



Environment
Canada

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Climatic Perspectives

ARCH 1

Monthly Review

JUNE - 1989

Vol. 11

CLIMATIC HIGHLIGHTS

In a dramatic turn-about from last year, heavy spring rains this year erased drought concerns on the Prairies and in southern Ontario.

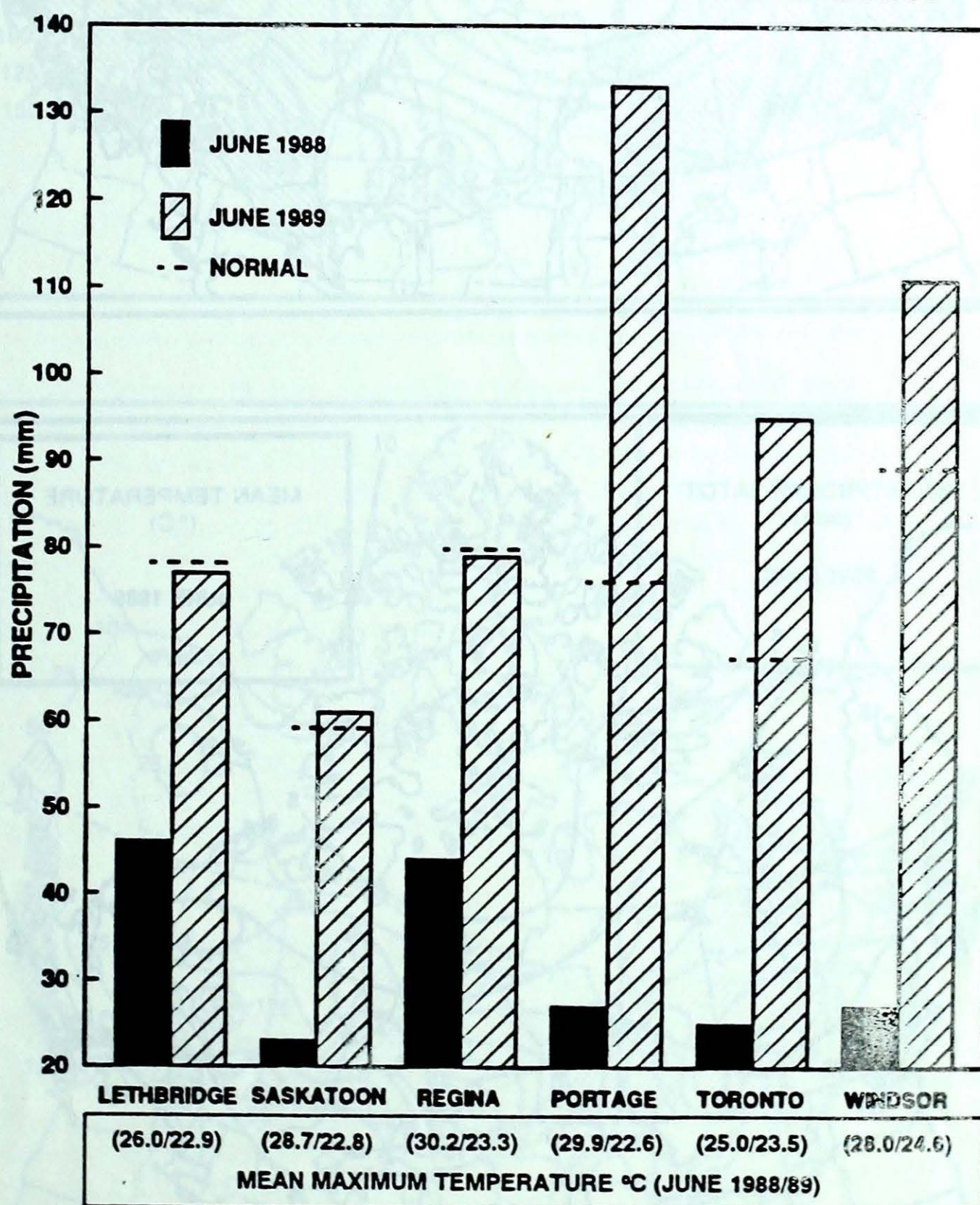
In many ways, June 1988 was very different from the June of this year. A year ago, the agricultural districts of the prairie provinces were experiencing one of their harshest droughts in decades. Many locations in Saskatchewan and Alberta had below-normal precipitation for at least nine months. Moisture in the soil was critically low, leaving the earth powder dry. Oppressively hot temperatures further aggravated the dryness by increasing the rate of evaporation. Southern Ontario was also experiencing a severe drought where many communities had their driest June on record.

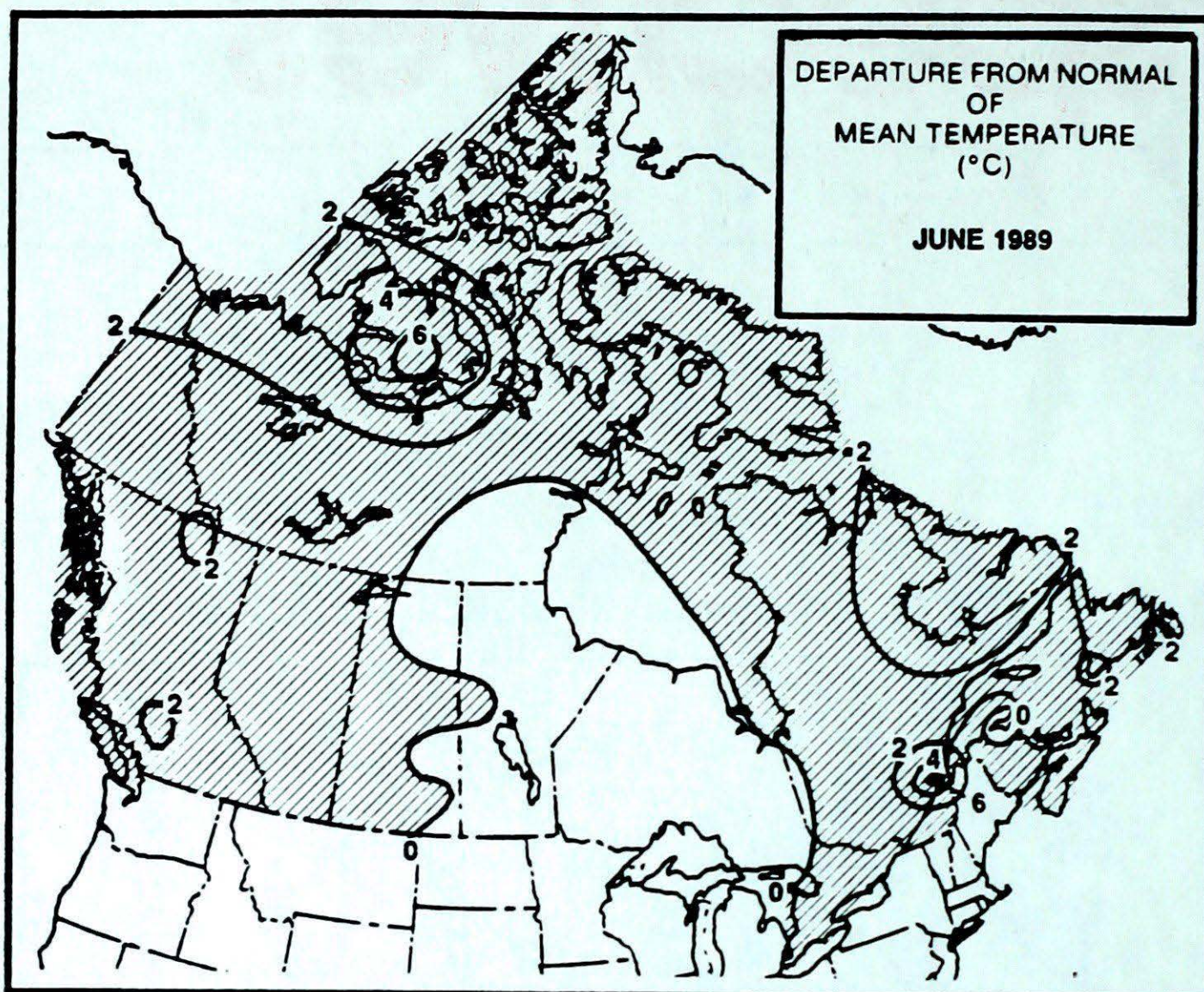
In sharp contrast, this year, heavy rains arrived on the Prairies in late spring. Farmers hailed the arrival of timely rains which helped to alleviate drought concerns in Alberta and Saskatchewan. Normal to above-normal amounts of precipitation fell where it was needed the most: for example, Saskatoon's 61.3 mm was 104% of normal.

Heavy rains also fell in southwestern Ontario. Some areas had more rain in the first five days of June 1989, than in all of June 1988. Comparisons of these values are, with 1988 in brackets: London, 29 mm, (10 mm), Toronto, 50 mm, (17 mm), and Waterloo-Wellington, 45 mm, (9 mm). Farmers were unable to get on to their fields this June, as farms became water logged.

Amir Shabbar, Canadian Climate Centre

PRECIPITATION COMPARISON - JUNE 1988/89





Across the country

YUKON AND N.W.T.

Temperatures averaged well-above normal across most of the Northwest Territories in June. In the southern Mackenzie District, the mercury rose into the thirties on several days just before mid-month. Hay River reached 34°C on the 13th. Generally dry conditions prevailed for the month, except for the central Mackenzie River Valley, where Norman Wells received 61 mm of rain.

In the Yukon, however, occasional cool periods resulted in near-normal monthly temperatures. An Arctic cold front swept across the northern Yukon at mid-month, dropping afternoon temperatures close to the freezing point at Old Crow. High winds accompanied the cold outbreak, giving high wind chill, and visibilities were reduced to 1 km in snow.

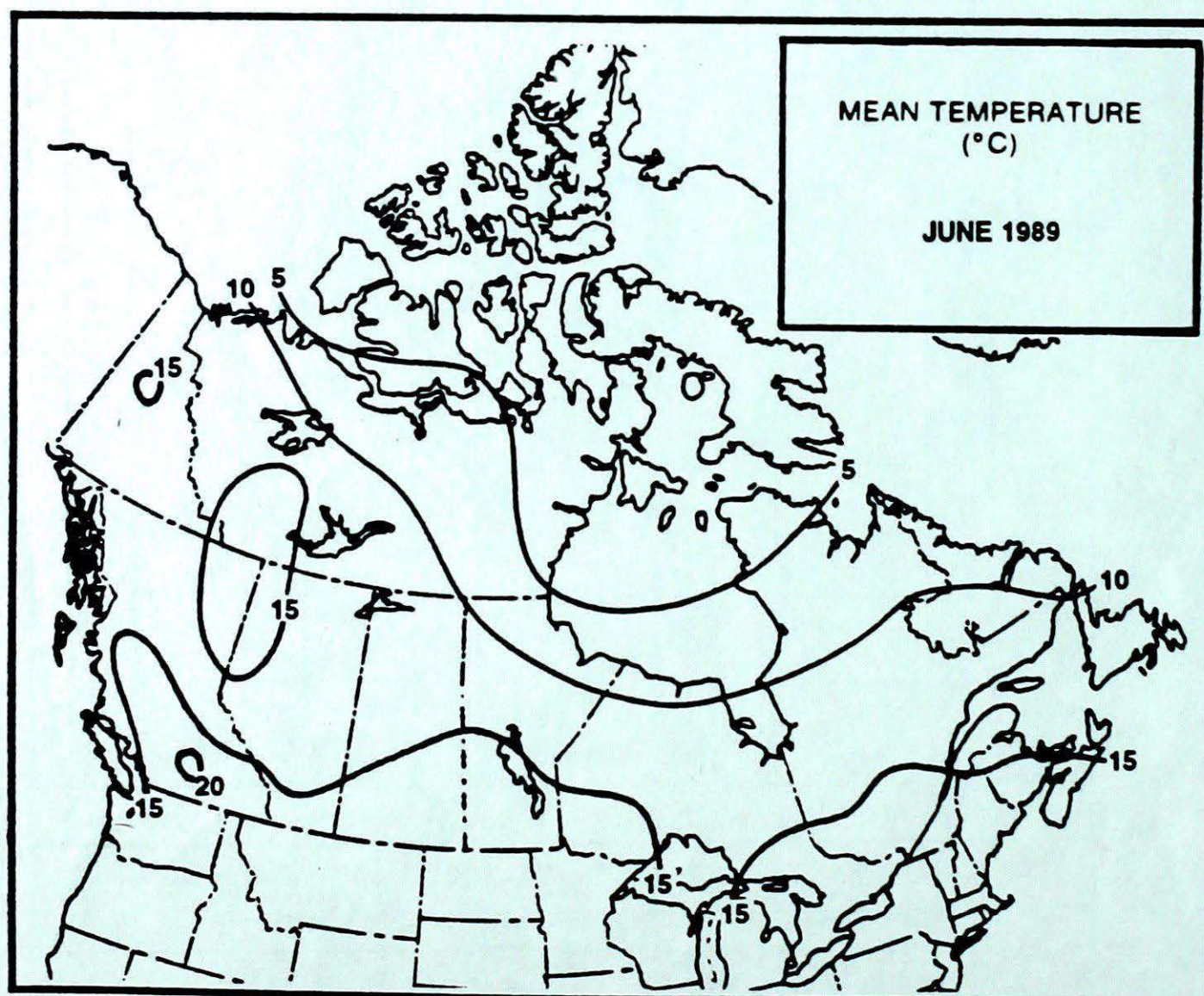
BRITISH COLUMBIA

Temperatures averaged well-above normal during the first week of June, and despite two weeks of relatively cool weather during the last half of the month, the monthly means still averaged about 1 to 2°C above normal everywhere in the province.

