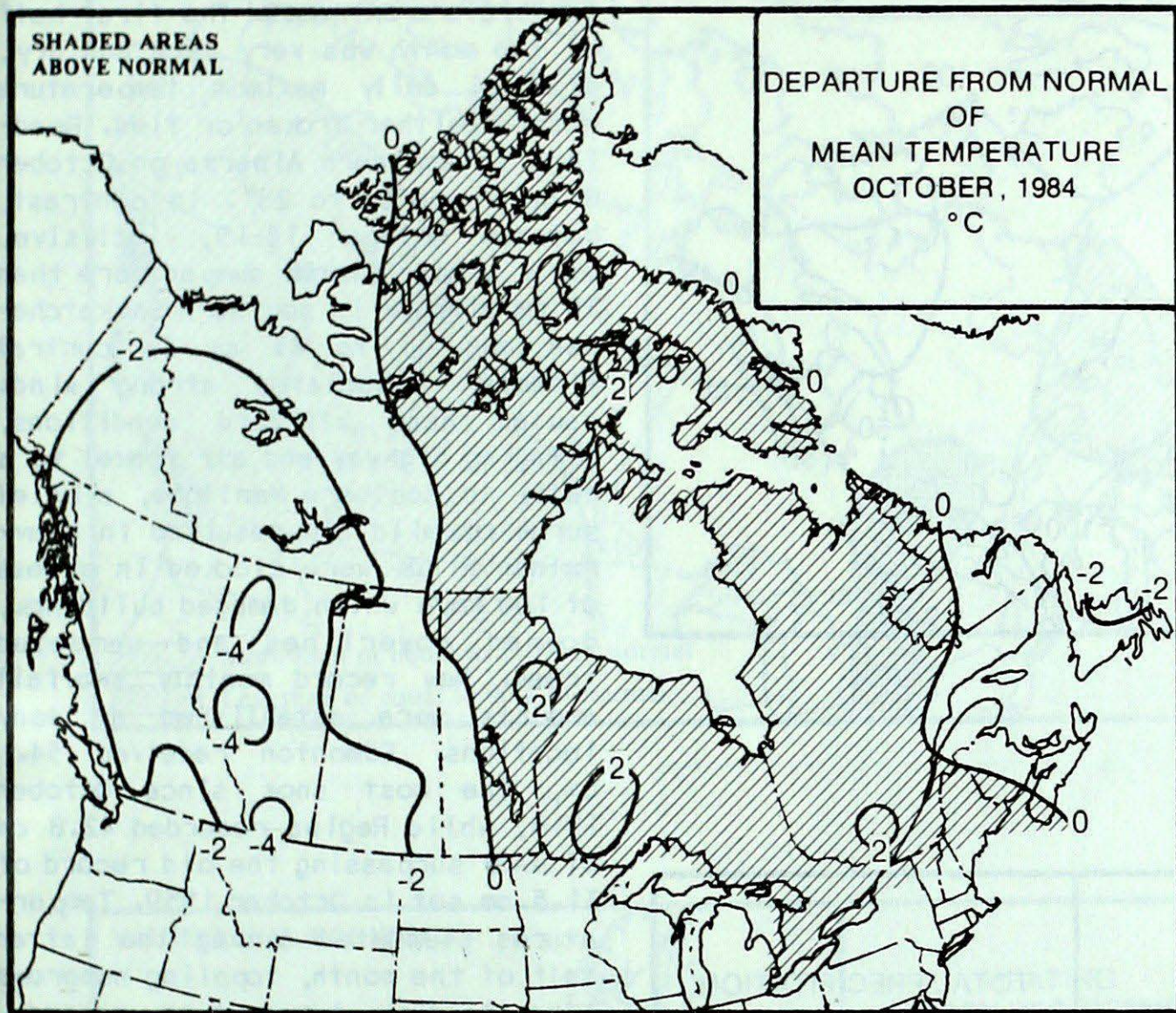


Climatic Perspectives

MONTHLY SUPPLEMENT

Canadian Climate Centre

Vol.6 October, 1984



ACROSS THE COUNTRY

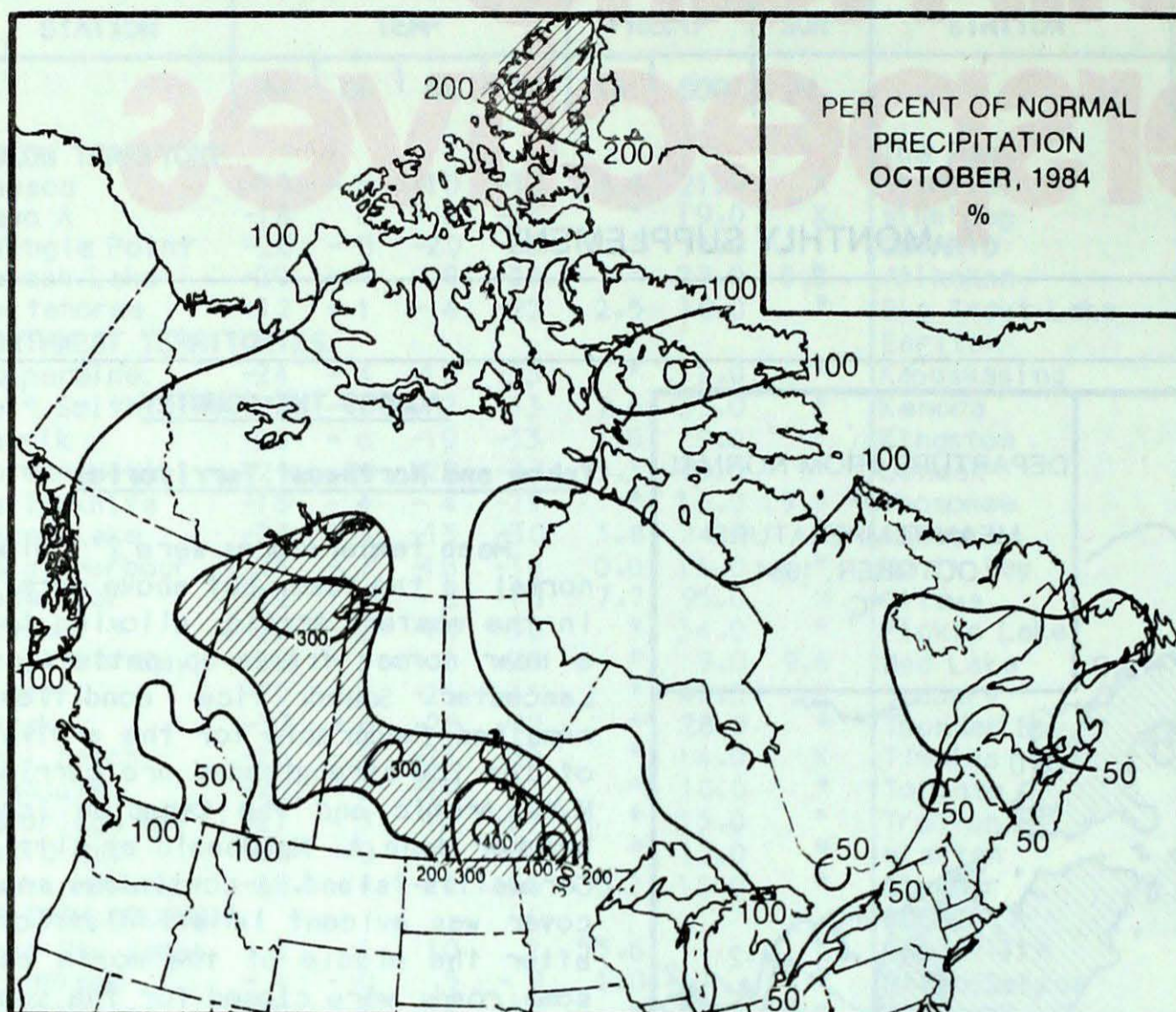
Yukon and Northwest Territories

Mean temperatures were 2° below normal in the Yukon but above normal in the eastern Arctic, allowing for a near normal freeze-up pattern in Lancaster Sound. Ice conditions remained favourable for the arrival of the ice-strengthened ore carrier M.V. Arctic and the Canadian ice-breaker John A. MacDonald at Little Cornwallis Island. A continuous snow cover was evident in all districts after the middle of the month and some roads were closed for the season. With freeze-up well underway, ferry services on major rivers were discontinued. By the end of the month, a pool of very cold Arctic air had exerted its influence over a large portion of the Northwest. Temperatures dropped to more than 15° below normal in the Yukon and Mackenzie District. On October 29, the mercury at Oglivie dropped to -42.0° the lowest temperature ever recorded in Canada for the month of October.

British Columbia

Relatively pleasant autumn weather gradually deteriorated, and by month's end an extremely frigid Arctic airmass brought winter-like conditions to the whole Province. Between October 28 and 31, more than thirty localities recorded their lowest-ever October temperatures. Earlier in the month, heavy precipitation fell along the Coast and some communities received more than 100 mm of rain in a 24 hour period. Heavy flooding at Pemberton Valley, north of Vancouver, caused flood damages estimated at more than \$5 million. Gales were frequently along the North Coast and on October 12, a vicious storm yielding more than 160 km/h, winds capsized eight fishing vessels with the loss of five lives.

In the Okanagan the apple and grape harvest was several weeks late.



due to poor spring weather. Blizzards in the Peace River District during the middle of the month ended all harvesting attempts for the remaining 30 percent of the crop still in the fields.

