Environment Canada Environnement Canada

Climatic Perspectives

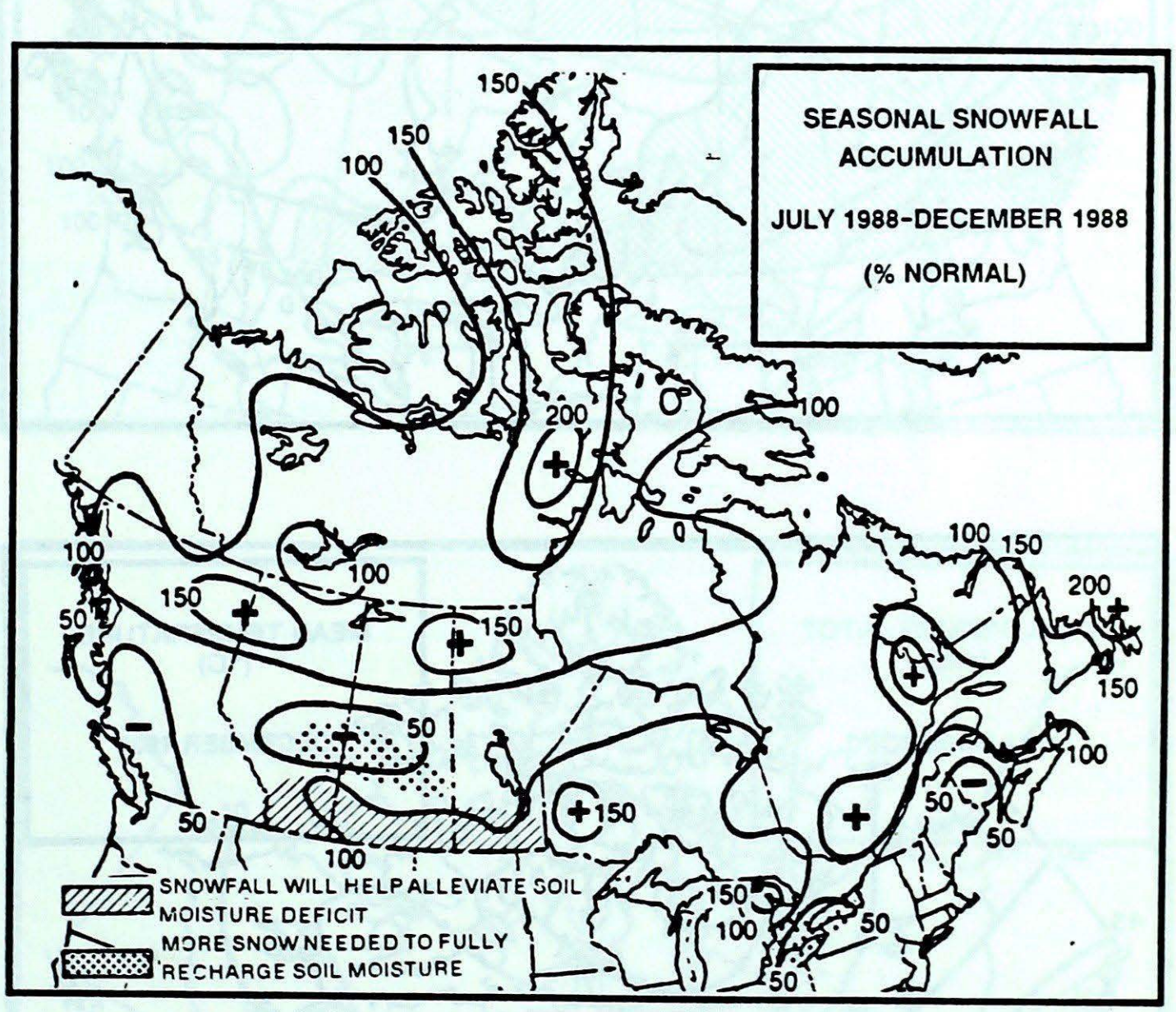
Monthly Review **DECEMBER – 1988** *Vol. 10*