It was very wet over the Queen Charlottes and Vancouver Island and also over some southern Interior valleys, with many stations in these areas receiving 150% of their normal June precipitation. In contrast, the north coast, the eastern lower Fraser Valley, and much of central and northern B.C. reported less than half of their normal precipitation amounts. In spite of the fact that many areas had heavy rain, sunshine was generally normal, to slightly above normal. Prince Rupert recorded a record 224.1 hours for the month. A severe hail storm hit the Okanagan area on June 19, causing much damage to apple orchards.

PRAIRIE PROVINCES

Mean temperatures ranged from near normal over Manitoba to 1 to 2°C above



normal over most of Saskatchewan and Alberta. Most of the hot weather occurred over a two-week period in mid-June and again towards the very end of the month.

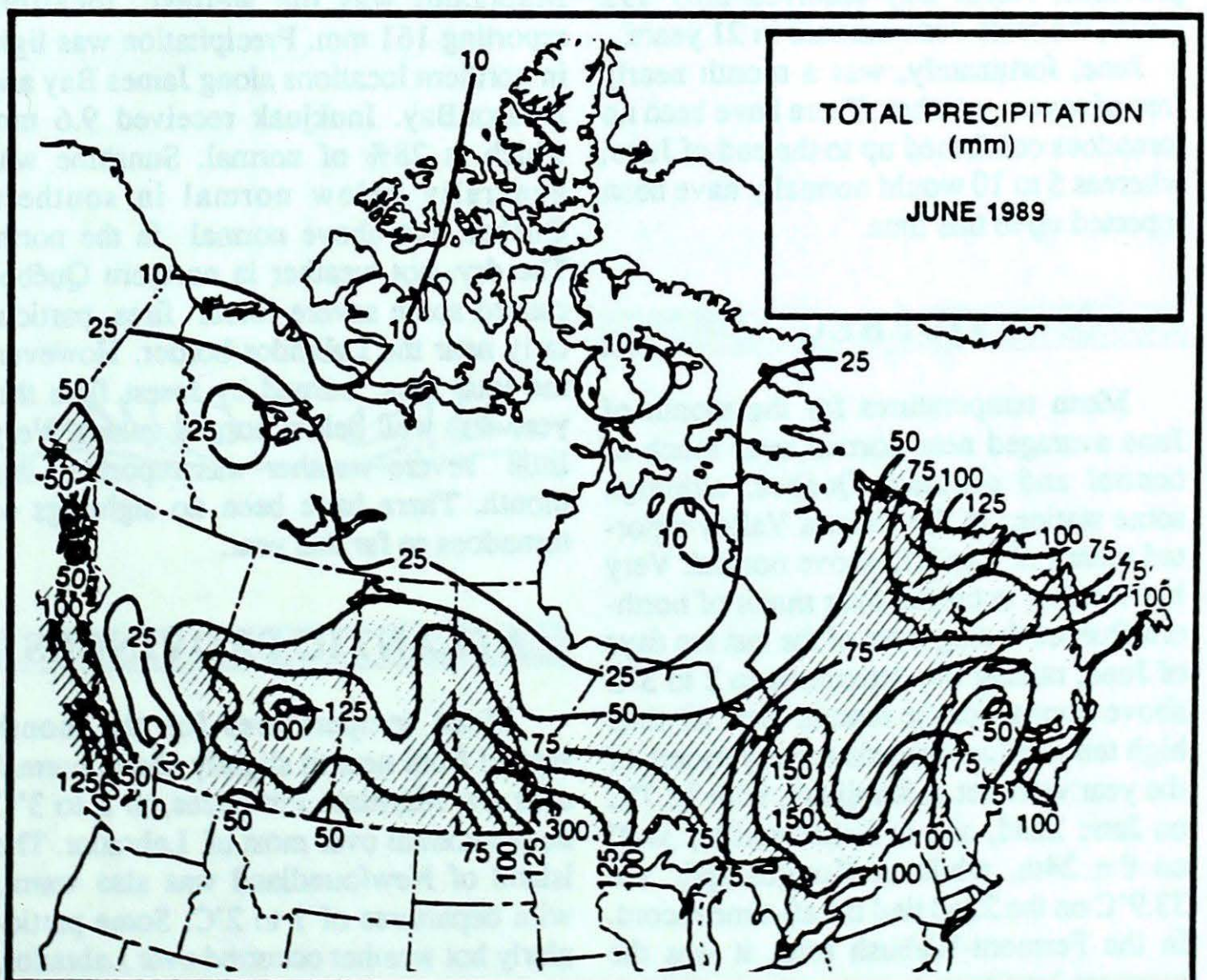
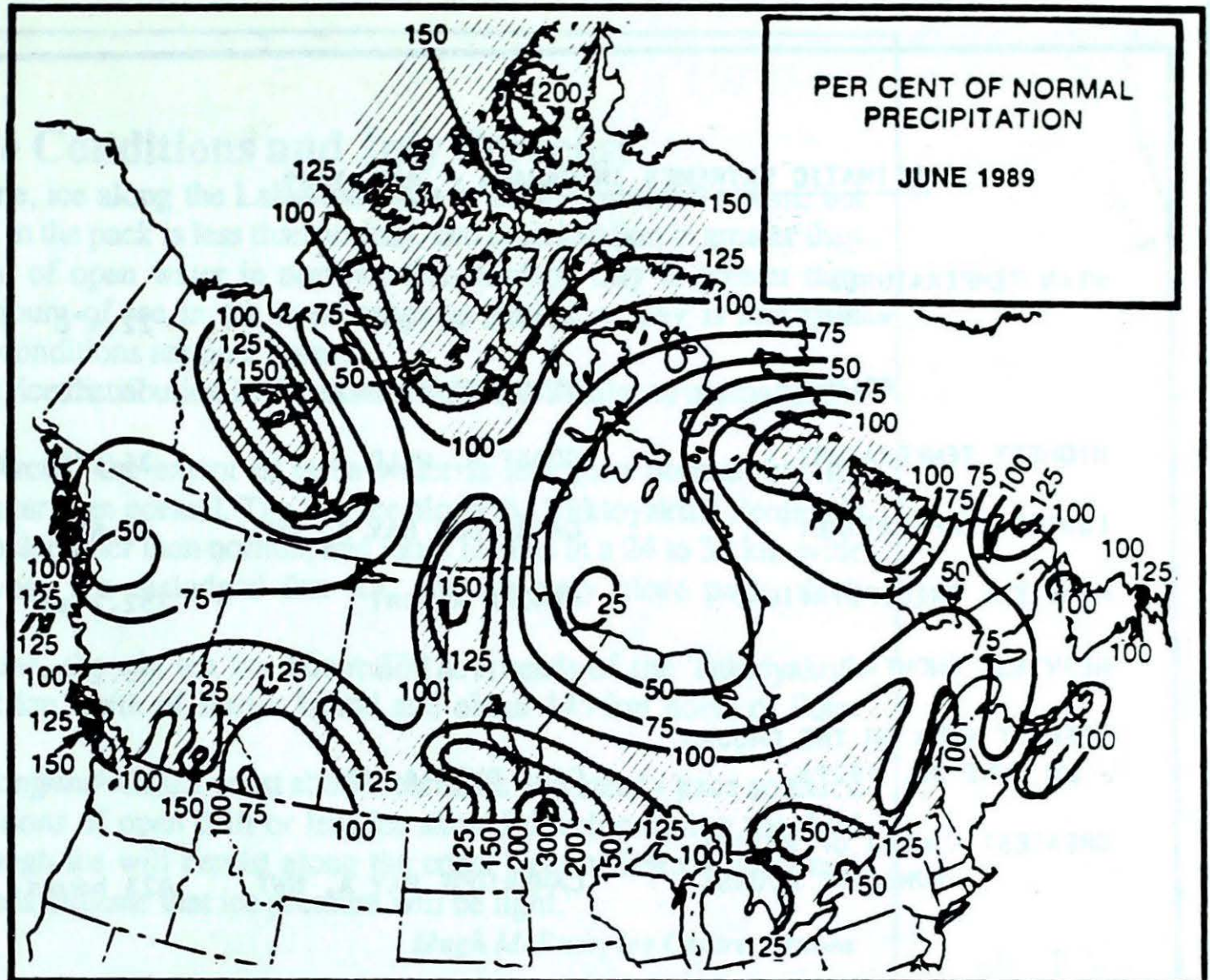
In Alberta, above-normal rainfall occurred in central regions, while there were some dry pockets in the very northern and southern parts of the province. It was wet over most regions of the other prairie provinces, except for some dry areas in south-eastern Saskatchewan and southwestern Manitoba. Gimli recorded over 200 mm for the month, and Winnipeg, 150 mm. Some localized flooding occurred on the 11th and 12th when over 200 mm fell at Langruth, Manitoba.

Several outbreaks of severe weather occurred across the Prairies during the month, with hail and damaging winds occurring on a number of occasions. From the beginning of the season up to the end of June, there were 11 individual tornado sightings in Saskatchewan alone, some of which caused considerable damage. On the 30th, a tornado ripped through the Poundmaker Indian Reserve near Cutknife, Sask. Seventy of the 100 houses on the reserve were damaged and nine people were taken to hospital. At Cutknife, a senior citizens home was damaged and six people had to be taken to hospital.

ONTARIO

Mean temperatures averaged close to normal over practically all of the province. The only significant exceptions were areas bordering Lake Superior, where means were up to 1.4°C below normal, and over eastern Ontario, where it was about 1°C above normal.

Most of the province was wet, with rainfall totalling 150 to 200% of normal at many locations. Kenora, with 252 mm, had the wettest June in 52 years. Over parts of southwestern and south-central Ontario, the heavy rains disrupted planting, and soggy fields caused considerable loss to some crops, particularly potatoes and tomatoes. In contrast, much of the eastern part of northern Ontario was dry, with precipitation only half of the normal values. With so much wet, dull weather, sunshine was below normal over most of the



CLIMATIC EXTREMES IN CANADA - JUNE 1989

MEAN TEMPERATURE:		
WARMEST	QUÉBEC A, QUE	22.4°C
COLDEST	RESOLUTE A, NWT	0.2°C
HIGHEST TEMPERATURE:	GOOSE A, NFLD	36.2°C
LOWEST TEMPERATURE:	CAMBRIDGE BAY A, NWT	-9.5°C
HEAVIEST PRECIPITATION:	KENORA A, ONT	252.2 mm
HEAVIEST SNOWFALL:	IQALUIT A, NWT	28.2 cm
DEEPEST SNOW ON THE GROUND ON JUNE 30, 1989:	CAPE DYER A, NWT	64 cm
GREATEST NUMBER OF BRIGHT SUNSHINE HOURS:	CAMBRIDGE BAY A, NWT	423 hours

of June. The hot, dry weather caused several severe forest fires in Labrador, but cool, damp weather towards the end of the month brought considerable relief to fire-fighting crews. On the 26th, the mercury at Goose Bay failed to rise above 8°C.