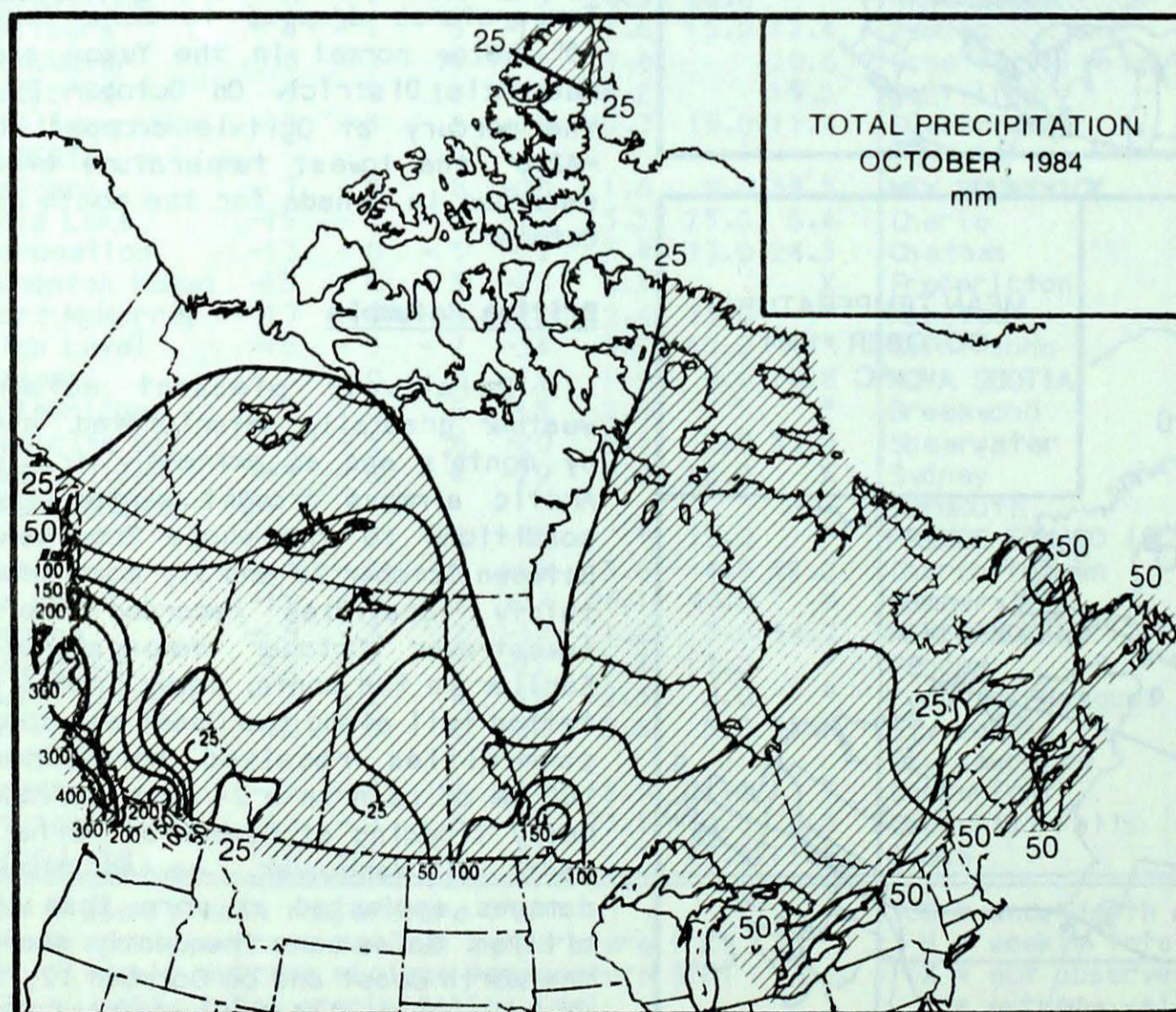
Prairie Provinces

This was a month of unusual temperature extremes. The first half of the month was very warm and dry, with 24 daily maximum temperature records either broken or tied. Readings in southern Alberta on October 8 or 9 soared to 28°. In contrast, between October 16-19, inclusive, early winter storms dumped more than 30 cm of snow in southern Saskatchewan and up to 45 cm in central Alberta. Associated strong winds caused near blizzard conditions, bringing highway and air travel to a halt. In southern Manitoba, a brief surge of mild air resulted in heavy rains. Winds were clocked in excess of 100 km/h which damaged buildings, downed powerlines and uprooted trees. New record monthly snowfall amounts were established at many locations. Edmonton received 54.1 cm, the most snow since October 1919, while Regina recorded 42.8 cm of snow surpassing the old record of 31.5 cm set in October 1959. Temperatures plummeted during the latter half of the month, toppling numerous long-standing temperature records. The final three days of the month saw the lowest October temperature readings in Alberta since records began. The mercury at High Level, Alberta plunged to -36.3°, the lowest temperature ever recorded for for the month of October in the Province.

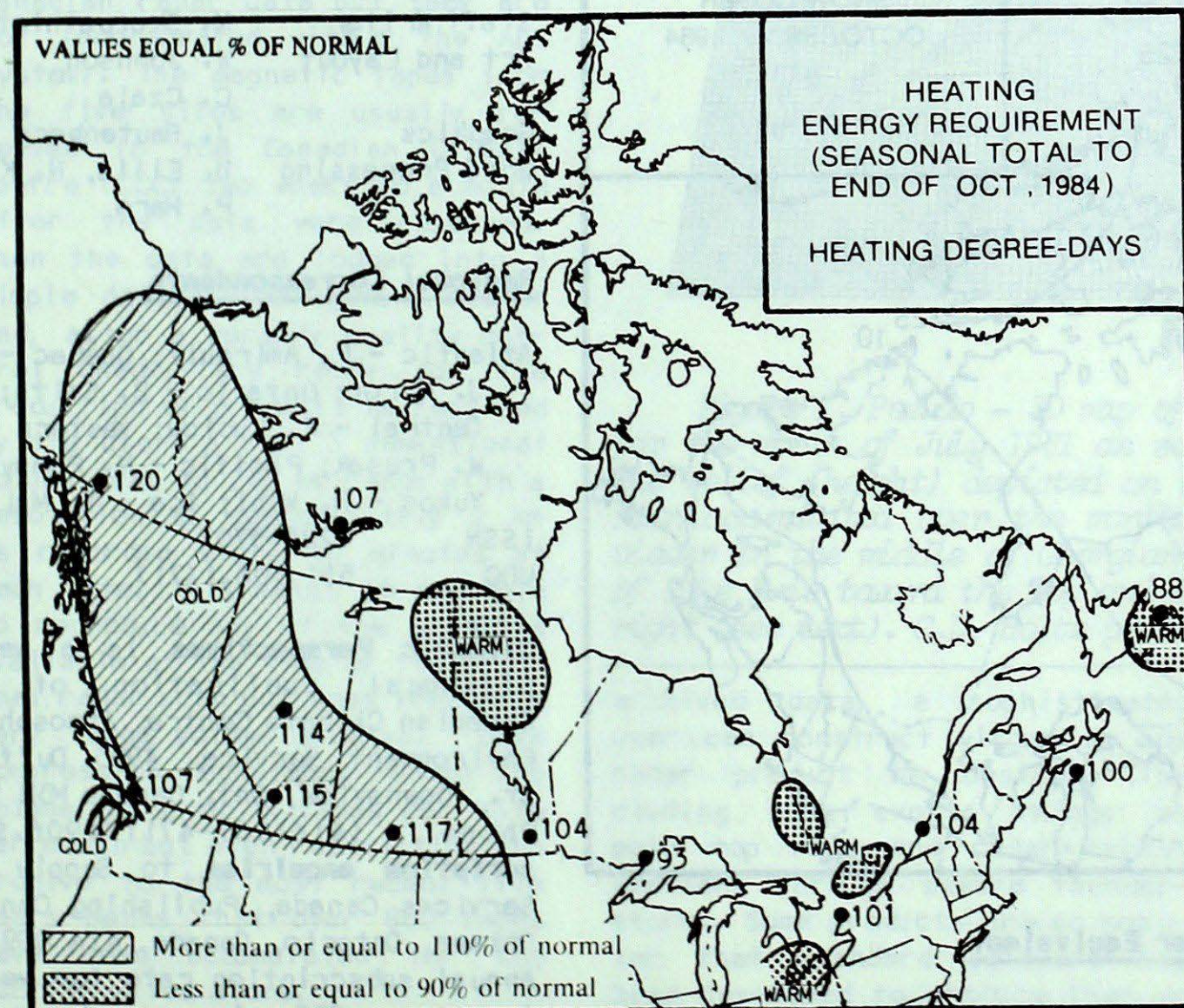
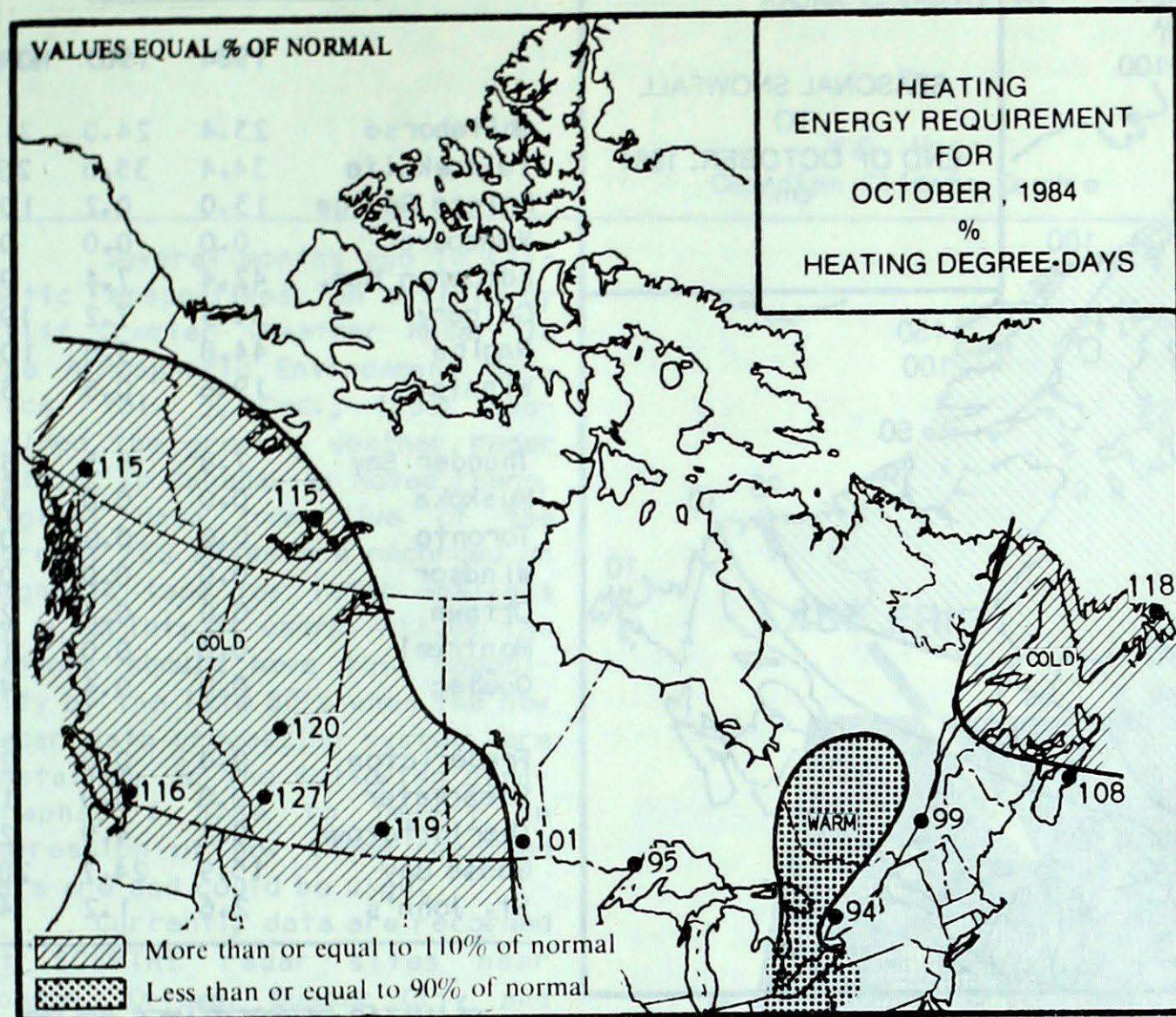
Ontario