CLIMATIC HIGHLIGHTS

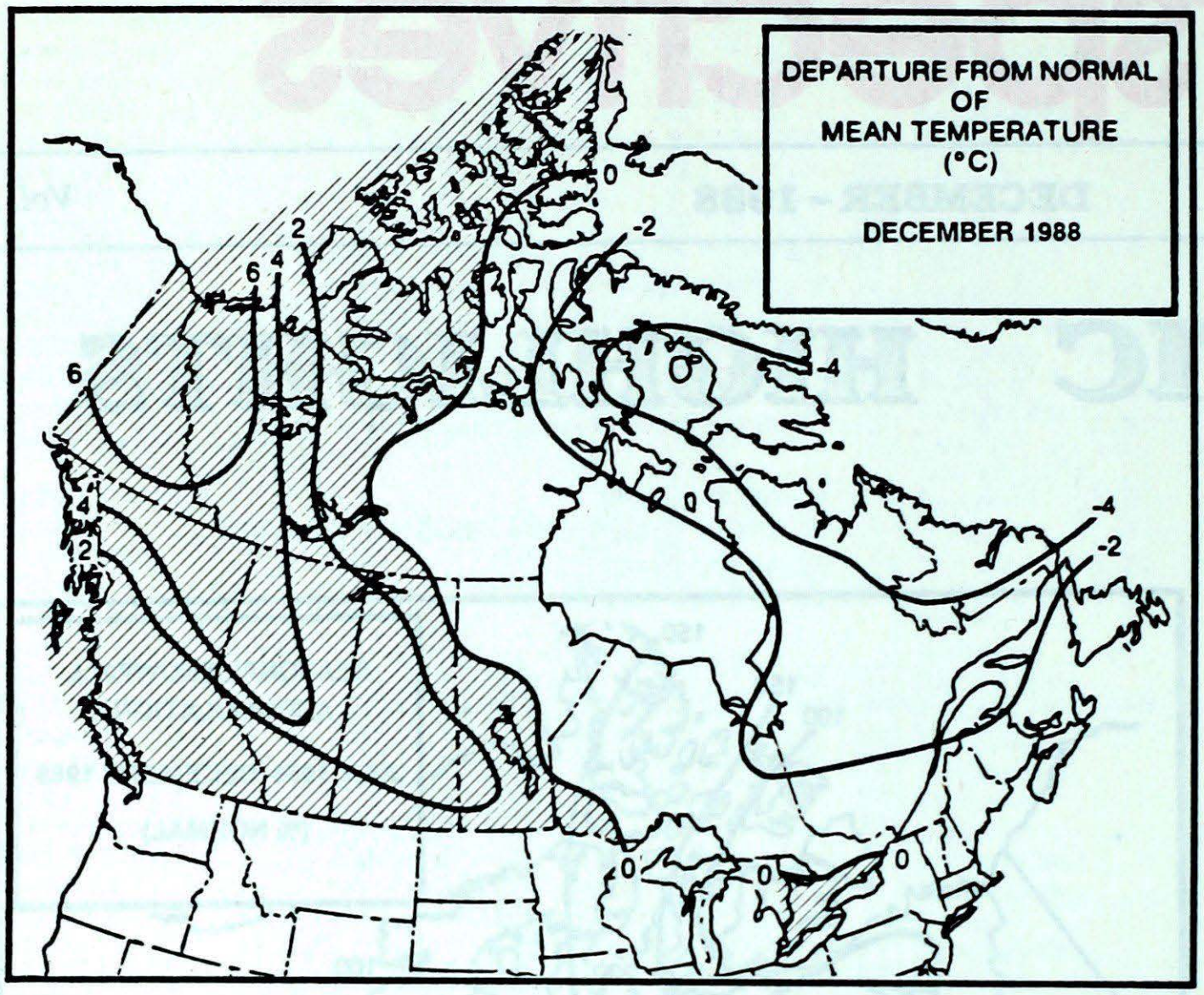
At last a winter with near-normal snow. Heavy snow in southern Alberta. Blizzard sweeps southeastern Prairies.

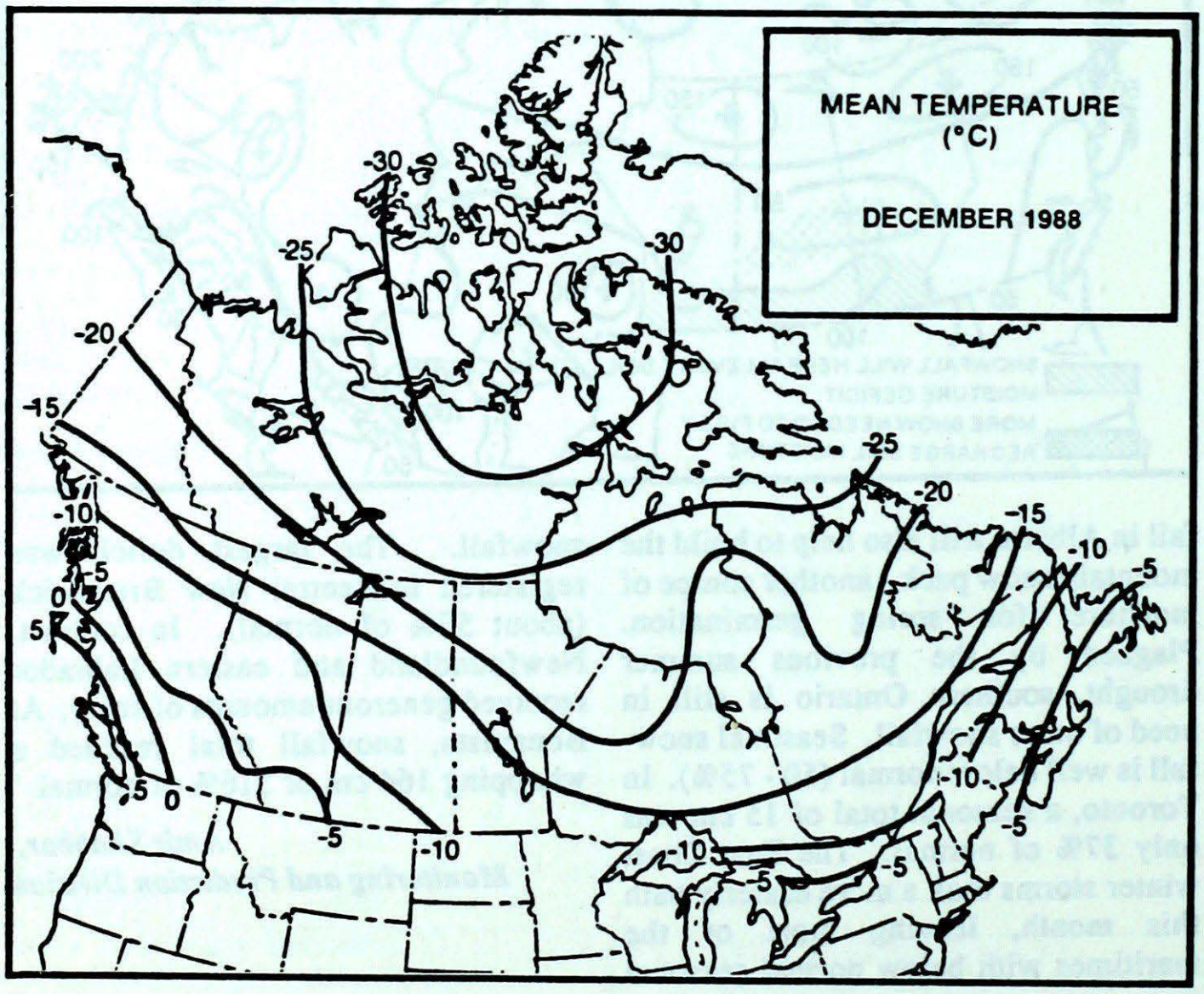
These are some of the welcome headlines that the prairie farmers heard recently. After a few winters of a meagre snowfall and summer droughts, ample snowfall finally arrived over the southern prairies. By the end of December, Winnipeg's seasonal snowfall of 65.4 cm matched the total amount for all of last winter. Seasonal snowfall was above normal in southwestern Saskatchewan - an area in desperate need to reload its depleted soil moisture reserves. Swift Current's 38 cm in December was nearly double the usual amount for that month. Although snowfall was below normal over southern Alberta at the end of the month, two winter storms in early January dumped from 10 to 50 cm of snow, with up to 100 cm in the foothills. Seasonal snowfall in central and western Saskatchewan, from Prince Albert to Lloydminster, was still below normal.