Cloudy, dull weather, with precipitation generally above normal, occurred over Nova Scotia and over the Avalon Peninsula of Newfoundland. The remainder of the Maritimes and practically all of Newfoundland and Labrador were dry, with some stations reporting only half of their normal June precipitation. On a surprise note, cold air flooded across Labrador on the 29th, and Nain received 22 cm of wet snow. A line of severe thunderstorms crossed the Maritimes on the 28th, causing a number of power outages in Nova Scotia.

province. North Bay received only 192 hours, the least June amount in 21 years.

June, fortunately, was a month nearly free of severe weather. There have been no tornadoes confirmed up to the end of June, whereas 5 to 10 would normally have been reported up to this time.

QUÉBEC

Mean temperatures for the month of June averaged near normal over much of central and southern Québec, although some stations in the Ottawa Valley reported means of 1 to 2°C above normal. Very hot weather occurred over much of northern Québec during most of the last ten days of June, raising the departures to 2 to 3°C above normal for the month. New all-time high temperature records for any month of the year were set at Kuujuaq, with 32.7°C on June 22nd, and at Schefferville, 34.3°C on the 24th, while at Kuujuarapik, the 33.9°C on the 22nd tied the all-time record. In the Fermont-Wabush area, it was the warmest June ever.

Most locations over the south reported precipitation totals close to normal.

Matagami was the wettest location, reporting 161 mm. Precipitation was light in northern locations along James Bay and Hudson Bay. Inukjuak received 9.6 mm which is 28% of normal. Sunshine was generally below normal in southern Québec, but above normal in the north. The dry, hot weather in northern Québec caused some severe forest fires, particularly near the Labrador border. However, the total area burned by forest fires this year was well below normal values. Very little severe weather was reported this month. There have been no sightings of tornadoes so far this year.

ATLANTIC PROVINCES

Mean temperatures for the month ranged from near to slightly above normal over the Maritime Provinces, to 2 to 3°C above normal over most of Labrador. The island of Newfoundland was also warm, with departures of 1 to 2°C. Some particularly hot weather occurred over Labrador, as the temperature on the 25th soared to 36.2°C at Goose Bay and 35.3°C at Cartwright, both the highest ever for the month



Ice Conditions and July Forecast

At the end of June, ice along the Labrador coast is about normal in extent, but concentration of ice in the pack is less than normal, and deterioration is greater than normal. The amount of open water in northwestern Hudson Bay is greater than normal, and the amount of ice in the approaches to Frobisher Bay is less than normal. Otherwise, conditions are near normal.

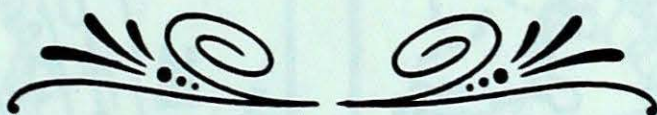
For the most part, ice distribution in the eastern Arctic is similar to normal at the end of June.

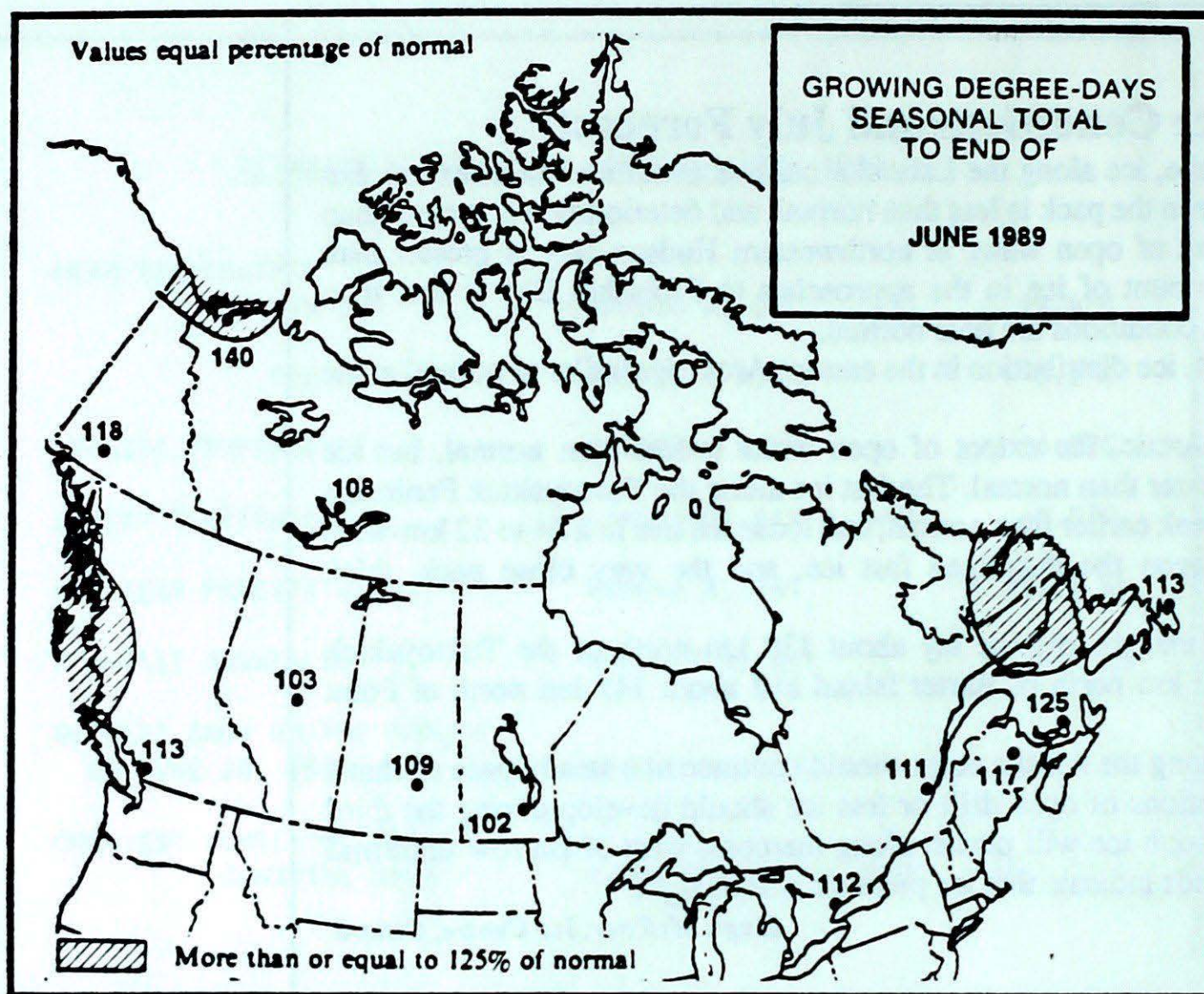
In the western Arctic, the extent of open water is less than normal, but ice deterioration is greater than normal. The fast ice along the Tuktoyaktuk Peninsula fractured about a week earlier than normal, and loose ice lies in a 24 to 32 km-wide band offshore between the dislodged fast ice, and the very close pack, thick first-year ice.

At the end of June, the old ice lay about 130 km north of the Tuktoyaktuk Peninsula, about 32 km north of Barter Island and about 145 km north of Point Barrow.

Melting of ice along the Alaska coast should continue at a steady pace so that a route through conditions of open drift or less ice should develop during the third week of July. Although ice will persist along the coast west of Barrow until mid July, favourable winds indicate that ice pressure will be light.

Hugh McRuer, Ice Centre, Ottawa





SEASONAL TOTAL OF GROWING DEGREE-DAYS TO END OF JUNE

1989 1988 NORMAL

BRITISH COLUMBIA

Abbotsford	693	646	572
Kamloops	827	*	746
Penticton	776	*	694
Prince George	323	*	278
Vancouver	670	659	593
Victoria	604	569	545

ALBERTA

Calgary	257	556	237
Edmonton Mun.	336	575	327
Grande Prairie	326	*	289
Lethbridge	302	670	283
Peace River	284	422	253

SASKATCHEWAN

Estevan	536	842	505
Prince Albert	440	564	417
Regina	523	798	480
Saskatoon	472	781	472
Swift Current	423	*	444

MANITOBA

Brandon	479	*	472
Churchill	*	26	*
Dauphin	525	600	459
Winnipeg	543	*	507

ONTARIO

London	605	684	549
North Bay	506	*	451
Ottawa	628	684	557
Thunder Bay	356	377	368
Toronto	609	643	546
Trenton	649	624	599
Windsor	742	832	738

QUEBEC

Baie Comeau	312	*	296
Maniwaki	575	517	498
Montréal	719	669	655
Québec	571	513	515
Sept-Îles	292	212	235
Sherbrooke	580	471	478