It was warmer than normal in spite of a very cool first week. A large stagnant high pressure area produced relatively pleasant autumn-like weather. Daytime readings during the middle of the month climbed into the low twenties, but on a number of mornings dense fog blanketed southern Ontario. Except for the Northwest this was the warmest October since 1973. Precipitation amounts were highly variable, ranging from a record October high

... cont'd on Page 7B



ENERGY REQUIREMENT

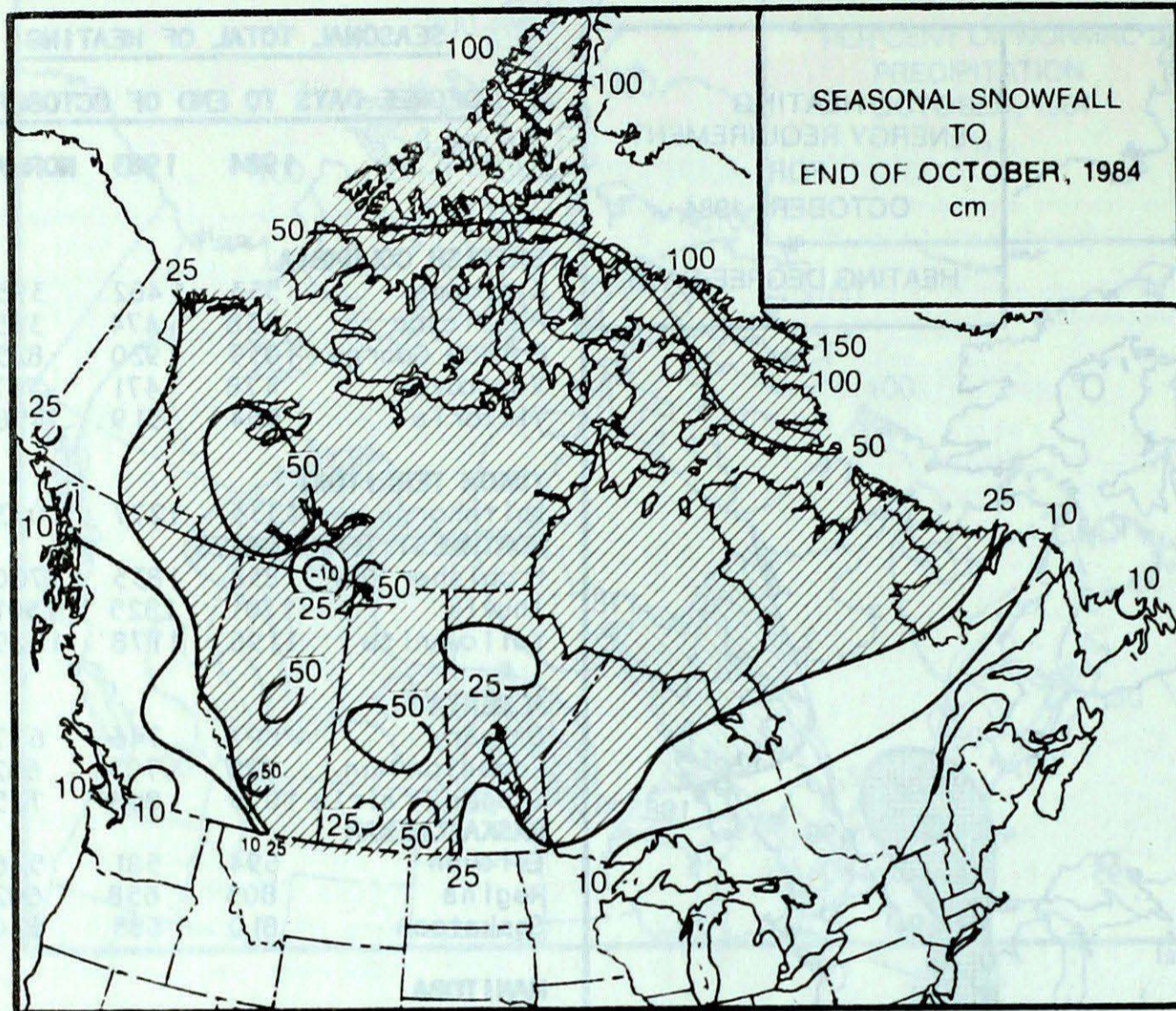


SEASONAL TOTAL OF HEATING

DEGREE-DAYS TO END OF OCTOBER

	1984	1983	NORMAL
BRITISH COLUMBIA			
Kamloops	533	462	395
Penticton	538	474	385
Prince George	1039	920	825
Vancouver	478	471	397
Victoria	564	519	458
YUKON TERRITORY			
Whitehorse	1333	1277	1053
NORTHWEST TERRITORIES			
Frobisher Bay	1838	1835	1700
Inuvik	1701	1825	1501
Yellowknife	1196	1178	1029
ALBERTA			
Calgary	897	746	697
Edmonton Mun.	829	705	662
Grande Prairie	1075	868	775
SASKATCHEWAN			
Estevan	694	581	526
Regina	805	658	602
Saskatoon	810	685	624
MANITOBA			
Brandon	758	644	584
Churchill	1301	1253	1248
The Pas	826	705	713
Winnipeg	618	594	534
ONTARIO			
Kapuskasing	763	682	738
London	345	359	349
Ottawa	421	402	407
Sudbury	575	537	556
Thunder Bay	647	584	624
Toronto	343	382	346
Windsor	241	277	254
QUÉBEC			
Bale Comeau	866	771	774
Montréal	453	393	360
Quebec	542	516	490
Sept-Îles	878	863	829
Sherbrooke	654	586	594
Val-d'Or	757	675	709
NEW BRUNSWICK			
Charlo	633	619	552
Fredericton	518	474	472
Mncton	520	477	474
NOVA SCOTIA			
Halifax	431	345	381
Sydney	513	458	451
Yarmouth	483	435	456
PRINCE EDWARD ISLAND			
Charlottetown	500	424	437
NEWFOUNDLAND			
Gander	782	673	637
St. John's	659	653	652

SNOWFALL



SEASONAL SNOWFALL TOTALS (CM) TO END OF OCTOBER

	1984	1983	NORMAL
Whitehorse	23.4	24.0	21.4
Yellowknife	34.4	35.0	26.7
Prince George	13.0	0.2	10.4
Vancouver	0.0	0.0	0.0
Edmonton Nam.	42.4	7.4	9.7
Calgary	39.3	7.2	19.4
Regina	44.8	3.8	10.0
Winnipeg	19.6	0.5	5.4
Thunder Bay	7.8	8.3	3.3
Muskoka	0.0	0.0	3.2
Toronto	0.0	0.0	0.9
Windsor	0.0	0.0	0.1
Ottawa	0.0	0.4	2.7
Montréal	0.0	0.0	1.7
Québec	0.0	0.4	4.4
Fredericton	0.0	0.0	2.3
Shearwater	0.0	0.0	1.7
Charlottetown	0.2	4.9	2.6
Goose Bay	15.9	24.7	28.7
St. John's	2.6	1.2	4.4

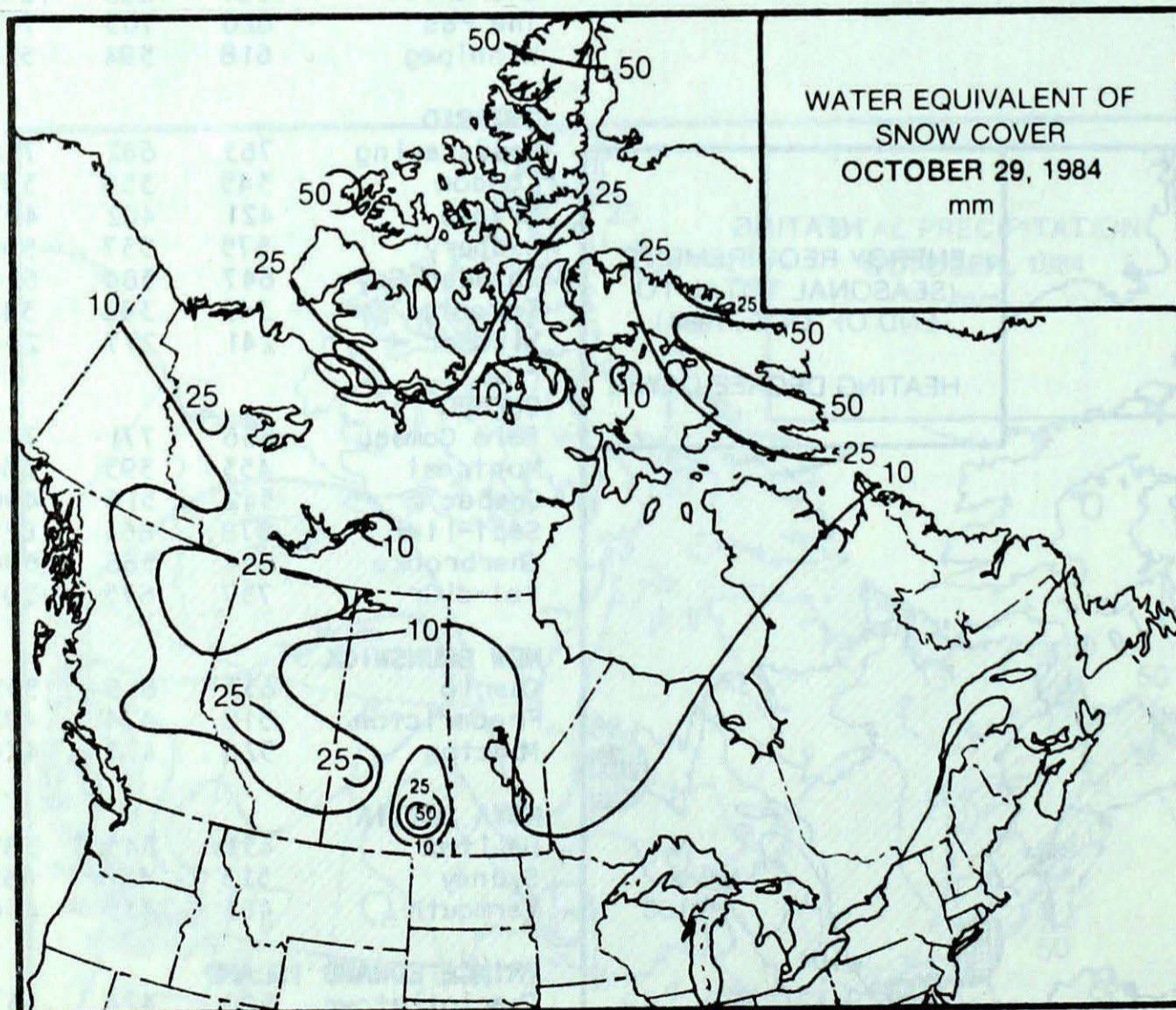
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Snow Cover Water Equivalent

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

RADAR CLIMATOLOGY

by

W.D. Hogg
Canadian Climate Centre

Several months ago in *Climatic Perspectives*, an article by Cliff Crozier (Weather Radar in the Atmospheric Environment Service, Vol. 5, Dec., 1983) described the growing weather radar network in Canada. As noted there, digital data from five of the current AES sites are recorded on magnetic tape for later analysis by a variety of users. All of the network should have this capability by the late 80's when the new radar data processing systems are installed. In the following paragraphs, I hope to impart an impression of how these recorded data are and could be used.