After suffering from the worst summer drought since the 1930s, the agricultural communities hailed the arrival of this winter snowfall. The snow fell where it was needed the most - in the drought stricken areas of southwestern Saskatchewan and southern Alberta. During the spring melt period, the snow cover will help to recharge the depleted soil moisture reserves. Snowfall in Alberta will also help to build the mountain snow pack - another source of moisture for spring germination. Plagued by the previous summer drought, southern Ontario is still in need of more snowfall. Seasonal snowfall is well below normal (50 - 75%). In Toronto, a seasonal total of 15 cm was only 37% of normal. The East Coast winter storms took a more easterly path this month, leaving most of the maritimes with below normal seasonal snowfall. The largest deficit was registered in central New Brunswick (about 50% of normal). In contrast, Newfoundland and eastern Labrador received generous amounts of snow. At Bonavista, snowfall total reached a whopping 164 cm or 316% of normal.



Amir Shabbar,
Monitoring and Prediction Division





Across the country

Yukon and Northwest Territories

The absence of prolonged cold spells and major snowstorms, other than along the coastal mountains, resulted in a month of above normal temperatures and light precipitation for the Yukon. All areas experienced at least one day with temperatures near or just above the freezing mark as mild Pacific air made an occasional appearance. The monthly hot spots were Burwash with 7°C on the 16th and Haines Junction with 6°C on the 15th. Beaver Creek, Dawson and Ogilvie had the dubious pleasure of dipping into the minus 40°C range early in the month. In the N.W.T., cold temperatures and strong northwest winds, creating extreme wind chills, dominated the eastern half, while mild temperatures, associated with a number of low pressure systems, prevailed in the west.

Impacts:

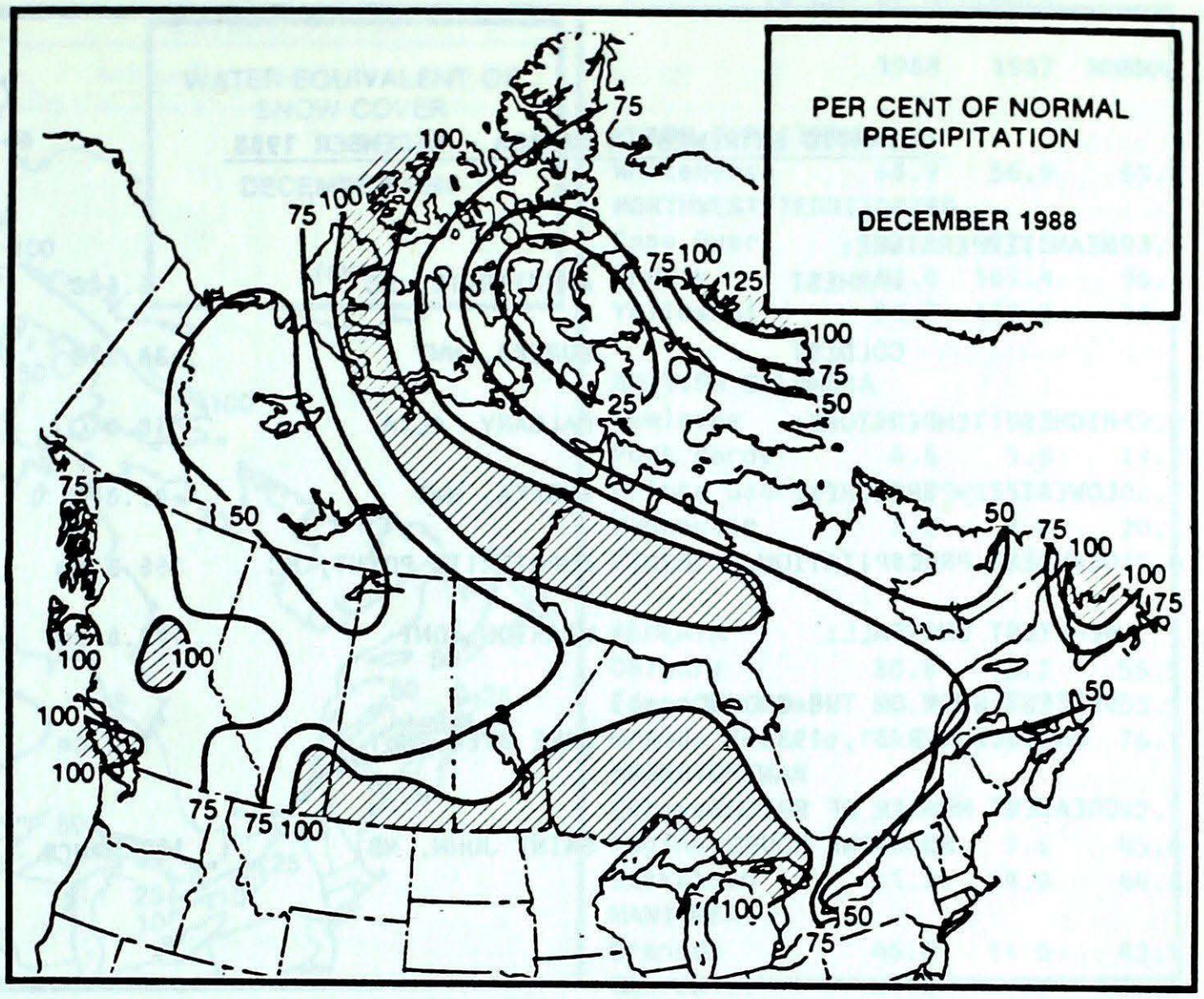
- **Dec 1-5:** The Klondike Highway, south of Whitehorse to Skagway, is closed for 3 days due to avalanches caused by heavy snowfall.
- **Dec 6-12**: Temperatures drop to into the -30's and -40's °C on Baffin Island. Eureka records 4 consecutive days of minimum temperatures in the -40 °C range.
- **Dec 13-19:** Heavy snowfall and 100 km/h winds in the coastal mountain areas of the Yukon cause whiteouts and road closures.