NEW BRUNSWICK

Charlo	367	371	345
Fredericton	592	480	508
Moncton	524	387	434

NOVA SCOTIA

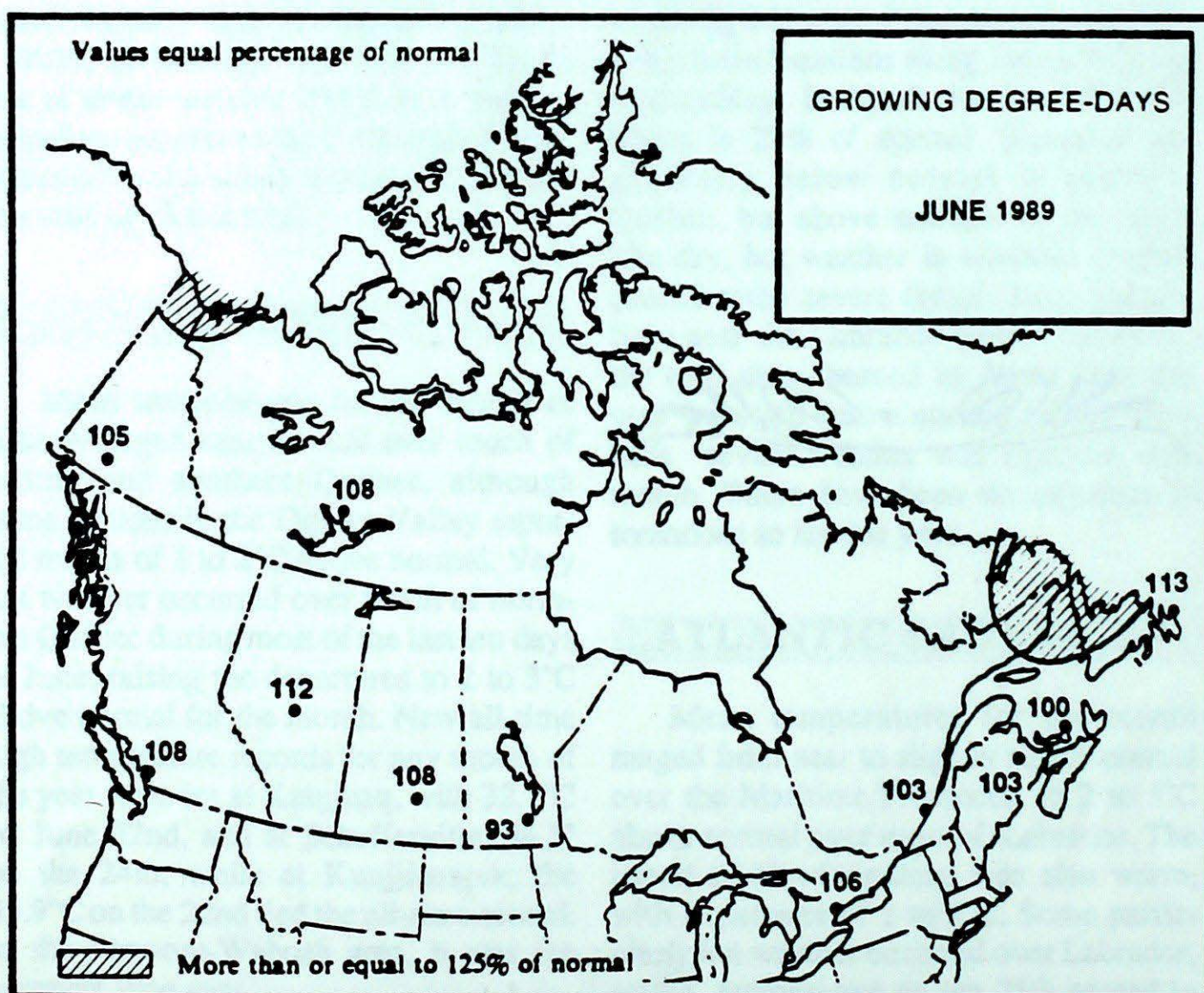
Sydney	292	325	270
Yarmouth	476	*	381

PRINCE EDWARD ISLAND

Charlottetown	487	356	391
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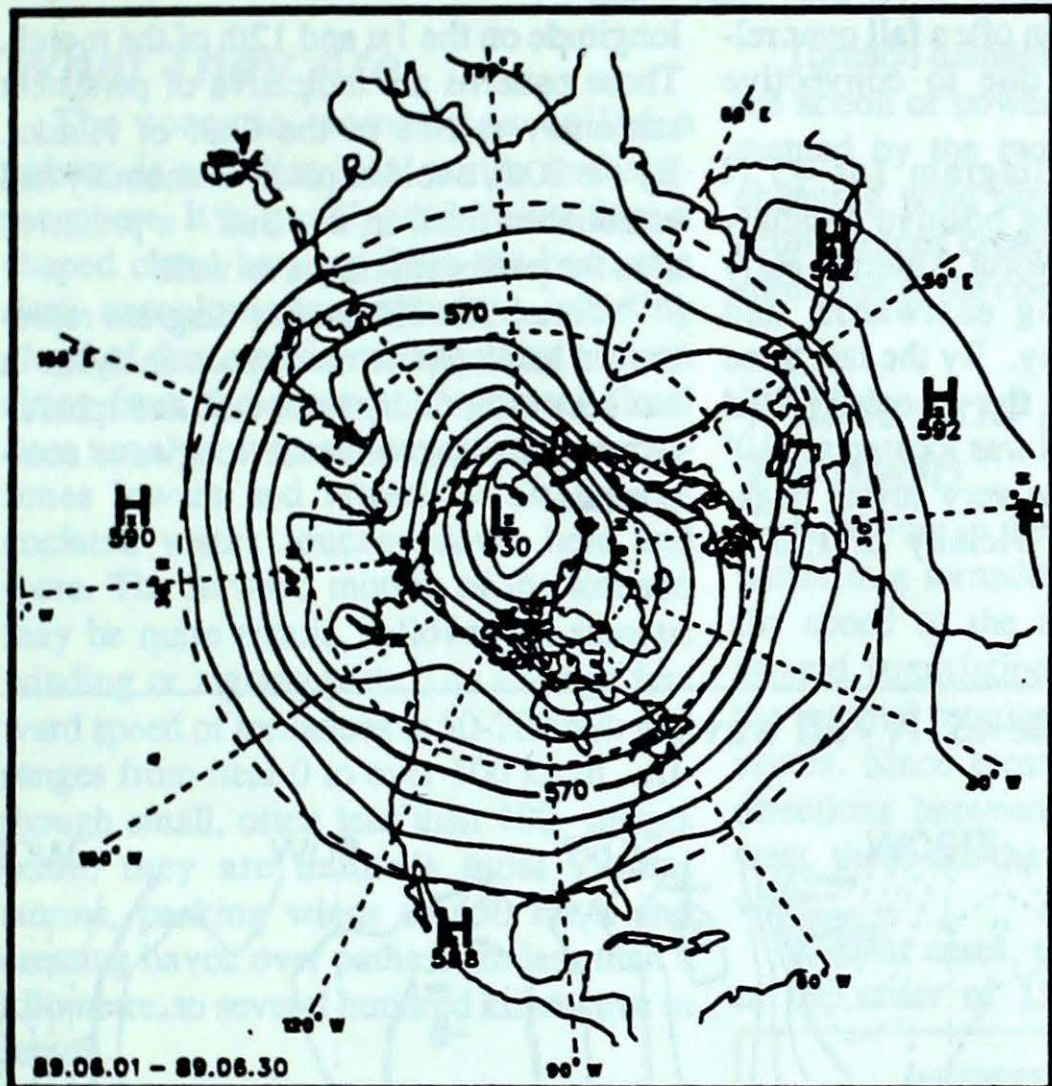
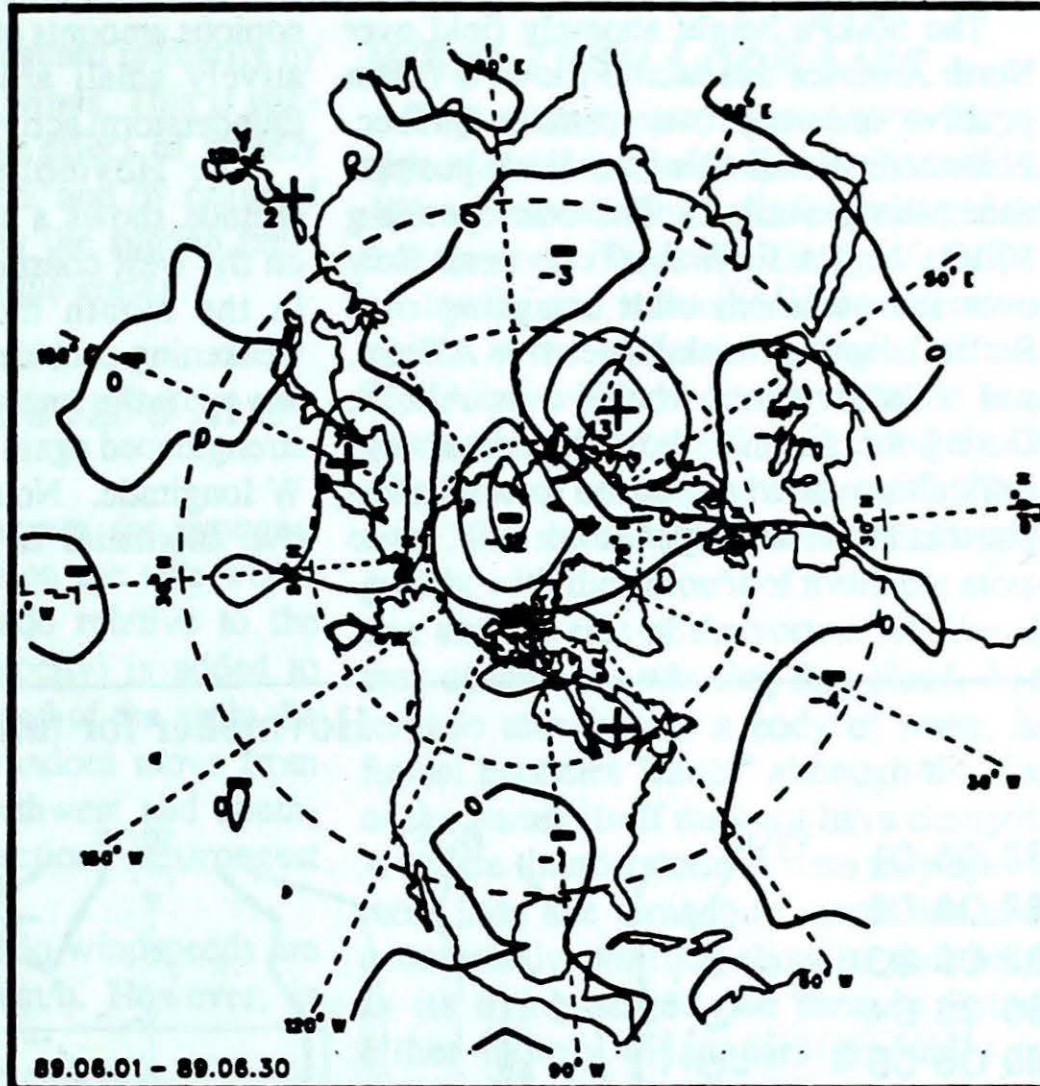
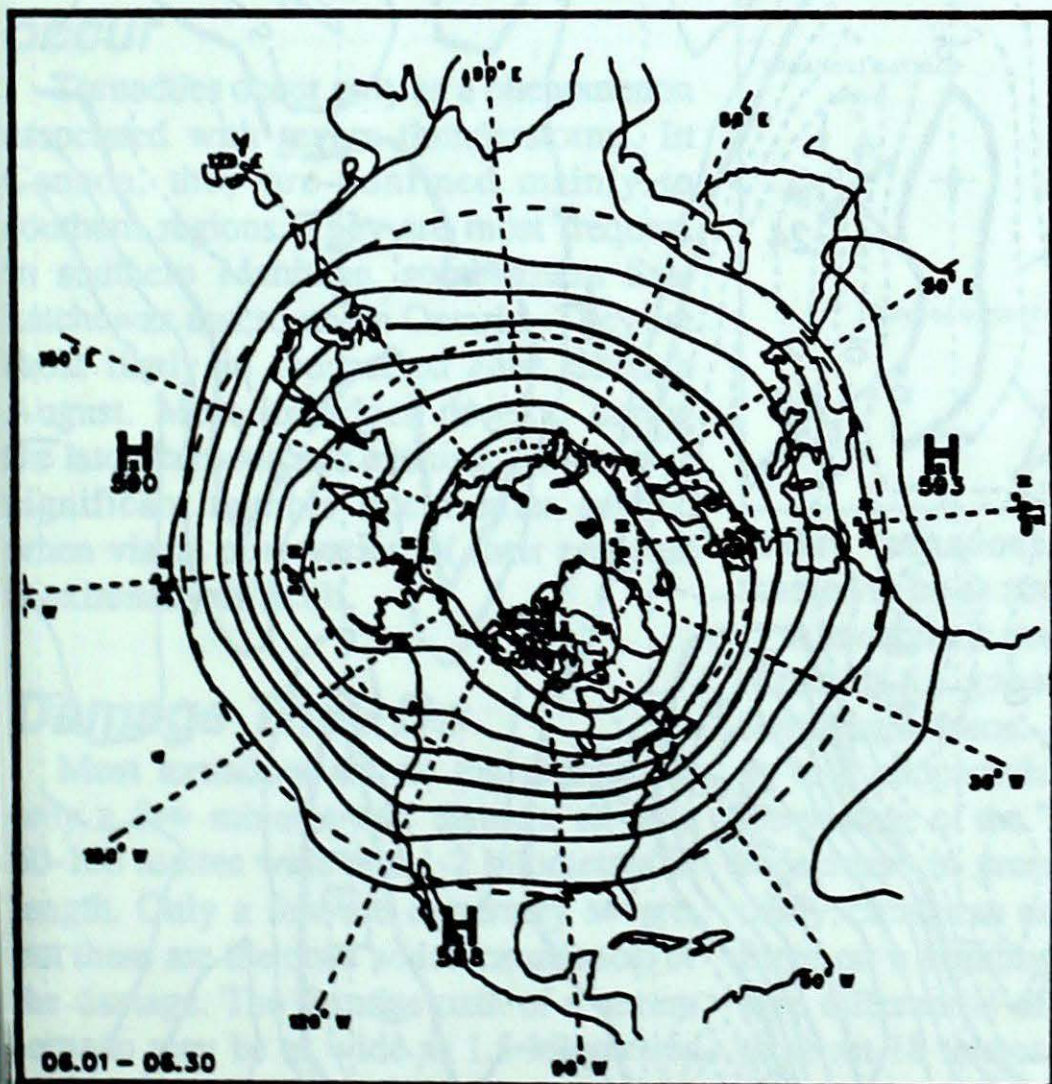
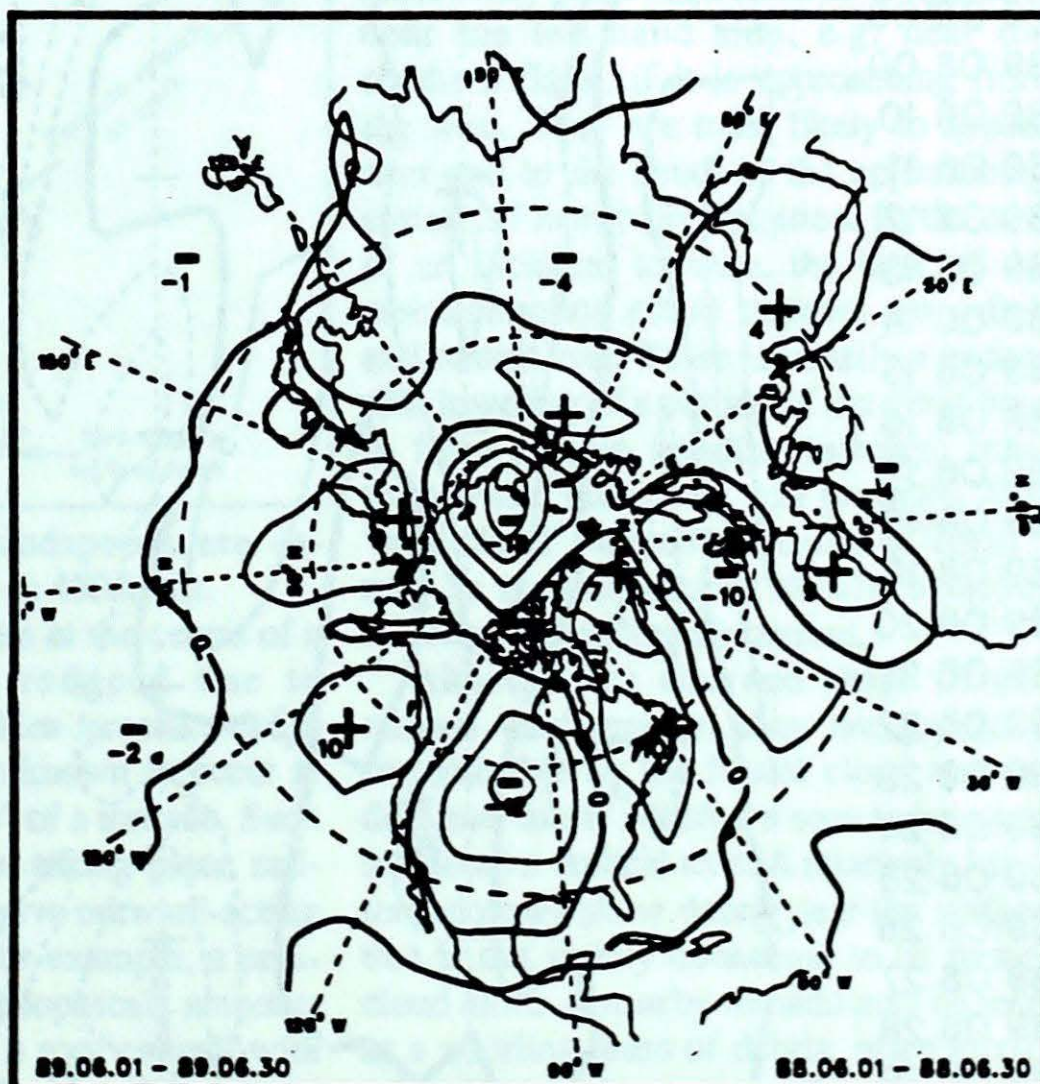
NEWFOUNDLAND