Currently data are recorded at SCEPTRE radar sites near London, Ottawa, Quebec City and Saint John's Newfoundland and at the new radar near Toronto. (The Alberta Research Council and McGill University also archive Canadian radar data but they are not incorporated within the AES system). The magnetic tapes from the five sites are usually received in the Canadian Climate Centre (CCC) two weeks to a month after the data were observed. Then the data are logged into a simple database management system and, after a cursory quality control check, are ready for the production of products as required by the user. A full 3 dimensional volume scan to 240 km range with a resolution of approximately 2 km is recorded every 10 minutes at each site. This makes it possible to reproduce any of the products available at the time of the original radar scan but does lead to a very large volume archive. Data compression techniques reduce the volume to 2 or 3 tapes per site per month but even restricting the archive to the most recent five years means that over 800 tapes have been accumulated for the SCEPTRE sites alone.

From the three dimensional

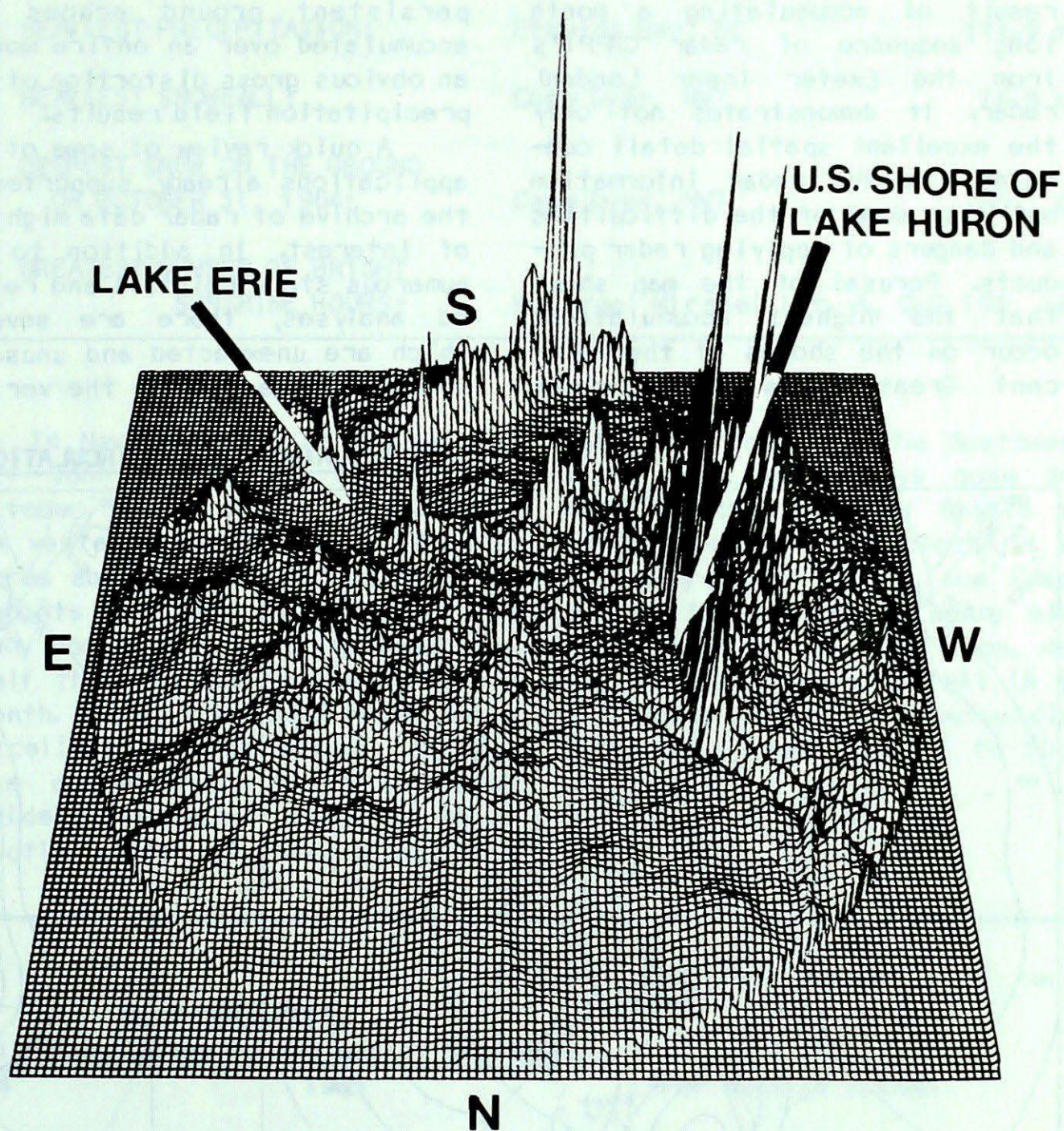


Figure 1. Pseudo - 3D map of accumulated radar estimated rainfall for the month of July 1981 as seen by the Exeter (near London) radar. The relief (height) depicted on the map is indicative of the depth of rain accumulated over the month. The image is depicted as seen by a viewer in the middle of Georgian Bay looking south. Note the flat area of Lake Erie toward the top and the U.S. shoreline of Lake Huron to the right (see text). C.D. Holtz produced the image.

archived data, a sophisticated user can construct virtually any radar product he desires, including such exotic things as echo top maps and radar cross-sections through severe thunderstorms. Some products are so popular that standard software has been developed to produce them on demand, subject to cost recovery,

of course. The constant altitude map of precipitation rates (CAPPI in the jargon of the discipline) is by far the most frequently requested product. Assuming that the precipitation as seen by the radar falls to the ground directly below (not necessarily a good assumption), potentially makes this precipitation rate CAPPI a

very useful tool. Individual maps describe the spatial distribution of precipitation rates in great detail. A sequence of maps describes the temporal distribution and the information from such a time series can be accumulated to depict the spatial distribution of the total storm precipitation.

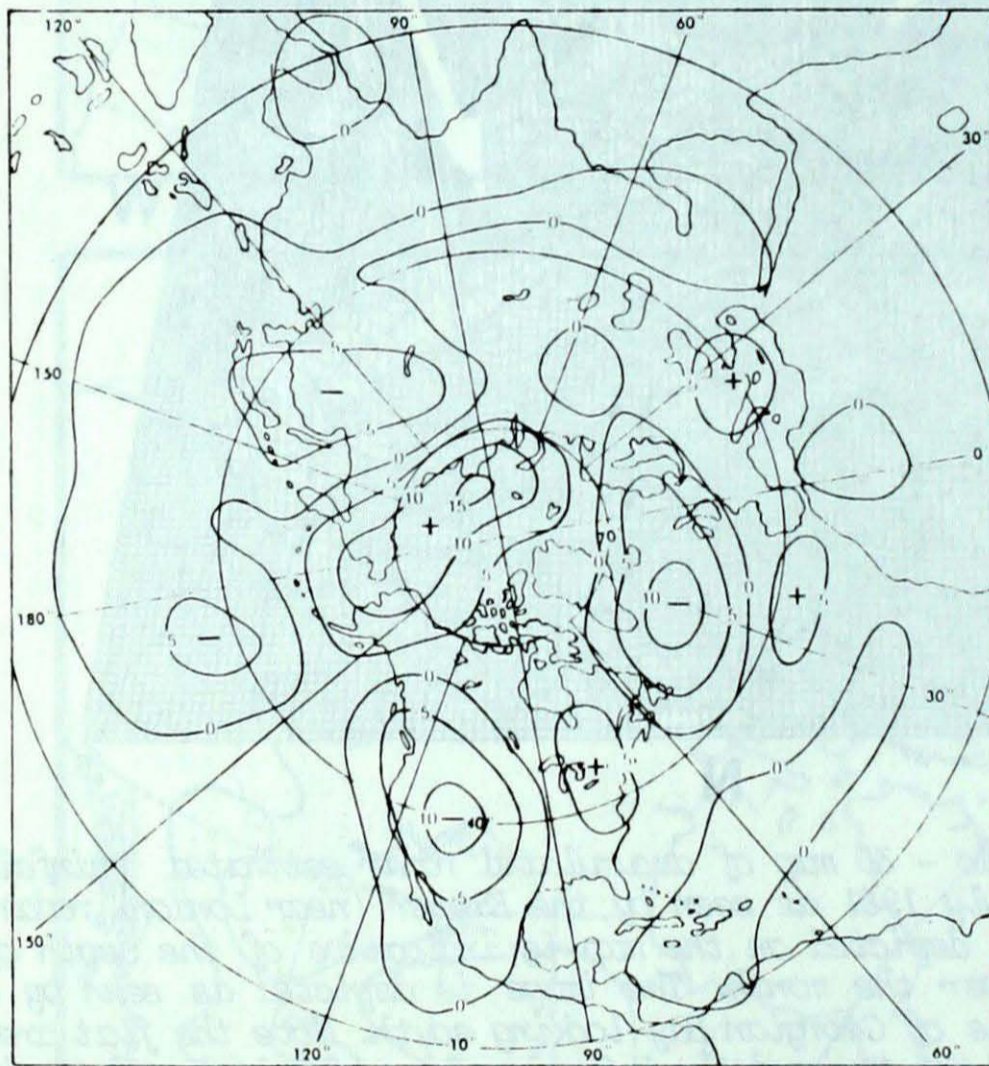
Figure 1 illustrates the result of accumulating a month long sequence of radar CAPPI's from the Exeter (near London) radar. It demonstrates not only the excellent spatial detail contained in the radar information but also some of the difficulties and dangers of applying radar products. Perusal of the map shows that the highest accumulations occur on the shores of the adjacent Great Lakes and careful

examination reveals the outline of the lakes themselves in the pattern. Some of this may be due to the development of thunderstorms over the land but the majority of it is almost certainly caused by bending of the radar beam above the cool waters of the lake with resultant false or ground echoes from the far shore. When these persistent ground echoes are accumulated over an entire month, an obvious gross distortion of the precipitation field results.