British Columbia

A series of ridges and troughs gave variable weather throughout the month and resulted in near normal monthly values of temperature and precipitation for most of the province. Only one monthly temperature record was set, at Cape Scott on the northwest tip of Vancouver Island, which recorded a maximum of 13.3°C, surpassing the old record of 12.7°C in 1985. Snow touched even the coastal areas of the province, although it usually melted at elevations of less than 150 to 300 meters.

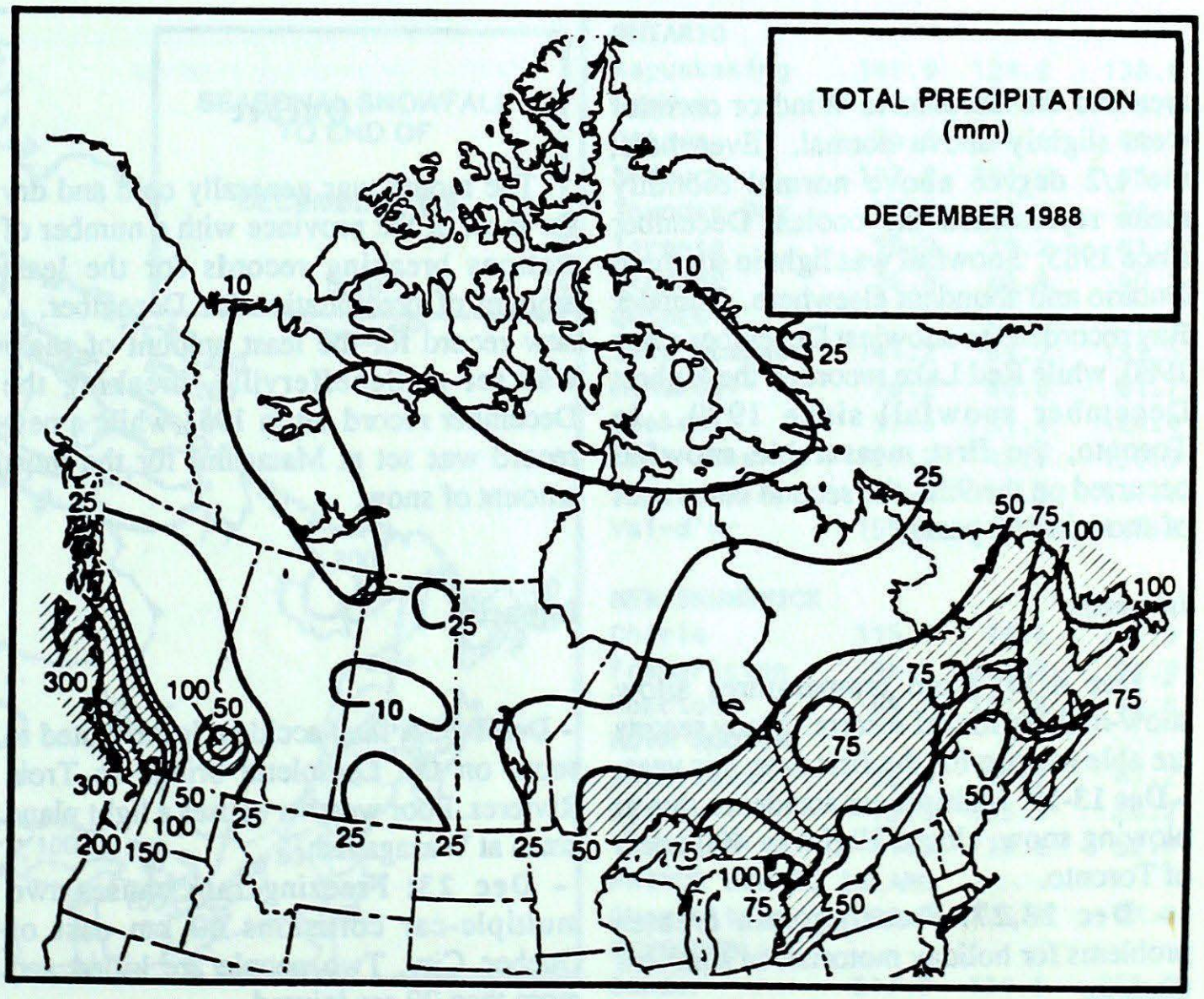
Impacts:

- **Dec 1-5:** Strong winds knock down trees and cause power outages in the Peace River District. Logging at a standstill due to lack of frost.
- **Dec 6-12:** At Prince George, the Canada Cup Cross Country ski race is moved to higher ground due to lack of snow. In Victoria, 20% of the Bonsai cherry trees are in bloom, two months earlier than usual.
- **Dec 13-19:** Heavy snowfall buries parts of the central interior causing power outages which last as long as 2 days.
- **Dec 30:** Blowing snow closes portions of the Rogers Pass.