Gander	113	168	98
St. John's	98	*	87
Stephenville	381	262	266



50-kPa ATMOSPHERIC CIRCULATION

June 1989

Mean geopotential heights
- 5 decametre interval -Mean geopotential height anomaly
- 5 decametre interval -Normal geopotential heights for the month
- 5 decametre interval -Mean heights difference w/r to previous month
- 5 decametre interval -

50-kPa ATMOSPHERIC CIRCULATION

May 1989

The 50-kPa height anomaly field over North America this month shows a 7 dam positive anomaly over central Québec. Elsewhere across Canada, weak positive anomalies prevailed. The corresponding 50-kPa height field shows a weak flow over the continent with troughing over Baffin Island, a weak ridge over Alberta, and a rather sharp trough over Alaska. During the summer months, it is always difficult to infer organized precipitation patterns from the upper level flow, since

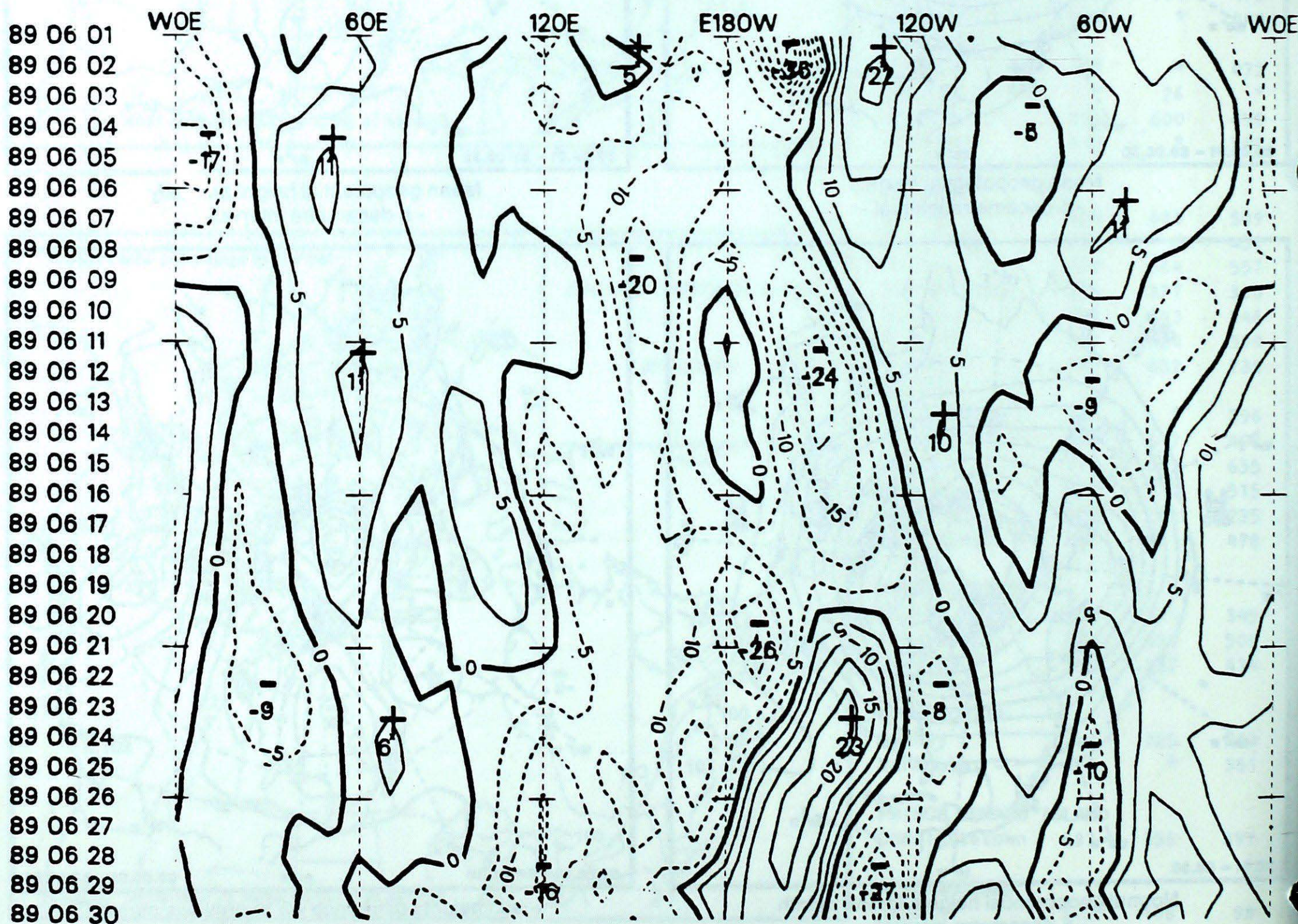
copious amounts of rain often fall over relatively small areas, due to convective thunderstorm activity.

The Hovmöller diagram for 45°N latitude shows a strong positive anomaly on the west coast of North America early in the month moving eastwards, and weakening considerably. By the last three days of the month, the anomaly had strengthened again and was located at 110° W longitude. Note the very strong negative anomalies in the vicinity of 150°W

longitude on the 1st and 12th of the month. These patterns are indicative of persistent stationary storms in the Gulf of Alaska. By the 20th, a robust positive anomaly had established itself in the Gulf - a preferred area for persistent ridges as well.

* Note: The Hovmöller diagram represents a hemispheric time-space analysis. It has been temporally smoothed and spatially normalized to enhance longwave components.

Hovmöller for latitude 45° N - all waves



TORNADOES

What They Are

The tornado, sometimes called a twister, is a violent local vortex in the atmosphere. It is usually visible as a funnel shaped cloud hanging from the base of a dark cumulonimbus cloud. A whirling cloud of dust and debris can often be seen rising from the ground. The funnel cloud does not always reach the ground. It sometimes lowers and retracts while the associated vortex touches down here and there. The forward motion of the tornado may be quite erratic, following a sinuous winding or zig-zag path. The average forward speed of tornadoes is 50-70 km/h and ranges from near 0 to over 100 km/h. Although small, often less than 100 metres wide, they are nature's most violent storms, packing winds to 450 km/h and creating havoc over paths from less than a kilometre, to several hundred kilometres in length.

Where and when they occur

Tornadoes occur only as a phenomenon associated with severe thunderstorms. In Canada, they are confined mainly to southern regions. They are most frequent in southern Manitoba, southeastern Saskatchewan and southern Ontario. They are most likely in the period June through August. Most tornadoes develop during the late afternoon and evening. However, a significant number occur after sunset, when visual observation of their progress is extremely difficult.

Damage They Do

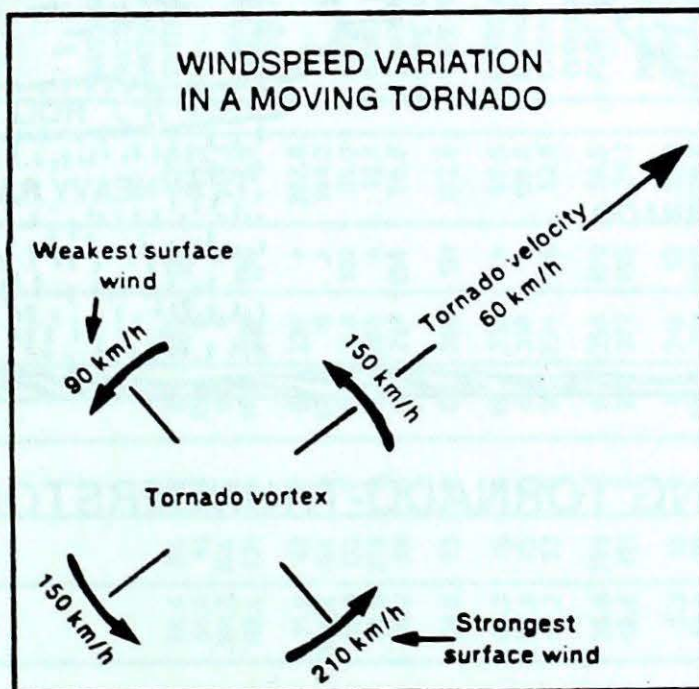
Most tornadoes are on the ground for only a few minutes and damage an area 50-100 metres wide and 1-2 kilometres in length. Only a few are extremely severe, but these are the ones which cause most of the damage. The damage path of a severe tornado may be as wide as 1.5 kilometres and cover a distance of up to 350 kilometres.