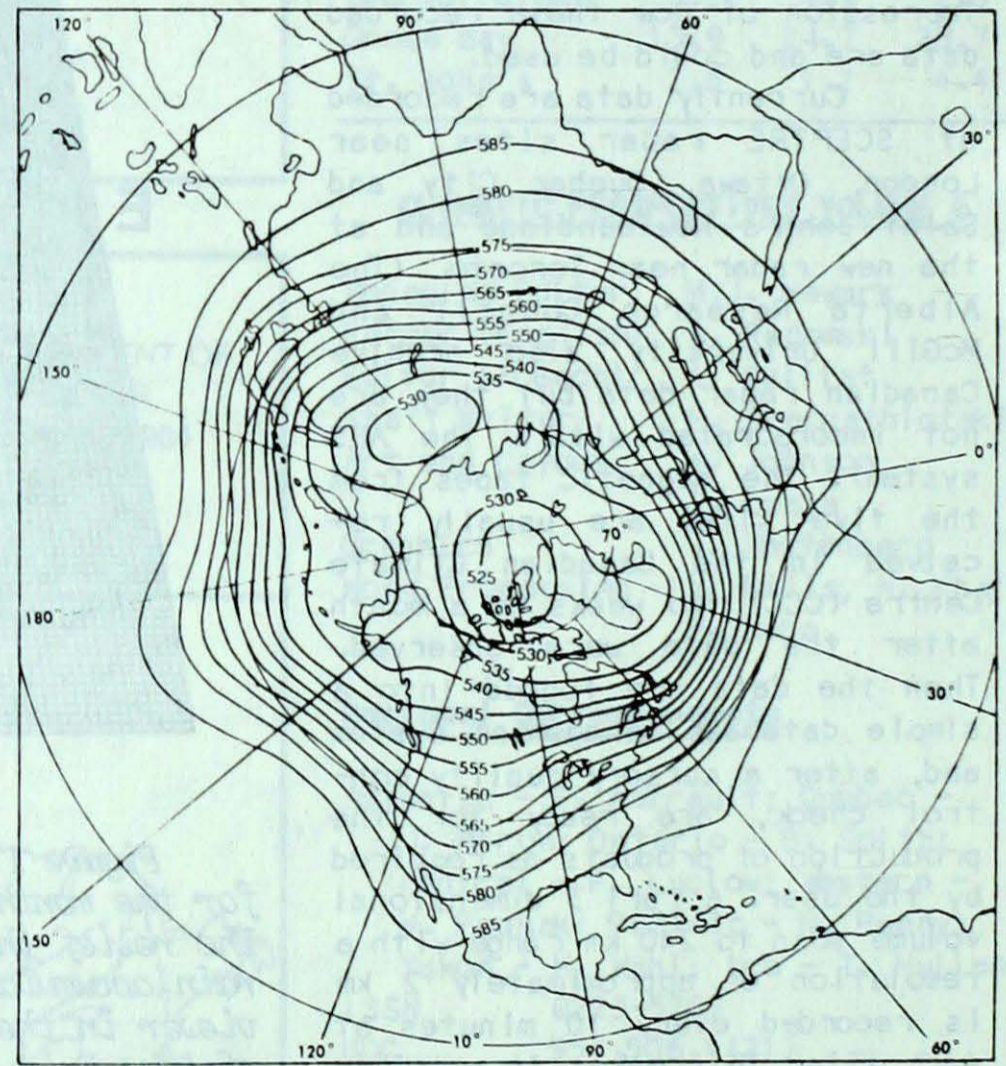
A quick review of some of the applications already supported by the archive of radar data might be of interest. In addition to the numerous storm rainfall and related analyses, there are several which are unexpected and unusual. Some of these include the verifi-

cation of the lack of precipitation during drought situations; the determination of probable weather conditions during highway and high seas (lakes) accidents for forensic meteorology applications, land versus ocean precipitation comparison; examination of orographic enhancement of precipitation, determination of the attenuation of microwave communication links; urban storm sewer system modelling and design; analysis of the reliability of iceberg detection radars; and the verification of satellite estimates of precipitation over the ocean, to name a few. Undoubtedly there are a lot more applications that we have yet to hear about.

50 kPa ATMOSPHERIC CIRCULATION



MEAN 50 kPa HEIGHT ANOMALY (dam) OCTOBER 1984



MEAN 50 kPa HEIGHT (dam) OCTOBER 1984

The mean 50 kPa circulation in the northern hemisphere for October 1984, and its departure from the long term normal heights are shown above (see Climatic Perspectives, Vol. 5, No. 42 for more detail concerning the interpretation, meaning and significance of these charts). The circulation for the month was characterized by a bi-polar vortex and 5

waves at 50°N latitude. The European and Asian troughs were in their normal positions, but the flow over the Pacific, North America and the North Atlantic was highly anomalous. The Pacific trough was further west than normal, while a deep trough over western North America was located where normally a ridge is found. The normal position of the

Canadian trough over eastern North America was occupied by a ridge, with lower heights than normal over the North Atlantic. The anomalous trough over western Canada was the reason for record breaking October snowfalls in parts of Alberta and Saskatchewan, while the ridge over the east was the cause of generally fine weather and some very warm days.

... (Cont'd from page 2B)

at Kenora of a 166 mm, to less than 30 mm adjacent to the lower Great Lakes. St. Catharines reported its driest October since 1924, a sparse 11 mm. There was no measurable snowfall in southern and central Ontario, but up to 57 cm of snow fell in the Northwest.

Québec

Relatively mild Indian Summer weather prevailed with above normal sunshine and temperatures. A southerly flow allowed the mercury to climb into the low to mid-twenties on a number of occasions, breaking many daily temperature records. Overall precipitation was below normal, especially in the South. Along the North Shore and in the Gaspé, four new monthly records were set for the least precipitation. Sept-Îles received only 28 percent of their normal precipitation for October. On October 30, strong winds gusting to 98 km/h at Val d'Or, overturned and damaged small planes and uprooted hundreds of trees.

Atlantic Provinces

It was a cool month, especial-

ly in Newfoundland. At Gander and St. John's this was the coldest October since records began. Only in western Labrador were temperatures above normal. Precipitation amounts were well below normal and many communities received less than half their normal rainfall for the month. The dry conditions were excellent for the autumn harvest. The dry weather, which has been evident in many areas of Nova Scotia since July was blamed for

water shortages in the Southwest, where many wells have gone dry. Water runoff in Nova Scotia and New Brunswick is deficient. It was a cloudy month in Prince Edward Island, but relatively sunny elsewhere. With a few exceptions, only small amounts of snow fell in the Maritimes; most of Newfoundland received a near normal 5 to 10 cm snowfall.

CLIMATIC EXTREMES - OCTOBER 1984

MEAN TEMPERATURE:

WARMEST	Windsor A, ONT	13.0°
COLDEST	Eureka, NWT	-21.0°

HIGHEST TEMPERATURE: Kamloops, BC 29.2°

LOWEST TEMPERATURE: OGILIVE, YT -42.0°

HEAVIEST PRECIPITATION: Ethelda Bay, BC 474.9 mm

HEAVIEST SNOWFALL: Cape Dyer, NWT 74.8 cm

DEEPEST SNOW ON THE GROUND
ON OCTOBER 31, 1984: Cape Dyer, NWT 86 cm

GREATEST NUMBER OF BRIGHT
SUNSHINE HOURS: Montreal Mirabel Int. A, QUE 196 hrs

CORN HEAT UNITS

Seasonal Accumulation to the end of September

Station	Seasonal Accumulation to the end of September		Per cent of Normal
	1984	1983	
Lethbridge	1791	1733	103
Brandon	2112	2200	97
Pilot Mound	2218	2367	106
Earlton	2055	2154	121
London	2894	2973	100
Ottawa	2809	2915	101
Thunder Bay	2002	2133	123
Toronto	2831	2978	99
Trenton	2820	3031	94
Warton	2490	2746	101
Windsor	3547	3607	102
Montréal	2924	2988	97
St Agathe	2131	2258	81
Sherbrooke	2249	2247	108
Fredericton	2355	2327	104
Truro	2250	2156	125
Charlottetown	2364	2420	102