Prairies

Despite several blasts of arctic air this month, all three provinces enjoyed above normal temperatures, except for northern Manitoba. In Alberta, a number of new record daily maximums were set during the first week and again near mid-month. The highest temperature was a balmy 18°C at Calgary on the 4th. The coldest morning in Alberta was the 31st with most areas reporting minimum temperatures in the -25 to -35°C range. The lowest temperature that day was -42°C at Ft. Chipewyan. This month, snowfall was below normal in Alberta except for the Coronation and the Jasper-Edson-Rocky Mountain House areas. In Manitoba and Saskatchewan, snowfall was near normal or above normal in the southern and northern parts. An area of concern is central and western Saskatchewan, from Prince Albert through North Battleford and Lloydminister where December's snowfall was well below normal. The total accumulated snowfall is above normal for northern Alberta, while for other areas of Alberta, the accumulated amounts range from 30% to 50% of the seasonal normal. Manitoba and Saskatchewan have had ample snowfall over almost the entire region this winter and December's contribution has been helpful to some of the areas hardest hit by last summer's drought.



Ontario

This month was the coldest December since 1985 across the majority of the province. Only the Lake of the Woods

CLIMATIC EXTREMES IN CANADA - DECEMBER 1988

MEAN TEMPERATURE:		
WARMEST	AMPHITRITE, BC	6.6°C
COLDEST	EUREKA, NWT	-34.3°C
HIGHEST TEMPERATURE:	CALGARY, ALTA	18.0°C
LOWEST TEMPERATURE:	EUREKA, NWT	-47.8°C
HEAVIEST PRECIPITATION:	AMPHITRITE POINT, BC	366.3 mm
HEAVIEST SNOWFALL:	WIARTON, ONT	178.8 cm
DEEPEST SNOW ON THE GROUND ON DECEMBER 31, 1988:	CAPE DYER, NWT	122 cm
GREATEST NUMBER OF BRIGHT SUNSHINE HOURS:	SAINT JOHN, NB	132 hours

area and the Toronto to Windsor corridor were slightly above normal. Even here, the 1/2 degree above normal monthly mean represented the coolest December since 1985. Snowfall was light in southern Ontario and abundant elsewhere. Thunder Bay recorded the snowiest December since 1980, while Red Lake recorded the highest December snowfall since 1970. In Toronto, the first measurable snowfall occurred on the 9th - the second latest start of snow in 150 years.

Impacts:

- **Dec 6-12:** Cold temperatures allow snow-making for ski resorts. Many resorts are able to open for the first time this year.
- **Dec 13-19:** Multiple car accidents, due to blowing snow, closed Highway 400 north of Toronto.
- **Dec 23,27:** Freezing rain creates problems for holiday motorists in southern Ontario.

Québec

The month was generally cold and dry for most of the province with a number of stations breaking records for the least amount of precipitation for December. A new record for the least amount of snow was set at Schefferville, breaking the December record set in 1951 while a new record was set at Matagami for the most amount of snow.

Impacts:

- **Dec 1-5:** A fatal accident is attributed to snow on the Laviolette bridge in Trois Rivieres. Poor weather causes a light plane crash at Wasaganish.
- **Dec 23:** Freezing rain causes two multiple-car collisions 40 km east of Quebec City. Two people are killed and more than 20 are injured.

Maritimes

December was sunny, dry and cold. A number of stations set new record low precipitation totals for the month. Fredericton, N.B. broke its record set in Dec 1955. Shearwater, N.S. and Halifax were the dryest since 1965, Chatham, N.B. since 1943, and Kentville, N.S. recorded its dryest December since 1925.