Tornado damage is caused primarily by the action of powerful winds. This is augmented by the twisting effect of rapidly changing wind direction, and by outward acting forces created by the sudden pressure-drop at the core of the vortex.

Winds and Pressure in a Tornado

As shown in the diagram, the strongest winds in a tornado are on the side where the speed of the tornado relative to the ground (translation velocity) is added to the internal rotating speed of the air in the vortex. Since most tornadoes move from directions between northwest and southwest, these are the directions of strongest wind.

In most cases, tornado windspeeds are in the order of 150 km/h. However, in



severe tornadoes, windspeeds are estimated to be as strong as 450 km/h.

Atmospheric pressure at the centre of a tornado is greatly reduced due to centrifugal force. Sudden pressure-drops up to 8 kilopascals are known to occur at the passage of the "eye" of a tornado. Such a decrease in pressure, taking place suddenly, creates an explosive outward-acting force on a building. For example, a pressure differential of 4 kilopascals amounts to about 18 tonnes on a roof or wall with dimensions of 3 m x 15 m.

What They Look Like

Tornadoes appear first as a cone-shaped appendage (funnel cloud) at the base of the dark and threatening cumulonimbus of the thunderstorm. Typically, the tip of the funnel lowers and a cloud of debris becomes visible at the surface and begins to rise. The outer whirl of dust and debris may obscure much of the funnel cloud which may, or may not, extend to the earth's surface. The size of the funnel cloud varies greatly with the amount of available moisture and the size of the vortex. At times it may obscure the whirling dust cloud. As a tornado moves over a body of water, its funnel becomes "fatter" although the size of the vortex itself may not have changed. A severe thunderstorm system may spawn more than one tornado in succession and, occasionally, whirling about its periphery. In its dying stages, the tornado funnel either simply disappears gradually or retracts into the cloud base.

In an approaching thunderstorm, the most likely place for a tornado to appear is near the left-hand side, e.g. near the southern flank, if it is approaching from the west. They are most likely to appear near and to the south of the approaching curtain of heavy precipitation. In the case of an incipient tornado, the base of the cumulonimbus cloud appears very dark and tumultuous. There is usually a noticeable lowering of a portion of the cloud base to form a large swirling turbulent mass from which the funnel will protrude. This "wall cloud", sometimes called a "collar", may be seen as rotating slowly, evidence of inward spiralling air current.

Although the size and shape of tornadoes vary greatly, they are generally recognizable by the funnel cloud and the dust and debris which are seen to be rotating about a vertical axis. A relatively "dry" tornado may show debris near the surface that is not visibly connected to its funnel cloud aloft. A nearby tornado may be seen as a whirling mass of debris, often mixed with mud and water (and heard by its tremendous roar, which may be likened to that of an express train, only louder, or that of a nearby jet engine).

Tornado Safety

The following basic principles may be used in order to minimize the danger of injury when a tornado threatens.

- In open country, avoid an approaching tornado by moving away from its path at a right angle. If there is not time to escape, lie flat in a ditch or a ravine for protection against flying debris. Hold onto the base of a small tree or shrub to avoid being lifted or rolled away.

- In built-up areas, seek shelter in a sturdy building. Go to an interior hallway on the lower floor. Avoid possible flying glass by keeping away from windows. Avoid buildings with wide free-span roofs such as shopping markets, gymnasiums and auditoriums.

- In homes, seek shelter in the basement under a sturdy table or under a stairway. If there is no basement, go to a small room or

interior hallway. The side of the building facing away from it is generally less hazardous than the one facing towards an on-coming tornado. Open one or two windows on the leeward side to reduce the explosive effect of suddenly reduced outside air pressure.

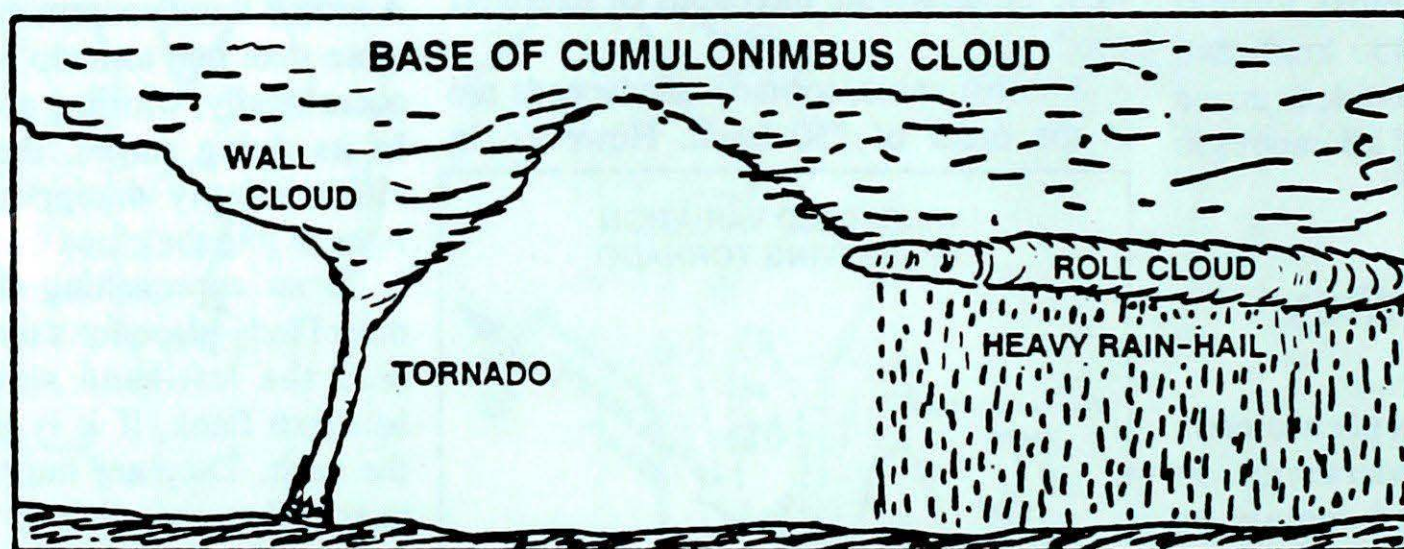
- Mobile homes are particularly vulnerable to overturning and severe damage. They may be made more secure by means of cables anchored in concrete. Nevertheless, in the face of a tornado threat it would be advisable to seek a more secure place.

Remember, recent studies have shown that the principal effects of a large tornado, in order of importance are:

- disintegration of buildings due to wind pressure, - injuries and damage by wind-driven objects and by debris falling from collapsing higher portions of buildings, - explosive pressure differential created by

the passage of the centre of the tornado vortex.

Finally, attention is directed to the fact that the Weather Service is able to identify conditions in which severe thunderstorms are likely. Special forecasts in the form of advisories or "Watch" bulletins are issued and broadcast. It should be noted that even when a relatively small area, such as one about 80 kilometres wide and 150 kilometres long, has been identified as one in which a special "Watch" should be kept, the chance of actually experiencing a tornado at any particular location is only about one in a thousand. Consequently, a TORNADO WARNING is very rare and only issued when a tornado or a funnel cloud has actually been reported. When severe thunderstorms threaten, it is a good practice to keep a "Weather-Eye" open and to have a plan of action in mind.



APPROACHING TORNADO-THUNDERSTORM

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 A	16.5	1.8	32.6	6.9	0.0	*	54.4	84	0	8	253	117	62.4
ALERT BAY	12.6	0.3	21.2	6.4	0.0	*	59.9	91	0	12	0	*	162.2
AMPHITRITE POINT	13.1	0.7	23.2	7.7	0.0	*	151.2	164	0	9	0	*	144.1
BLUE RIVER A	14.7	0.9	30.6	2.9	0.0	*	112.6	131	0	17	216	109	0.0
CAPE ST JAMES	11.3	0.7	17.1	6.8	0.0	*	71.6	97	0	8	229	*	202.0
CAPE SCOTT	11.8	0.6	15.5	8.0	0.0	*	109.6	104	0	12	0	*	194.2
CASTLEGAR A	17.8	0.9	32.0	6.3	0.0	*	70.3	122	0	11	258	107	35.0
COMOX A	16.2	1.2	32.2	6.4	0.0	*	74.9	213	0	11	289	*	72.7
CRANBROOK A	16.7	1.8	29.5	3.6	0.0	*	26.2	59	0	8	297	104	50.8
DEASE LAKE	11.9	1.5	25.1	-1.1	0.0	0	31.8	73	0	8	262	121	182.8
FORT NELSON A	16.6	2.2	32.8	6.1	0.0	0	48.2	78	0	11	331	*	58.6
FORT ST JOHN A	15.4	1.9	29.4	5.0	0.0	0	50.9	75	0	9	310	*	89.4
HOPE A	17.2	1.4	33.1	7.4	0.0	*	47.3	73	0	8	234	104	52.9
KAMLOOPS A	19.0	1.8	33.8	7.1	0.0	*	36.8	123	0	9	256	100	30.5
KELOWNA A	17.7	1.6	33.9	5.2	0.0	*	48.6	191	0	7	272	100	34.1
LYTTON	20.0	2.0	35.8	9.1	0.0	*	3.3	18	0	1	245	92	22.0
MACKENZIE A	13.7	1.3	29.2	0.0	0.0	*	51.0	72	0	10	271	108	129.6
PENTICTON A	19.0	1.8	33.9	7.3	0.0	*	46.3	164	0	5	272	103	17.6
PORT ALBERNIA	15.8	1.5	33.5	4.5	0.0	*	63.8	165	0	10	241	*	78.1
PORT HARDY A	12.6	0.8	23.6	5.2	0.0	*	80.1	113	0	11	230	134	161.2
PRINCE GEORGE A	14.3	1.4	30.0	-0.9	0.0	*	40.9	61	0	8	260	100	115.0
PRINCE RUPERT A	11.6	0.9	17.9	4.1	0.0	*	37.8	38	0	5	224	148	189.6
PRINCETON A	15.6	1.1	30.6	1.3	0.0	*	28.7	108	0	8	288	*	0.0
QUESNEL A	*	*	*	*	*	*	*	*	*	*	*	*	*
REVELSTOKE A	17.3	1.5	32.7	7.0	0.0	*	87.9	131	0	15	231	107	46.6
SANDSPIT A	13.5	1.9	23.5	11.8	0.0	*	81.0	157	0	10	247	141	136.6
SMITHERS A	14.1	1.6	30.0	0.4	0.0	*	12.7	32	0	5	276	111	122.2
TERRACE A	15.4	1.7	29.5	4.3	0.0	*	20.2	48	0	4	275	144	88.1
VANCOUVER INT'L A	16.1	1.8	26.1	8.1	0.0	*	49.6	110	0	7	265	111	66.1
VICTORIA INT'L A	15.1	0.8	30.7	6.1	0.0	*	22.6	78	0	4	271	105	96.7
VICTORIA MARINE	13.4	0.9	26.9	5.2	0.0	*	29.0	121	0	6	0	*	141.1
WILLIAMS LAKE A	14.2	1.2	29.3	9.9	0.0	0	47.8	106	0	9	279	98	116.6