OCTOBER 1984

STATION	Temperature C				Snowfall (cm)	% of Normal Snowfall	Total Precipitation (mm)	% of Normal Precipitation	Snow on ground at end of month (cm)	No. of days with Precip 1.0 mm or more	Bright Sunshine (hours)	% of Normal Bright Sunshine	Degree Days below 18 C
	Mean	Difference from Normal	Maximum	Minimum									
BRITISH COLUMBIA													
ABBOTSFORD	8.1	-2.0	22.2	-7.5	0.0	0	171.9	112	0	17	106	78	306.8
ALERT BAY	7.9	-1.4	17.8	-2.9	TR	0	262.1	125	0	17	X		313.2
BLUE RIVER	2.8	-2.7	18.1	-20.0	19.2	582	99.3	123	9	11	57	62	MSG
CAPE ST. JAMES	8.9	-1.0	15.0	-2.0	1.2	200	199.5	101	0	20	99	*	283.8
CAPE SCOTT	MSG		MSG	MSG	MSG		MSG		MSG	MSG	X		MSG
CASLEGAR	6.6	-1.5	24.9	-11.2	2.3	164	33.0	61	0	8	107	86	354.5
COMOX	8.3	-0.9	18.0	-4.8	TR	0	184.0	144	0	16	X		302.9
CRANBROOK	4.5	-1.4	24.2	-15.5	4.6	36	8.9	49	1	5	144	*	420.0
DEASE LAKE	-1.3	-2.6	14.9	-27.3	10.4	59	36.9	105	5	7	104	120	597.6
ETHELDA BAY	7.3	-1.5	14.3	-7.6	13.5	500	474.9	117	18	21	X		331.8
FORT NELSON	-2.2	-3.3	20.7	28.6	40.6	215	44.6	184	22	7	91	*	625.8
FORT ST. JOHN	0.4	-3.9	17.8	-25.0	26.8	149	68.3	247	11	12	X		570.2
HOPE	8.1	-2.3	22.5	-11.2	18.1		224.1	131	7	16	88	84	306.3
KAMLOOPS	6.9	-1.5	29.2	-17.1	2.6	650	9.6	63	TR	3	109	80	349.9
KELOWNA	5.6	-1.3	26.8	-15.7	1.8	360	36.4	192	0	7	MSG		337.5
LANGARA	8.6	-0.4	15.3	-4.5	11.6	320	220.6	83	1	24	X		337.5
LYTTON	7.4	-2.7	23.4	-18.1	7.8	560	44.9	120	3	6	85	63	329.2
MACKENZIE	1.3	-2.3	16.6	-21.5	7.0	40	92.0	155	0	15	57	49	531.6
MCINNES ISLAND	8.5	-1.0	14.4	-5.4	3.6	450	383.2	114	0	19	X		295.6
MERRY ISLAND	9.5	-1.2	17.0	0.4	0.2	*	157.0	145	0	16	103	*	263.3
PENTICTON	6.8	-1.9	25.5	-14.5	3.0	500	30.4	199	TR	7	125	79	349.1
PORT ALBERNI	MSG		MSG	MSG	MSG		MSG		MSG	MSG	MSG		MSG
PORT HARDY	7.6	-1.1	18.4	-5.4	2.8	400	295.4	121	1	20	79	81	324.2
PRINCE GEORGE	1.5	-3.3	19.9	-26.5	13.0	143	103.2	174	7	13	88	80	510.9
PRINCE RUPERT	6.7	-1.2	16.0	-11.3	4.0	000	340.4	93	2	22	88	136	349.4
PRINCETON	4.6	-2.0	26.1	-23.1	18.4	681	41.2	181	4	8	124	*	MSG
QUESNEL	2.7	-3.0	21.3	-28.4	23.6	375	63.9	133	20	9	X		475.4
REVELSTOKE	5.7	-1.2	18.0	12.7	3.2	640	61.3	73	1	11	85	95	381.8
SANDSPIT	8.4	-0.6	17.1	-3.1	6.2	*	265.9	137	0	22	99	110	296.5
SMITHERS	2.4	-2.3	15.1	-22.0	1.8	22	74.2	116	1	11	81	89	484.7
STEWART TERRACE	MSG		MSG	MSG	MSG		MSG		MSG	MSG	MSG		MSG
VANCOUVER HARBOUR	4.6	-1.8	13.1	-13.5	2.8	72	193.0	90	TR	17	92	148	416.7
VANCOUVER INT'L	9.4	-1.3	18.5	-3.2	0.2	*	3.4	2	TR	16	X		MSG
VICTORIA GONZ. HTS	8.8	-1.2	18.3	-5.9	TR	0	129.5	114	0	12	113	95	284.8
VICTORIA INT'L	9.5	-1.3	17.9	-2.8	0.4	*	84.3	133	TR	15	127	88	262.9
VICTORIA INT'L	8.3	-1.6	18.7	-3.0	TR	0	86.5	110	0	13	114	79	300.7
VICTORIA MARINE	8.6	-1.3	17.5	-2.4	0.0	0	164.5	125	0	17	X		271.4
WILLIAMSLAKE	1.6	-3.5	19.8	-28.6	20.7	276	27.4	90	8	9	101	74	505.4

STATION	Temperature C				Snowfall (cm)	% of Normal Snowfall	Total Precipitation (mm)	% of Normal Precipitation	Snow on ground at end of month (cm)	No. of days with Precip 1.0 mm or more	Bright Sunshine (hours)	% of Normal Bright Sunshine	Degree Days below 18 C
	Mean	Difference from Normal	Maximum	Minimum									
YUKON TERRITORY													
BURWASH	-4.5	-1.9	12.6	-31.0	13.2	91	14.2	89	6	7	X		685.7
DAWSON	-5.5	-1.5	13.3	-33.4	5.3	22	12.7	46	5	4	X		725.7
MAYO	-4.4	-2.1	13.9	-33.7	12.6	61	10.2	36	6	3	X		692.3
WATSON LAKE	-2.9	-2.6	15.5	-36.6	26.0	120	38.7	111	14	12	81	84	648.0
WHITEHORSE	-1.9	-2.5	12.4	-29.9	18.8	117	18.8	116	4	8	104	111	616.2
NORTHWEST TERRITORIES													
ALERT	-19.4	0.3	-3.0	-34.4	38.0	244	30.5	226	44	9	NIL	*	1165.1
BAKER LAKE	-7.6	.1	MSG0	MSG	19.8	85	22.8	75	MSG	MSG	65	90	309.5
CAMBRIDGE BAY	-10.4	1.3	0.5	-23.8	24.6	160	23.8	161	10	4	62	105	881.3
CAPE DYER	-8.2	-0.5	9.3	-25.6	74.8	75	57.7	58	86	10	X		812.5
CAPE PARRY	-7.6	-0.8	0.0	-23.0	27.5	102	14.8	74	8	6	X		792.4
CLYDE	-5.1	1.8	10.3	-17.5	64.8	173	62.5	182	43	15	32	67	717.3
COPPERMINE	-7.6	-1.0	7.0	-24.2	25.2	120	36.7	114	0	9	46	100	780.3
CORAL HARBOUR	-6.3	1.5	3.3	-18.5	32.5	122	37.5	101	13	10	80	93	752.4
EUREKA	-21.0	1.1	0.6	-39.1	23.8	317	18.4	263	27	4	7	87	1208.6
FORT RELIANCE	-3.4	-1.6	11.3	-19.6	20.2	100	67.5	244	9	7	X		664.0
FORT SIMPSON	-4.4	-2.8	15.1	-27.7	36.2	185	45.6	170	4	7	81	95	694.8
FORT SMITH	-1.9	-2.2	19.5	-27.9	61.4	386	94.5	357	28	14	61	91	615.0
FROBISHER BAY	-4.5	0.5	5.0	-18.5	49.9	126	49.4	112	17	12	59	102	696.0
HALL BEACH	-8.2	2.3	2.7	-19.0	8.0	37	13.8	65	5	5	X		801.1
HAY RIVER	-1.4	-2.3	18.9	-24.3	53.3	282	81.5	267	12	14	X		599.7
INUVIK	-9.1	-1.0	0.2	-30.3	26.2	70	14.8	44	11	6	74	148	842.0
MOULD BAY	-18.1	-0.5	0.2	-33.5	18.9	172	16.6	177	13	6	12	112	1119.7
NORMAN WELLS	-7.1	-2.5	5.5	-28.4	41.3	172	40.6	151	6	10	62	105	777.3
POND INLET	MSG		MSG	MSG	MSG		MSG		MSG	MSG	X		MSG
RESOLUTE	-13.7	1.4	0.6	-26.4	6.9	47	18.8	136	8	4	21	89	988.0
SACHS HARBOUR	-12.6	-1.0	-0.4	-30.9	16.2	88	14.1	63	12	4	29	78	948.4
YELLOWKNIFE	-4.2	-2.6	11.5	-27.3	31.8	138	46.2	134	7	8	78	139	691.4
ALBERTA													
BANFF	2.2	-2.2	23.0	-27.0	28.4	160	24.6	79	15	MSG	X		MSG
BROOKS	2.5	-3.9	28.5	-23.5	44.1	865	41.9	313	10	MSG	X		135.3
CALGARY INT'L	1.9	-3.6	26.7	-25.7	18.9	140	18.2	103	6	5	122	69	500.9
COLD LAKE	2.5	-2.0	25.5	-23.5	36.6	523	48.4	286	8	8	117	75	480.9
CORONATION	1.2	-3.6	27.0	-26.5	36.2	416	30.6	204	10	7	126	70	552.9
EDMONTON INT'L	1.7	-3.0	27.5	-26.5	39.3	587	45.9	298	16	7	132	81	508.0
EDMONTON MUN.	3.0	-2.8	27.1	-23.7	54.1	413	61.7	372	15	9	141	87	467.5
EDMONTON NAMA0	2.0	-3.1	25.3	-24.5	31.8	412	35.7	197	10	10	X		496.3
EDSON	-0.3	-4.0	26.5	-34.6	40.0	354	37.0	189	18	10	95	91	567.0
FORT CHIPEWYAN	-0.3	-1.6	20.5	-30.0	39.0	382	92.6	328	MSG	MSG	X		MSG

X = Not observed * = normal missing MSG = data missing

STATION	Temperature C				Snowfall (cm)	% of Normal Snowfall	Total Precipitation (mm)	% of Normal Precipitation	Snow on ground at end of month (cm)	No. of days with Precip 1.0 mm or more	Bright Sunshine (hours)	% of Normal Bright Sunshine	Degree Days below 18 C
	Mean	Difference from Normal	Maximum	Minimum									
FORT MCMURRAY	0.9	-2.4	25.7	-24.5	38.7	305	74.5	265	5	10	102	82	526.0
GRANDE PRAIRIE	0.4	-3.8	18.0	-30.5	31.4	266	48.6	183	8	11	88	*	550.9
HIGH LEVEL	-2.0	-4.0	17.3	-36.3	37.8	402	48.4	336	24	8	92	65	619.4
JASPER	2.0	-2.7	23.3	-28.7	17.6	326	26.8	91	2	9	93	*	495.1
LETHBRIDGE	3.3	-4.2	27.7	-26.7	28.1	240	34.9	196	11	10	MSG		456.6
MEDICINE HAT	3.5	-3.9	28.2	-24.0	26.8	335	27.1	167	7	6	156	90	450.2
PEACE RIVER	-0.3	-4.0	17.6	-30.0	35.1	356	56.1	281	11	9	X		563.9
RED DEER	1.1	-3.5	27.7	-26.3	21.3	181	25.7	125	6	6	X		523.8
ROCKY MTN HOUSE	0.6	-4.3	27.2	-27.5	31.4	209	28.4	125	2	7	X		542.8
SLAVE LAKE	1.3	-2.9	20.8	-21.8	51.2	648	57.0	230	20	11	77	52	517.8
SUFFIELD	2.9	-4.1	28.2	-23.7	39.5	580	34.4	226	5	7	143	77	474.7
WHITECOURT	0.8	-2.6	27.0	-28.9	54.1	347	55.9	200	10	10	X		533.1
SASKATCHEWAN													
BROADVIEW	2.5	-1.8	23.6	-23.0	51.6	607	56.2	227	14	8	151	94	481.4
COLLINS BAY	-2.0	-2.9	22.4	-22.6	25.8	83	42.6	111	7	11	91	*	617.3
CREE LAKE	0.3	-1.3	21.6	-22.9	20.9	141	48.5	161	3	10	94	97	568.4
ESTEVAN	4.4	-2.0	23.6	-18.1	33.4	484	41.3	187	8	7	149	79	424.2
HUDSON BAY	2.2	-1.7	24.8	-18.8	33.2	329	59.4	223	9	8	142	*	492.1
KINDERSLEY	2.1	-3.2	27.8	-24.8	30.2	444	25.1	181	11	7	X		523.9
LA RONGE	2.0	-1.5	24.5	-18.2	21.6	220	52.3	175	8	9	X		497.7
MEADOW LAKE	2.1	-2.5	26.5	-22.7	36.6	420	40.4	229	7	4	120	*	493.6
MOOSE JAW	3.8	-2.6	25.3	-19.0	21.2	279	22.0	120	1	5	145	84	439.7
NIPAWIN	2.0	-2.2	25.2	-18.6	44.8	124	49.0	233	10	6	131	92	469.9
NORTH BATTLEFORD	2.3	-2.6	28.1	-21.4	39.6	558	41.4	262	10	9	X		488.0
PRINCE ALBERT	2.2	-1.5	26.4	-21.1	55.2	594	67.7	313	20	6	112	77	490.7
REGINA	3.0	-1.5	24.6	-21.6	42.8	522	42.8	228	7	7	139	83	466.9
SASKATOON	2.9	-2.0	27.6	-19.9	46.9	510	58.6	339	11	8	X		469.6
SWIFT CURRENT	2.4	-3.4	26.2	-24.1	24.2	266	24.5	135	3	6	140	83	484.7
URANIUM CITY	-1.7	-2.3	18.5	-25.9	52.6	384	71.0	231	14	16	X		612.8
WYNYARD	2.4	-2.4	24.5	-19.6	55.5	491	65.0	265	6	8	128	86	486.0
YORKTON	2.7	-2.1	24.2	-20.2	35.5	473	52.5	230	7	10	113	72	474.4
MANITOBA													
BISSETT	5.9	1.6	21.5	-14.1	31.4	240	136.8	311	12	13	86	77	372.2
BRANDON	4.1	-1.1	25.3	-18.5	12.1	186	73.1	340	8	10	X		431.0
CHURCHILL	-0.9	0.6	19.3	-16.4	24.4	83	23.3	54	3	4	99	160	583.1
DAUPHIN	4.1	-1.4	23.3	-16.5	9.7	117	87.5	303	4	8	107	70	425.4
GILLAM	1.4	2.1	22.4	-19.4	17.6	92	20.0	51	2	6	X		514.7
GIMLI	6.0	-0.1	23.0	-16.4	35.9	505	131.8	331	8	11	97	67	371.2
ISLAND LAKE	3.8	1.2	21.7	-11.2	12.8	53	44.2	81	2	7	X		441.3
LYNN LAKE	-0.4	0.1	24.0	-19.6	16.8	56	57.4	122	6	11	98	138	571.5
NORWAY HOUSE	2.8	-0.5	19.4	-17.2	14.0	144	83.5	260	11	9	X		472.9
PILOT MOUND	5.2	-0.3	24.6	0.3	9.2	107	113.2	386	3	13	X		398.2