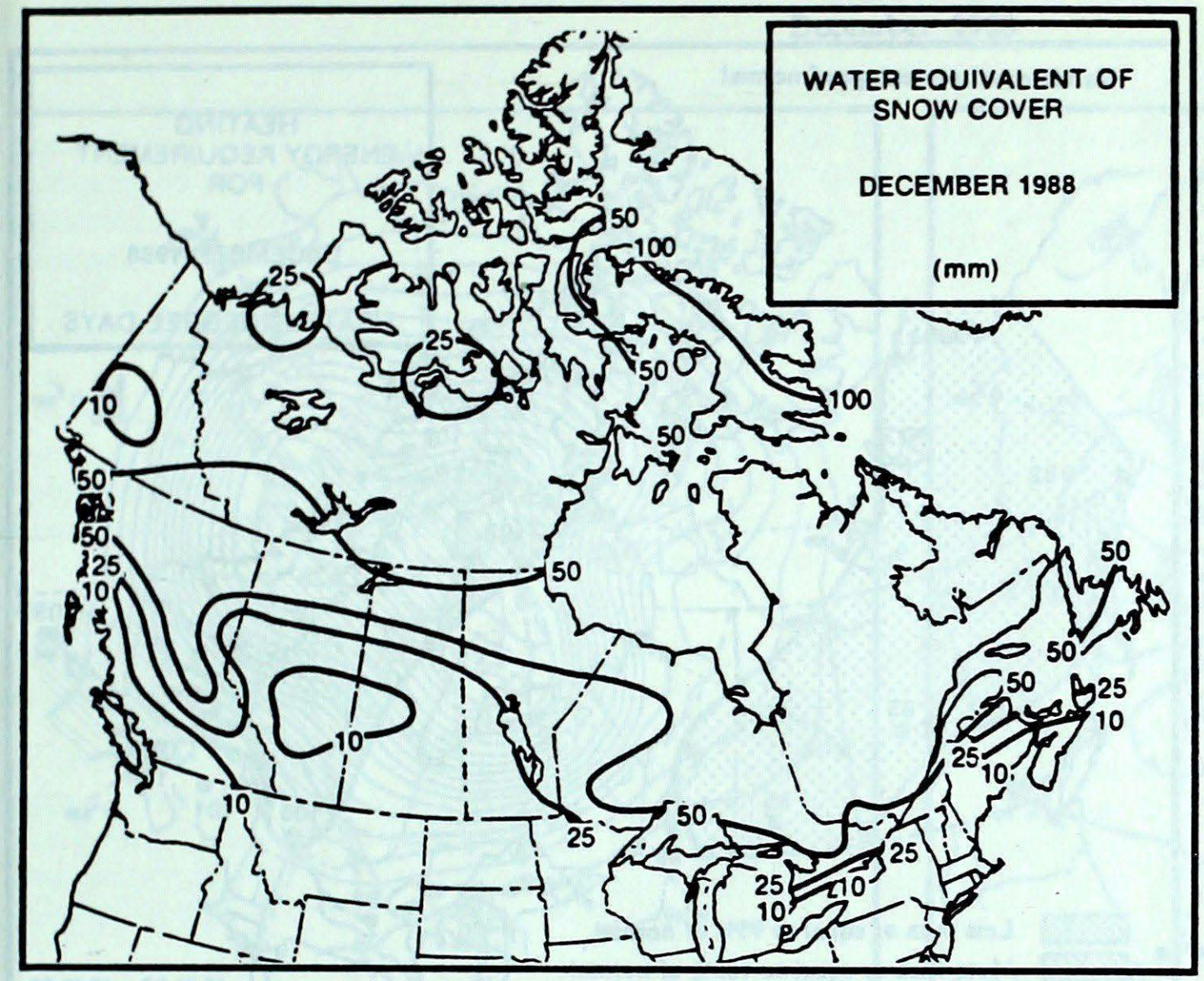
Impacts:

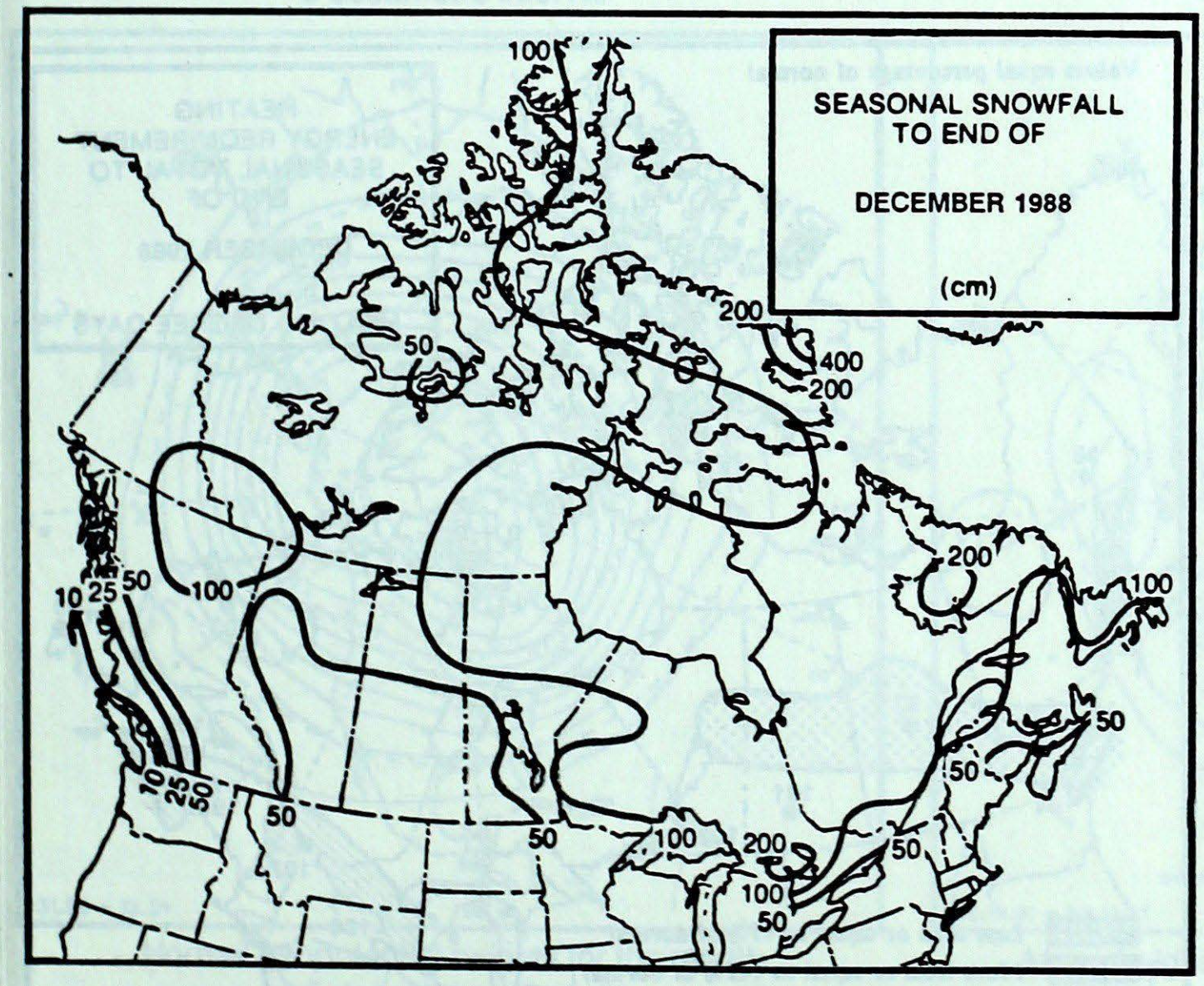
- **Dec 15:** Rowan Gorilla 1, a jack-up oil rig, being towed out to sea, encountered a severe storm with hurricane force winds. The crew of 27 were forced to abandon the rig before it capsized and sank.
- **Dec 18:** The first major snowstorm of the year dumps up to 30 cm of snow onto some areas in central and northern Nova Scotia.