STATION	Temperature C				Snowfall (cm)	%	Total	%	Snow on ground at end of month (cm)	No. of days with Precip 1.0 mm or more	Bright Sunshine (hours)	%	Degree Days below 18 C
	Mean	Difference from Normal	Maximum	Minimum									
YUKON TERRITORY													
DAWSON A	14.2	*	27.1	0.5	0.0	*	39.0	*	0	*	*	*	*
MAYO A	15.2	1.8	27.3	2.0	0.0	*	32.7	93	0	*	*	*	*
WATSON LAKE A	14.1	1.4	27.6	0.5	0.0	*	26.4	51	0	7	339	128	119.5
WHITEHORSE A	12.6	0.6	25.2	0.4	0.0	0	24.1	79	0	5	272	100	163.4
NORTHWEST TERRITORIES													
ALERT	1.8	2.0	9.0	-3.2	21.4	218	24.0	198	1	8	233	77	495.0
BAKER LAKE A	3.6	-0.5	18.1	6.2	6.8	243	20.6	99	0	4	328	125	433.7
CAMBRIDGE BAY A	8.5	7.0	20.1	-9.5	4.2	105	17.8	135	0	4	423	158	395.9
CAPE DYER A	0.3	0.1	7.8	-7.2	11.6	40	13.4	34	64	5	*	*	532.6
CAPE PARRY A	4.1	2.5	19.6	-2.7	0.4	13	11.5	80	0	2	*	*	416.3
CLYDE A	0.8	0.2	11.4	-8.8	9.5	99	15.7	126	0	5	276	106	518.6
COPPERMINE A	7.4	3.6	24.4	-6.2	0.6	23	8.2	48	0	3	415	134	319.5
CORAL HARBOUR A	3.8	0.9	17.8	-4.4	2.6	32	10.5	39	0	3	270	96	450.3
EUREKA	2.2	0.4	8.5	-2.7	6.8	283	12.6	233	0	5	319	79	474.7
FORT RELIANCE	10.6	1.1	28.6	-4.2	1.0	77	16.8	64	0	6	*	*	226.5
FORT SIMPSON A	15.7	1.1	33.1	3.9	0.0	*	39.7	101	0	6	320	114	184.4
FORT SMITH A	14.8	1.2	30.7	1.1	0.0	0	21.8	53	0	9	281	*	112.2
IGALUIT	3.8	0.4	15.5	-3.6	28.2	279	45.6	116	0	6	139	80	424.6
HALL BEACH A	1.7	1.7	12.3	-5.9	2.0	32	8.4	50	0	3	*	*	489.7
HAY RIVER A	13.5	1.6	34.0	0.8	0.0	0	28.2	105	0	7	*	*	135.6
INUVIK A	12.3	2.2	27.0	-0.2	0.8	36	20.2	86	0	6	355	95	178.2
MOULD BAY A	0.7	1.0	8.1	-6.1	0.8	23	8.6	137	0	2	240	98	484.9
NORMAN WELLS A	14.9	0.9	30.1	2.2	0.0	0	60.5	164	0	8	260	84	109.1
POND INLET A	2.3	*	15.5	-6.4	0.4	*	20.6	*	0	2	32	*	46.1
RESOLUTE A	0.2	0.8	6.4	-5.0	4.4	63	15.2	126	0	6	257	100	533.7
YELLOWKNIFE A	13.8	0.9	28.1	3.1	0.0	0	28.5	170	0	9	367	93	130.5
ALBERTA													
BANFF	12.9	1.3	28.0	1.5	0.0	0	52.4	85	0	6	*	*	*
CALGARY INT'L A	14.3	0.8	28.1	3.0	0.0	0	80.7	90	0	16	291	109	114.2
COLD LAKE A	14.6	0.1	25.3	2.4	0.0	*	69.0	96	0	14	213	75	102.3
CORONATION A	14.8	0.4	30.7	1.5	0.0	*	78.4	136	0	11	265	86	101.6
EDMONTON INT'L A	14.7	0.6	30.3	3.6	0.0	*	80.6	105	0	12	287	100	102.7
EDMONTON MUNICIPAL	15.5	0.4	29.7	5.3	0.0	*	83.4	108	0	13	285	105	81.0
EDMONTON NAMAO A	14.6	-0.1	29.5	4.2	0.0	0	90.9	117	0	14	*	*	103.0
EDSON A	13.4	0.9	29.6	-1.0	0.0	0	144.0	120	0	12	267	105	139.0

JUNE 1989

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 CHIPEWYAN A	14.4	0.2	30.0	-1.0	0.0	*	28.8	62	0	*	*	*	*
FORT McMURRAY A	14.4	0.4	27.6	4.6	0.0	*	91.8	143	0	13	224	82	115.3
GRANDE PRAIRIE A	15.0	1.3	30.0	3.5	0.0	*	83.7	120	0	12	312	*	99.1
HIGH LEVEL A	14.7	0.3	29.2	2.6	0.0	*	44.8	65	0	8	314	103	105.1
JASPER	13.8	1.2	28.2	2.2	0.0	*	55.2	101	0	11	239	*	131.2
LETHBRIDGE A	16.2	0.8	30.3	6.2	0.0	0	77.1	99	0	8	300	*	71.8
MEDICINE HAT A	17.3	0.7	33.5	3.2	0.0	*	32.4	51	0	9	327	117	49.0
PEACE RIVER A	15.0	1.3	29.8	2.8	0.0	*	36.1	61	0	6	*	*	96.8
RED DEER A	14.4	0.8	29.3	2.8	0.0	0	76.9	91	0	15	*	*	111.2
ROCKY MTN HOUSE A	13.1	0.3	29.0	0.2	0.0	0	91.4	88	0	11	*	*	147.8
SLAVE LAKE A	13.9	0.3	26.5	1.5	0.0	*	75.0	77	0	10	285	104	126.9
SUFFIELD A	16.7	*	32.4	2.7	0.0	*	29.4	*	0	8	303	*	61.1
WHITECOURT A	14.0	1.3	28.4	0.2	0.0	0	117.6	128	0	14	*	*	122.7
SASKATCHEWAN													
BROADVIEW	15.4	0.2	32.7	0.5	0.0	*	67.2	114	0	11	269	91	93.4
COLLINS BAY	10.6	*	26.7	-1.9	0.0	*	81.2	*	0	11	238	*	225.5
CREE LAKE	12.1	-1.4	25.6	-2.2	0.0	0	54.4	85	0	7	237	89	179.3
ESTEVAN A	16.3	-0.2	33.2	0.2	0.0	*	49.7	64	0	9	289	96	73.0
HUDSON BAY A	*	*	*	*	*	*	*	*	*	*	*	*	*
KINDERSLEY	16.1	0.4	35.4	3.1	0.0	*	53.0	93	0	11	302	*	77.7
LA RONGE A	*	*	*	*	*	*	*	*	*	*	*	*	*
MEADOW LAKE A	14.5	*	28.9	3.1	0.0	*	69.0	*	0	14	229	*	109.3
MOOSE JAW A	16.0	0.2	33.9	3.8	0.0	*	96.1	145	0	11	289	102	63.9
NIPAWIN A	15.7	*	30.4	2.1	0.0	*	91.2	*	0	13	300	*	82.0
NORTH BATTLEFORD A	*	*	*	*	*	*	*	*	*	*	*	*	*
PRINCE ALBERT A	16.0	1.4	32.3	3.0	0.0	*	48.9	71	0	9	285	109	78.7
REGINA A	16.5	0.6	35.4	4.4	0.0	*	79.3	100	0	11	274	97	72.3
SASKATOON A	16.4	0.7	34.3	4.7	0.0	*	61.3	104	0	9	*	*	71.4
SWIFT CURRENT A	15.4	0.3	32.9	3.5	0.0	*	96.7	128	0	10	291	104	97.2
WYNYARD	15.3	-0.1	31.4	3.8	0.0	*	108.4	147	0	11	269	92	100.6
YORKTON A	15.0	-0.5	31.3	2.2	0.0	*	112.3	159	0	7	269	93	103.8
MANITOBA													
BRANDON A	15.1	-1.0	31.1	0.7	0.0	*	62.4	81	0	12	234	*	96.9
CHURCHILL A	5.5	-0.7	27.1	-3.6	0.6	17	20.4	47	0	5	215	92	376.1
DAUPHIN A	15.6	-0.2	31.8	0.5	0.0	*	132.9	154	0	11	263	96	90.5
GILLAM A	10.5	-0.4	31.1	-2.8	0.0	0	13.6	24	0	5	*	*	241.3
GIMLI	15.3	*	29.7	-1.3	0.0	*	203.4	*	0	100	286	97	99.2
ISLAND LAKE	13.7	-0.3	29.0	-0.5	0.0	0	56.1	87	0	6	*	*	144.8
LYNN LAKE A	11.2	-1.3	28.0	-0.6	0.0	0	103.6	152	0	12	235	89	203.4
NORWAY HOUSE A	13.8	*	29.7	0.5	0.0	*	30.0	*	0	8	*	*	135.9

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									
PORTAGE LA PRAIRIE	16.3	-0.7	31.0	-1.6	0.0	*	133.8	176	0	11	*	*	71.3
THE PAS A	16.1	1.7	31.2	5.0	0.0	0	63.9	101	0	11	*	*	71.2
THOMPSON A	11.3	-0.9	18.7	3.9	0.6	15	39.1	53	0	7	273	104	205.7
WINNIPEG INT'L A	16.4	-0.4	30.6	-0.8	0.0	*	150.2	188	0	12	279	101	70.6
ONTARIO													
BIG TROUT LAKE	11.7	-0.3	29.4	-1.8	*	*	33.2	50	0	4	236	*	199.4
EARLTON A	15.0	-0.2	29.8	0.0	0.0	0	12.2	126	0	17	*	*	115.9
GERALDTON A	13.0	*	28.6	-2.4	0.0	*	61.6	*	0	8	*	*	160.4
GORE BAY A	15.5	-0.1	27.6	4.1	0.0	*	80.6	138	0	10	*	*	89.1
HAMILTON RBG	18.9	*	32.1	9.7	0.0	*	87.2	*	0	12	232	*	*
HAMILTON A	17.9	0.0	29.7	7.1	0.0	*	89.1	128	0	15	*	*	44.4
KAPUSKASING A	13.8	-0.3	31.0	0.0	0.0	0	93.1	110	0	14	*	*	149.0
KENORA A	16.4	0.3	31.0	1.2	0.0	*	252.2	302	0	14	*	*	70.9
KINGSTON A	17.8	1.4	27.6	7.4	0.0	*	103.6	135	0	9	209	87	42.1
LANSDOWNE HOUSE	*	*	*	*	*	*	*	*	*	*	*	*	*
LONDON A	18.4	0.5	29.6	7.9	0.0	*	93.2	127	0	10	186	76	34.1
MOOSEHORN	11.9	0.0	31.7	-2.9	0.0	0	39.4	50	0	9	206	94	210.3
MUSKOKA A	16.6	0.7	28.6	4.3	0.0	*	115.4	141	0	12	*	*	69.1
NORTH BAY A	16.0	0.3	28.0	5.9	0.0	*	142.4	167	0	11	192	76	87.1
OTTAWA INT'L A	18.9	0.9	32.1	8.6	0.0	*	70.8	96	0	10	226	92	29.2
PETAWAWA A	16.6	0.2	30.5	3.1	0.0	*	54.8	58	0	7	*	*	75.6
PETERBOROUGH A	17.9	1.2	31.0	5.5	0.0	*	97.6	150	0	13	*	*	40.5
PICKLE LAKE	13.7	-0.2	28.7	-1.0	*	*	82.5	94	0	11	*	*	150.1
RED LAKE A	14.8	-0.3	30.1	0.4	0.0	0	121.4	140	0	13	284	*	110.1
ST CATHARINES A	19.2	0.7	29.6	9.7	0.0	*	103.2	138	0	12	*	*	21.6
SARNIA A	18.1	0.3	31.4	6.0	0.0	*	81.3	99	0	11	322	118	39.4
SAULT STE MARIE A	14.4	0.0	29.1	-1.4	0.0	*	74.2	89	0	11	219	86	115.5
SIoux LOOKOUT A	15.3	0.1	30.7	2.7	*	*	121.2	132	0	10	*	*	103.5
SUDBURY A	15.9	-0.1	29.5	3.9	0.0	*	160.9	194	0	12	181	74	90.3
THUNDER BAY A	12.6	-1.4	27.7	0.9	0.0	*	98.7	129	0	12	233	89	161.7
TIMMINS A	13.8	-0.8	29.4	-1.2	0.0	0	94.3	105	0	12	*	*	147.3
TORONTO	19.4	*	30.0	11.1	0.0	*	105.8	*	0	10	*	*	16.0
TORONTO INT'L A	18.4	0.7	31.4	7.4	0.0	*	94.7	141	0	11	*	*	31.8
TORONTO ISLAND A	17.9	*	28.5	9.5	0.0	*	91.0	*	0	12	*	*	32.9
TRENTON A	18.5	0.7	28.6	8.0	0.0	*	84.2	132	0	12	*	*	29.5
WATERLOO WELLINGTON	17.8	0.7	30.4	6.5	0.0	*	108.8	147	0	12	*	*	44.1
WAWA A	11.8	*	26.3	-1.5	0.0	*	65.0	*	0	13	*	*	196.9
WIARTON A	15.3	-0.3	29.0	2.7	0.0	*	78.4	117	0	11	207	71	114.9
WINDSOR A	19.8	0.1	32.6	10.3	0.0	*	110.6	124	0	10	*	*	13.5