STATION	Temperature C				Snowfall (cm)	% of Normal Snowfall	Total Precipitation (mm)	% of Normal Precipitation	Snow on ground at end of month (cm)	No. of days with Precip 1.0 mm or more	Bright Sunshine (hours)	% of Normal Bright Sunshine	Degree Days below 18 C
	Mean	Difference from Normal	Maximum	Minimum									
PORTAGE LA PRAIRIE	5.9	-0.6	25.0	-16.5	16.5	220	134.9	438	7	11	X		376.2
THE PAS	2.8	-0.8	24.2	-14.7	23.7	232	74.7	225	6	10	133	111	472.7
THOMPSON	0.5	0.8	24.6	-25.7	8.3	27	46.1	87	5	6	137	173	572.8
WINNIPEG INT'L	6.4	0.3	23.3	-14.3	13.0	250	99.0	320	TR	8	109	72	362.3
ONTARIO													
ATIKOKAN	6.8	2.3	21.1	-12.0	9.6	74	75.0	96	TR	10	79	71	345.6
EARLTON	MSG		MSG	MSG	MSG		MSG	MSG	MSG	MSG	X		MSG
GERALDTON	6.0	2.1	20.1	-11.6	6.2	57	52.8	81	2	12	X		371.5
GORE BAY	9.8	1.5	19.2	-2.9	0	0	99.7	147	0	12	X		253.9
HAMILTON RBG	11.2	0.6	23.4	-0.3	0	0	20.5	28	0	4	126	88	253.9
HAMILTON	10.8	1.4	22.0	1.0	0	0	16.0	26	0	7	X		223.3
KAPUSKASING	6.3	1.9	22.0	-10.8	26.6	126	67.4	87	15	9	X		393.9
KENORA	6.8	1.2	20.6	-11.2	34.9	472	166.4	409	6	16	X		348.5
KINGSTON	10.3	1.3	21.6	-4.6	0	0	25.2	31	0	5	139	92	240.7
LANSDOWNE HOUSE	4.5	1.7	22.1	-10.7	16.6	54	48.7	75	2	15	X		419.4
LONDON	11.3	1.9	21.3	-0.6	0	0	30.9	4.2	0	9	132	92	206.8
MOOSONEE	5.5	1.4	23.4	-10.2	5.8	40	51.8	70	4	11	MSG		388.3
MOUNT FOREST	0.5	1.7	20.2	-2.0	0	0	55.4	67	0	10	149	107	262.8
MUSKOKA	9.4	1.9	22.4	-2.9	0	0	83.6	89	0	12	X		268.7
NORTH BAY	8.2	1.8	21.2	-6.7	0	0	91.0	104	0	13	145	122	304.0
OTTAWA INT'L	9.4	1.3	23.4	-3.6	0	0	52.8	78	0	7	144	106	267.6
PETAWAWA	8.1	1.9	22.3	-7.2	0	0	57.2	79	0	8	X		306.5
PETERBOROUGH	9.1	1.6	22.2	-6.6	0	0	23.5	41	0	5	X		276.7
PICKLE LAKE	5.1	2.4	20.3	-13.6	57.4	275	69.6	110	4	12	X		411.4
RED LAKE	5.3	1.3	21.4	-11.1	34.2	314	120.1	238	7	14	64	*	394.9
ST. CATHARINES	11.3	1.2	24.2	-0.2	0	0	11.4	16	0	5	X		208.0
SARNIA	11.6	1.9	22.0	1.4	0	0	45.6	77	0	10	145	100	194.0
SAULT STE. MARIE	8.9	1.3	18.4	-2.9	TR	0	94.1	127	0	14	MSG		281.8
SIMCOE	11.0	1.5	23.0	0.0	0	0	20.2	29	0	7	X		217.4
SIOUX LOOKOUT	6.7	2.0	19.7	-7.7	20.8	145	80.2	124	3	12	X		352.3
SUDBURY	7.6	1.5	21.2	-6.7	TR	0	73.7	99	0	11	145	119	317.5
THUNDER BAY	6.6	0.9	19.8	-13.2	5.0	152	82.6	151	3	9	80	63	353.1
TIMMINS	6.4	1.6	22.5	-9.5	6.4	51	55.8	81	0	10	X		377.3
TORONTO	12.0	1.0	23.5	2.8	0	0	22.8	37	0	7	126	85	186.4
TORONTO INT'L	10.3	1.0	22.2	-2.6	0	0	26.1	42	0	7	X		237.8
TORONTO ISLAND	11.7	1.6	23.9	3.5	0	0	22.6	40	0	7	X		195.9
TRENTON	10.1	0.9	21.9	-4.1	0	0	23.6	34	0	7	X		246.4
TROUT LAKE	3.2	1.4	21.3	-12.9	51.4	213	62.8	112	3	10	113	*	456.9
WATERLOO-WELL	9.8	1.6	20.5	-2.7	0	0	30.6	45	0	8	X		254.0
WAWA	MSG		MSG	MSG	MSG		MSG	MSG	MSG	MSG	X		MSG
WIARTON	10.3	1.3	20.8	-0.5	0	0	60.4	73	0	10	116	87	239.6
WINDSOR	13.0	1.9	24.0	2.5	0	0	49.8	87	0	8	X		154.2

X = Not observed * = normal missing MSG = data missing

OCTOBER 1984

STATION	Temperature C				Snowfall (cm)	% of Normal Snowfall	Total Precipitation (mm)	% of Normal Precipitation	Snow on ground at end of month (cm)	No. of days with Precip 1.0 mm or more	Bright Sunshine (hours)	% of Normal Bright Sunshine	Degree Days below 18 C
	Mean	Difference from Normal	Maximum	Minimum									
QUEBEC													
BAGOTVILLE	5.6	0.3	20.7	-8.4	0.8	7	43.2	60	0	9	X		381.8
BAIE COMEAU	3.7	-0.6	14.1	-8.9	TR	0	25.8	29	0	5	170	*	442.5
BLANC SABLON	2.0	-1.9	9.7	-9.8	8.4	93	MSG		0	11	137	*	477.0
CHIBOUGAMAU	4.2	1.6	20.0	-9.0	2.6	11	52.6	61	TR	12	137	193	429.1
KUUJUAQ	0.3	1.2	12.1	-11.8	17.1	63	33.8	70	3	11	50	102	575.1
GASPE													
GASPE	4.8	-1.0	18.4	-10.0	0.4	8	26.8	29	0	5	153	*	410.0
INUKJUAQ	0.6	1.0	9.1	-12.8	36.2	165	51.8	113	5	22	MSG		539.0
LA GRANDE RIVIERE	2.1	*	18.4	-11.5	30.3	*	43.6	*	3	10	82	*	477.4
MANIWAKI	8.0	1.5	22.9	-5.6	0.0	0	60.4	84	0	8	158	131	309.0
MATAGAMI	4.5	1.5	22.8	-11.3	5.5	32	53.5	97	3	9	137	147	418.9
MONT JOLI													
MONTREAL INT'L	9.4	0.7	24.0	-3.8	0.0	0	49.0	65	0	7	165	121	266.9
MONTREAL M INT'L	8.1	*	24.5	-6.2	TR	0	57.8	*	0	7	196	*	305.6
NATASHQUAN	2.8	-1.3	12.8	-10.4	TR	0	30.4	28	0	6	166	128	475.6
NITCHEQUON	0.9	1.1	14.0	-8.9	26.8	69	57.4	69	5	13	65	118	525.6
KUUJUARAPIK													
KUUJUARAPIK	3.0	1.0	20.3	-6.5	27.8	102	48.6	66	2	13	83	177	449.5
QUEBEC	7.9	1.3	22.6	-4.1	TR	0	45.0	50	0	6	167	144	321.9
ROBERVAL	MSG		MSG	MSG	MSG		MSG		MSG	MSG		MSG	MSG
STE AGA THE DES MONTS	7.3	1.9	22.4	-6.7	3.6	47	MSG		MSG	8	152	127	332.2
ST HUBERT	8.8	0.4	24.8	-5.2	0.0	0	53.9	70	0	7	X		289.1
SCHEFFERVILLE													
SCHEFFERVILLE	0.3	1.7	12.5	-11.2	19.9	44	32.3	43	5	7	60	*	566.1
SEPT-ILES	3.2	-0.4	15.5	-8.1	TR	0	20.2	21	0	5	176	140	459.6
SHERBROOKE	7.0	0.4	8.0	-7.0	0.0	0	55.3	63	0	11	154	*	340.9
VAL D'OR	6.2	1.6	22.0	-8.5	6.2	43	52.2	63	0	11	136	153	367.6
NEW BRUNSWICK													
CHARLO	5.5	0.1	17.8	-6.4	1.0	29	40.9	44	0	8	157	123	386.0
CHATHAM	6.9	-0.9	19.1	-3.6	TR	0	42.6	45	0	7	131	92	357.4
FREDERICTON	7.6	0.1	20.0	-4.2	TR	0	39.2	40	0	10	154	111	323.5
MONCTON	6.9	-0.7	19.0	-4.1	3.0	97	47.7	48	0	9	126	89	343.8
SAINT JOHN	7.8	0.2	18.5	-1.4	TR	0	48.9	38	0	10	156	111	317.9