Newfoundland and Labrador

Temperatures were below normal, especially during the latter part of the month, across much of Newfoundland. Above normal snowfall and below normal rainfall were also widespread across the province. The highest temperature recorded for the month was 9.2°C at St. John's on the 18th, and Badger reported a minimum of -26.1°C on the 12th. Light precipitation was the screnario early in the month, becoming more frequent in the latter half. Major snowfalls of 20 to 30 cm occurred on the 15th and on Christmas day. Several major storms brought strong winds to the region. On the 18th, Gander recorded wind gusts to 130 km/h, and on the 29th, Port-aux-Basques had gusts to 145 km/h.

Labrador experienced below normal temperatures with light snowfall. A cold air outbreak late in the month sent temperatures plunging into the -20°C range, with Churchill Falls registering a minimum of -36.3°C on the 29th. Strong winds coupled with the cold blast gave extreme wind chill factors. There was only one major snowfall during the month, with the Cartwright area reporting 18 cm on the 18th.



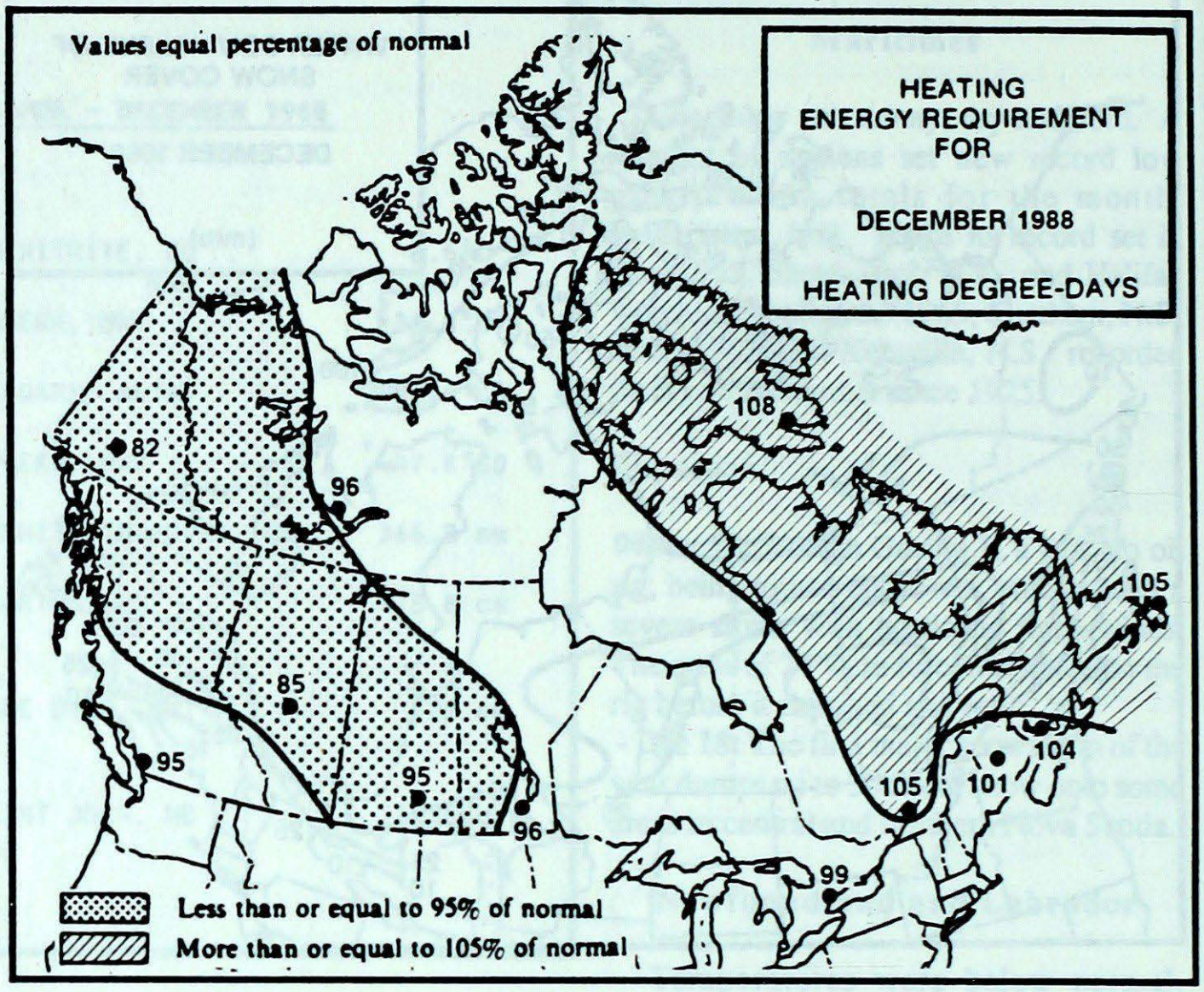


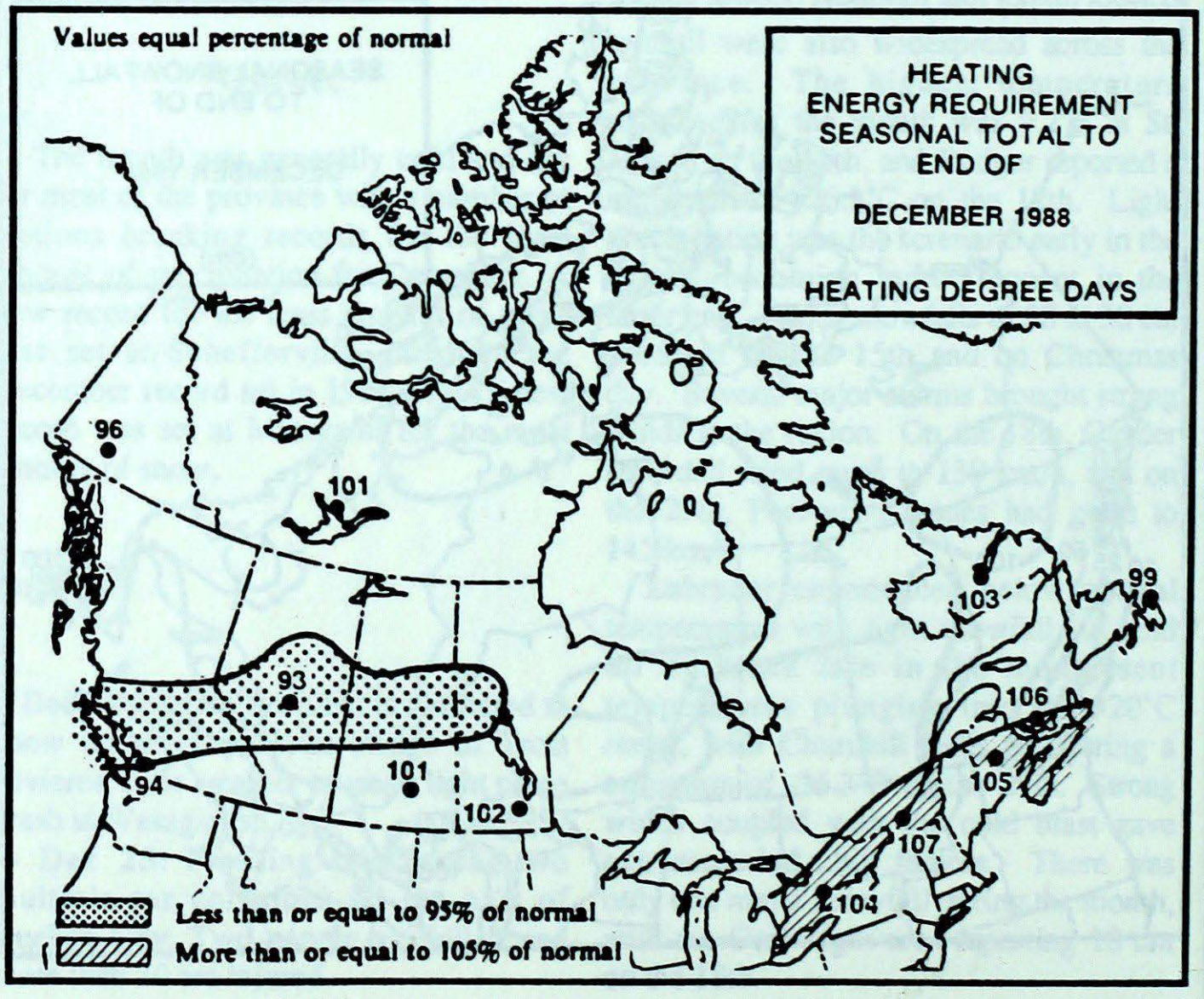
SEASONAL SNOWFALL TOTALS (CM) TO END OF DECEMBER

	1988	1987	NORMAL
YUKON TERRITORY			