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									
QUÉBEC													
BAGOTVILLE A	"	"	"	"	"	"	"	"	"	"	"	"	"
BAIE COMEAU A	12.8	0.0	26.0	0.4	0.0	"	68.3	97	0	11	247	105	155.9
BLANC SABLON A	9.2	2.0	21.3	0.0	0.0	0	82.0	88	0	9	210	"	263.5
CHIBOUGAMAU CHAPAIS	13.7	"	33.4	-0.4	0.2	"	89.0	"	0	11	215	92	154.3
GASPE A	13.8	"	29.0	-2.1	0.0	"	65.8	"	0	70	243	"	132.5
MUKJUAQ A	4.9	0.5	17.2	-5.0	2.4	65	9.6	28	0	4	262	136	394.5
KUUJUAQ A	9.0	2.1	32.7	-1.6	0.0	0	41.0	81	0	8	232	129	278.4
KUUJUAUAPIK A	7.2	0.7	33.9	-5.0	9.1	190	31.1	55	0	3	259	139	335.4
LA GRANDE IV A	"	"	"	"	"	"	"	"	"	"	"	"	"
LA GRANDE RIVIERE A	11.4	"	34.3	-3.9	9.4	"	30.5	"	0	5	266	"	222.6
MANIWAKI	17.0	1.1	31.6	3.8	0.0	"	64.0	71	0	7	200	81	68.7
MATAGAMIA	13.0	"	31.6	-1.9	0.0	"	16.1	"	0	11	210	88	176.2
MONT JOLI A	14.4	0.1	26.2	3.1	0.0	"	69.4	111	0	7	249	103	116.6
MONTREAL INT'L A	18.9	0.6	32.7	7.9	0.0	"	84.6	103	0	8	225	90	229.4
MONTREAL MIRABEL V	17.5	"	31.9	6.9	0.0	"	105.4	"	0	9	245	"	53.9
NATASHOUAN A	12.5	2.0	26.4	3.6	0.0	"	61.6	69	0	7	256	112	165.6
QUEBEC A	22.4	6.0	31.9	6.7	0.0	"	121.2	110	0	9	224	100	68.7
ROBERVAL A	15.5	0.0	33.9	2.8	0.0	"	62.6	77	0	8	236	"	112.5
SCHÉFFERVILLE A	11.7	3.1	34.3	-3.7	0.0	0	75.2	102	0	11	227	120	212.9
SEPT-ÎLES A	13.0	1.3	26.8	2.5	0.0	"	81.9	91	0	100	267	114	151.3
SHERBROOKE A	16.5	0.9	31.0	1.6	0.0	"	74.2	76	0	11	213	"	63.7
STE AGATHE DES MONT	16.0	0.8	30.9	5.0	0.0	0	133.6	123	0	10	221	93	83.8
ST HUBERT A	18.5	0.3	32.2	5.6	0.0	"	85.0	99	0	10	196	"	35.4
VAL D'OR A	14.6	0.0	30.7	-0.4	0.0	0	96.0	102	0	10	200	83	130.7
NEW BRUNSWICK													
CHARLO A	14.4	-0.3	29.9	1.4	0.0	"	56.9	67	0	6	226	96	124.7
CHATHAM A	15.8	0.1	31.9	3.8	0.0	"	48.8	60	0	9	211	92	88.4
FREDERICTON A	16.3	0.1	31.1	3.3	"	"	60.8	72	0	8	157	"	73.4
MONCTON A	15.3	0.3	28.0	4.1	0.0	"	69.6	78	0	12	207	92	93.7
SAINT JOHN A	15.2	1.4	28.1	6.2	0.0	"	99.6	106	0	11	209	103	94.5

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													
GREENWOOD A	"	"	"	"	"	"	"	"	"	"	"	"	"
HALIFAX INT'L A	15.4	0.6	26.9	6.7	0.0	"	104.4	117	0	12	"	"	83.5
SABLE ISLAND	11.4	0.4	18.7	6.9	0.0	"	85.2	91	0	11	104	63	197.2
SHEARWATER A	"	"	"	"	"	"	"	"	"	"	"	"	"
SYDNEY A	13.4	0.2	25.4	4.2	0.0	"	99.2	121	0	14	152	67	139.6
YARMOUTH A													
YARMOUTH A	14.1	0.7	22.6	7.0	0.0	"	90.2	111	0	10	184	87	116.6
PRINCE EDWARD ISLAND													
CHARLOTTETOWN A	14.4	-0.1	27.2	4.8	0.0	"	76.2	95	0	14	"	"	112.3
SUMMERSIDE A	14.9	0.0	27.9	5.2	0.0	"	62.7	85	0	12	187	77	99.1
NEWFOUNDLAND													
BONAVISTA	11.3	1.7	25.1	1.0	0.0	0	59.4	93	0	22	"	"	200.5
BURGED	11.4	1.9	21.1	2.5	0.0	"	90.2	66	0	12	"	"	196.5
CARTWRIGHT	9.8	1.4	35.3	-1.2	0.0	0	102.1	131	0	100	184	102	258.7
CHURCHILL FALLS A	12.7	3.0	33.4	-1.0	0.0	0	45.4	44	0	9	275	147	181.1
COMFORT COVE	12.8	0.9	28.0	0.3	0.0	0	48.8	64	0	10	"	"	161.7
DANIELS HARBOUR	11.3	1.5	25.5	1.4	0.0	0	90.0	104	0	10	211	111	200.1
DEER LAKE A	14.1	1.9	30.1	-0.8	0.0	0	63.7	90	0	10	"	"	120.9
GANDER INT'L A	13.0	1.2	26.8	-0.8	0.0	0	53.1	66	0	9	189	103	154.0
GOOSE A	13.7	2.4	36.2	-0.3	0.0	0	73.1	79	0	11	230	123	163.7
MARY'S HARBOUR	9.8	3.6	35.6	-1.2	0.0	0	75.4	95	0	11	"	"	256.6
PORT AUX BASQUES	11.6	2.6	20.4	4.0	0.0	"	99.8	97	0	12	185	"	192.1
ST ANTHONY	9.5	1.4	27.4	-2.0	0.0	0	75.9	76	0	8	"	"	254.6
ST JOHN'S A	11.8	0.9	25.5	0.8	0.0	0	109.4	128	0	9	152	81	189.1
ST LAWRENCE	11.3	3.0	20.1	1.5	0.0	0	98.5	90	0	13	"	"	200.0
STEPHENVILLE A	13.6	1.7	28.9	3.6	0.0	"	69.6	81	0	11	210	110	132.5
WABUSH LAKE A	12.6	2.7	33.2	-0.9	0.0	0	57.2	64	0	10	251	132	155.9

AGROCLIMATOLOGICAL STATIONS

JUNE 1989

STATION	Temperature C				Snowfall (cm)	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)	Degree days above 5 C	
	Mean	Difference from Normal	Maximum	Minimum							This month	Since Jan. 1st
BRITISH COLUMBIA												
AGASSIZ	17.2	1.6	32.0	7.0	0.0	53.4	67	0	9	234	365.3	898.7
KAMLOOPS	2.2	2.2	2.2	2.2	2.2	2.2	22	222	222	22	2.2	2.2
SIDNEY	15.1	0.0	28.5	5.5	0.0	23.7	83	0	6	272	313.8	764.1
SUMMERLAND	18.9	1.5	33.0	6.5	0.0	22.6	74	0	6	280	416.4	879.2
ALBERTA												
BEAVERLODGE	14.6	1.5	29.5	4.0	0.0	68.4	100	0	10	316	287.3	493.3
ELLERSLIE	2.2	2.2	2.2	2.2	2.2	2.2	22	222	222	22	2.2	2.2
LACOMBE	16.5	2.0	30.0	3.0	0.0	46.8	58	0	14	305	285.7	454.1
LETHBRIDGE	2.2	2.2	2.2	2.2	2.2	2.2	22	222	222	22	2.2	2.2
VEGREVILLE	2.2	2.2	2.2	2.2	2.2	2.2	22	222	222	22	2.2	2.2
SASKATCHEWAN												
INDIAN HEAD	15.8	0.2	33.0	1.0	0.0	72.8	99	0	10	22	325.0	637.9
MELFORT	15.8	0.5	32.0	3.0	0.0	64.1	90	0	12	254	325.0	563.5
REGINA	16.4	0.7	35.0	1.0	0.0	88.5	122	0	8	22	340.7	610.0
SASKATOON	2.2	2.2	2.2	2.2	2.2	2.2	22	222	222	22	2.2	2.2
SCOTT	15.5	1.0	31.0	4.0	0.0	69.8	105	0	11	279	314.1	500.5
SWIFT CURRENT	15.6	0.1	32.0	4.0	0.0	117.5	159	0	9	251	318.0	545.1
MANITOBA												
BRANDON	16.2	-0.1	32.7	0.0	0.0	63.0	78	0	8	22	335.3	647.9
GLENLEA	16.9	0.0	31.0	3.5	0.0	97.4	110	0	10	22	362.5	711.5
MORDEN	16.5	-0.9	29.5	-2.0	0.0	184.0	243	0	12	266	343.0	658.5
ONTARIO												
DELHI	18.4	0.1	31.0	6.5	0.0	101.2	142	0	12	22	2.2	735.2
ELORA	17.1	0.0	29.2	5.5	0.0	134.0	154	0	11	22	345.6	603.2
GUELPH	17.5	0.1	29.8	4.4	0.0	118.0	167	0	10	211	374.7	648.3
HARROW	19.5	-0.2	32.0	8.0	0.0	116.4	154	0	8	212	434.1	803.7
KAPUSKASING	13.6	-0.5	30.0	-1.0	0.0	92.6	113	0	14	221	247.4	410.3
OTTAWA	18.9	0.8	31.1	7.2	0.0	105.1	132	0	10	226	417.3	751.0
SMITHFIELD	19.1	1.8	30.8	5.8	0.0	120.0	193	0	11	22	414.4	733.2
VINELAND	18.2	-0.2	29.6	8.0	0.0	94.0	132	0	11	210	396.9	696.7
WOODSLIE	2.2	2.2	2.2	2.2	2.2	2.2	22	222	222	22	2.2	2.2

STATION	Temperature C				Snowfall (cm)	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)	Degree days above 5 C	
	Mean	Difference from Normal	Maximum	Minimum							This month	Since Jan. 1st
QUÉBEC												
LA POCAIERE	15.3	-0.4	30.5	5.0	0.0	87.2	97	0	9	252	311.3	517.0
L'ASSOMPTION	18.4	0.8	32.5	6.5	0.0	77.8	92	0	9	183	2.2	415.3
LENNOXVILLE	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
NORMANDIN	14.5	-0.1	34.5	-1.0	0.0	48.6	63	0	10	229	287.6	501.4
STE.CLOTILDE	18.5	0.8	32.5	4.0	0.0	58.4	68	0	5	233	405.8	743.1
NEW BRUNSWICK												
FREDERICTON	16.9	0.9	30.0	6.0	0.0	57.2	64	0	9	157	350.7	641.3
NOVA SCOTIA												
KENTVILLE	16.6	0.7	28.5	5.0	0.0	100.5	141	0	10	198	348.4	685.6
NAPPAN	15.8	1.1	28.0	2.5	0.0	108.0	138	0	12	191	358.2	622.0
PRINCE EDWARD ISLAND												
CHARLOTTETOWN	15.1	0.2	28.0	4.0	0.0	58.6	80	0	11	190	302.6	573.0
NEWFOUNDLAND												
ST.JOHN'S WEST	12.9	1.8	24.5	1.0	0.0	111.6	140	0	10	135	2.2	394.4