STATION	Temperature C				Snowfall (cm)	% of Normal Snowfall	Total Precipitation (mm)	% of Normal Precipitation	Snow on ground at end of month (cm)	No. of days with Precip 1.0 mm or more	Bright Sunshine (hours)	% of Normal Bright Sunshine	Degree Days below 18 C
	Mean	Difference from Normal	Maximum	Minimum									
NOVA SCOTIA													
EDDY POINT	8.2	-0.9	18.4	-3.0	TR	0	65.7	75	0	11	150	110	304.7
GREENWOOD	8.5	-0.1	20.1	-3.6	TR	0	44.6	46	0	8	X		294.6
HALIFAX INT'L	8.4	-1.2	20.8	-2.0	TR	0	50.1	38	0	7	X		296.4
SABLE ISLAND	10.3	-1.2	17.4	-1.2	0	0	60.9	52	0	11	117	98	240.0
SHEARWATER	9.2	-0.3	19.0	1.1	0	0	58.3	48	0	5	156	99	272.3
SYDNEY													
SYDNEY	7.4	-1.0	16.9	-2.7	2.8	108	69.8	57	0	10	136	103	327.4
TRURO	7.3	-0.5	17.0	-2.3	TR	0	53.4	48	0	7	125	98	330.9
YARMOUTH	9.6	0.1	20.2	0.3	0	0	55.8	48	0	9	160	107	259.7
PRINCE EDWARD ISLAND													
CHARLOTTETOWN	7.4	-0.7	16.4	-4.5	0.2	8	63.1	59	0	9	X		329.3
SUMMERSIDE	7.7	-0.9	16.9	-1.3	3.0	143	54.2	58	0	9	101	77	322.0
NEWFOUNDLAND													
ARGENTIA	6.7	-1.7	14.2	-2.0	TR	0	58.6	65	NIL	11	X		351.6
BATTLE HARBOUR	2.0	-2.2	15.0	-9.2	1.4	38	51.7	67	0	9	X		494.8
BONA VISTA	5.0	-2.2	14.6	-1.7	MSG		MSG		0	MSG	X		MSG
BURGED	5.5	-1.6	15.1	-4.7	3.5	219	63.8	45	0	11	164	144	386.2
CARTWRIGHT	1.9	-1.2	12.5	-5.6	9.0	75	39.7	55	0	10	102	115	500.3
CHURCHILL FALLS													
CHURCHILL FALLS	0.6	0.7	12.2	-10.5	32.6	60	42.2	49	2	10	83	*	541.4
COMFORT COVE	3.8	-2.2	14.9	-5.4	8.4	66	40.4	37	0	9	X		400.6
DANIEL'S HARBOUR	4.6	-1.3	10.7	-5.4	3.6	78	49.0	54	0	11	111	133	415.7
DEER LAKE	3.7	-1.6	12.4	-10.4	8.2	112	52.8	50	0	8	X		MSG
GANDER INT'L	3.8	-2.2	14.0	-5.7	17.2	141	59.4	57	0	11	109	99	436.6
GOOSE													
GOOSE	2.1	-0.6	14.5	-11.1	15.5	63	38.7	51	0	10	109	116	492.4
HOPEDALE	MSG		MSG	MSG	MSG		MSG		MSG	MSG	X		MSG
PORT-AUX-BASQUES	5.2	-1.8	0.2	MSG	0.3	9	0.8	1	0	0	0	*	0.4
ST ANTHONY	3.3	-1.0	11.7	-7.0	16.2	83	62.2	66	0	14	X		484.6
ST JOHN'S	5.0	-1.9	15.4	-4.7	2.6	59	80.7	55	0	18	115	104	401.1
ST LAWRENCE													
ST LAWRENCE	6.1	-1.3	15.4	-5.8	TR	0	79.3	58	0	14	X		368.1
STEPHENVILLE	5.9	-1.1	16.2	-2.7	MSG		49.2	44	0	11	124	134	373.2
WABUSH LAKE	1.2	1.9	13.8	-13.0	22.1	44	41.1	48	3	8	76	115	520.9

X = Not observed * = normal missing MSG = data missing

OCTOBER 1984 OCTOBRE

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 Écart à la normale	Maximum Maximale	Minimum Minimale							This Month Présent mois	Since Jan. 1st Depuis le 1 ^{er} janv.	
AGROCLIMATOLOGICAL STATIONS AGROCLIMATOLOGIQUES													
BRITISH COLUMBIA COLOMBIE-BRITANNIQUE													
Agassiz	8.5	-2.4	22.0	-8.5	3.4	197.3	112	1	17	116	126.5	2019.5	
Kamloops													
Sidney													
Summerland	7.2	-1.8	25.0	14.0	3.2	26.8	152	3	7	155	115.5	1963.0	
ALBERTA													
Beaverlodge	0.0	-4.4	20.0	-29.0	30.0	54.0	189	10	12	88	56.3	1146.7	
Ellerslie	1.6	-3.0	26.5	-24.5	30.5	35.9	212	14	8	136	91.0	1370.2	
Fort Vermilion													
Lacombe	1.6	-3.1	28.0	-24.5	4.5	21.7	123	4	7		96.3	1287.5	
Lethbridge													
Vauxhall													
Vegreville	1.7	-2.4	28.5	-22.0	7.0	41.5	266	8	7		79.6	1368.6	
SASKATCHEWAN													
Indian Head	2.6	-2.7	23.0	-22.0	47.0	50.0	202	16	8		89.5	1701.0	
Melfort	2.4	-1.8	26.0	-20.0	52.7	59.3	224	18	6		87.5	1604.5	
Regina	2.4	-2.1	24.5	-23.0	34.5	38.4	209	5	6		0.0	1562.0	
Saskatoon													
Scott													
Swift Current South	2.6	-3.3	26.5	-23.0	21.9	19.4	120	5	6	125	105.8	1734.2	
MANITOBA													
Brandon	4.4	-1.2	25.5	-19.5	11.3	90.6	387	10	10	116	90.7	1731.8	
Glenlea	6.0	0.2	23.5	-15.0	3.8	93.6	249	3	13	109	112.0	1799.8	
Morden	6.6	-0.4	26.0	-14.0	9.4	117.6	373	6	10	105	130.2	2006.3	
ONTARIO													
Delhi	11.4	2.5	23.0	-2.5	0.0	21.4	29	0	7	134	201.9	2131.3	
Elora	10.2	1.7	20.7	-1.6	0.0	45.6	69	0	6		162.5	1825.9	

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 Écart à la normale	Maximum Maximale	Minimum Minimale							This Month Présent mois	Since Jan. 1st Depuis le 1 ^{er} janv.	
Guelph	10.5	1.3	21.0	-3.6	0.0	32.5	44	0	7	133	168.7	1916.2	
Harrow	13.3	2.0	22.5	1.5	0.0	67.3	120	0	8	128	258.0	2423.0	
Kapuskasing													
Merivale													
Ottawa	9.6	1.1	23.4	-5.1	0.0	64.1	94	0	9	151	147.2	2090.8	
Smithfield													
Vineland Station	11.5	0.5	24.0	0.0	0.0	18.8	32	0	5	117	202.7	2206.6	
Woodslee													
QUEBEC													
La Pocatiere	6.5	-0.4	20.0	-4.0	0.0	41.0	57	0	6	171	61.3	1585.5	
L'Assomption	5.1	-2.9	24.5	-5.0	0.0	53.4	67	0	7	168	107.8	1933.4	
Lavaltrie													
Lennoxville													
Normandin	5.1	0.5	21.5	-9.0	T	30.6	51	0	5	119	47.9	1392.7	
St. Augustin													
Ste. Clothilde													
NEW BRUNSWICK NOUVEAU-BRUNSWICK													
Fredericton													
NOVA SCOTIA NOUVELLE-ÉCOSSE													
Kentville													
Nappan													
PRINCE EDWARD ISLAND ILE-DU-PRINCE-ÉDOUARD													
Charlottetown	7.8	-0.9	17.0	-5.0	0.2	61.8	60	0	11	110	97.6	1749.0	
NEWFOUNDLAND TERRE-NEUVE													
St. John's West	5.1	-2.0	15.0	-5.0	0.0	68.0	47	0	5	106	34.7	1379.9	

ACID RAIN REPORT ISSUED BY ENVIRONMENT CANADA
FOR NOV. 9- NOV. 17, 1984

SITE	DAY	pH	AIR PATH TO SITE
Longwoods, near London, Ont.	9-10		Data not available.
	11	4.6	U.S. Midwest.
	15	3.9	U.S. Midwest.
Dorset,* Muskoka, Ont.	9	4.1	U.S. Midwest and southern Ontario.
	10	4.4	U.S. Midwest and southern Ontario.
	11	4.3	U.S. Midwest and southern Ontario.
	15	4.3	Illinois, Michigan, Lake Huron.
	16	4.7	Northwestern Ontario.
Chalk River Ottawa Valley, Ont.	9	4.1	U.S. Midwest and southern Ontario.
	10	4.5	U.S. Midwest and southern Ontario.
	11	4.9	U.S. Midwest and southern Ontario.
	15	4.3	U.S. Midwest and southern Ontario.
	16	4.8	Northwestern Ontario.
Montmorency, Quebec City Que.	9	3.8	U.S. Midwest, southern Ontario, and southern Quebec.
	10	4.3	Ohio Valley and St. Lawrence River Valley.
	11	4.4.	North and South Carolina, Pennsyl- vania, New York and southern Quebec.
	12	6.2	Northern Quebec.
	13	5.4	Northern Quebec.
	15	4.1	U.S. Midwest, southern Ontario and southern Quebec.
	16	5.6	Wisconsin, Lake Michigan, Lake Huron, central Ontario and central Quebec.
Kejimkujik, Southwestern N.S.	10	4.3	Virginia along the eastern seaboard.
	11	4.8	From the south over the Atlantic.
	12	4.5	From the south over the Atlantic.
	14	5.2	Northern Quebec, southern Quebec and Maine.
	16	4.0	Southern Ontario, New York, New England States and Maine.
	17	4.8	Northern Quebec, New Brunswick and Maine.