Whitehorse	68.9	56.9	69.4
NORTHWEST TERRITORIES			
Cape Dyer	452.2	197.6	303.3
Inuvik	88.0	107.4	96.4
Yellowknife	84.7	110.3	78.7
BRITISH COLUMBIA			
Kamloops	22.3	14.7	42.0
Port Hardy	8.6	1.8	19.7
Prince George	95.6	55.4	102.9
Vancouver	3.2	6.0	20.3
Victoria	0.6	1.0	15.4
ALBERTA			
Calgary	30.8	13.2	56.5
Edmonton Namao	30.7	16.2	53.5
Grande Prairie	44.9	19.7	76.7
SASKATCHEWAN			
Estevan	52.4	3.4	42.7
Regina	35.2	9.6	45.0
Saskatoon	31.2	14.8	44.8
MANITOBA			
Brandon	46.0	14.0	42.9
Churchill	131.6	62.9	100.1
The Pas	48.2	53.3	72.1
Winnipeg	65.6	21.6	48.1
ONTARIO			
Kapuskasing	149.0	124.8	138.8
London	68.9	82.7	77.6
Ottawa	74.8	94.4	81.7
Sudbury	107.0	116.2	95.6
Thunder Bay	97.9	31.3	79.3
Toronto	15.2	19.2	41.4
Windsor	26.4	45.4	40.2
QUEBEC			
Baie Comeau	141.2	64.2	133.5
Montréal	76.2	68.0	81.7
Quebec	97.6	81.4	124.4
Sept-Iles	159.2	43.8	150.5
Sherbrooke	70.6	125.5	111.9
Val-d'Or	155.6	114.4	127.8
NEW BRUNSWICK			
Charlo	115.8	76.6	146.9
Fredericton	46.8	103.9	92.0
Moncton	64.7	181.8	96.8
NOVA SCOTIA			
Shearwater	28.9	95.7	47.2
Sydney	73.5	133.3	80.2
Yarmouth	41.8	76.2	52.0
PRINCE EDWARD ISLAND			
Charlottetown	91.4	175.4	97.0
NEWFOUNDLAND			
Gander	217.9	124.6	115.0
St. John's	95.7	113.0	90.7

SEASONAL TOTAL OF HEATING DEGREE-DAYS TO END OF DECEMBER

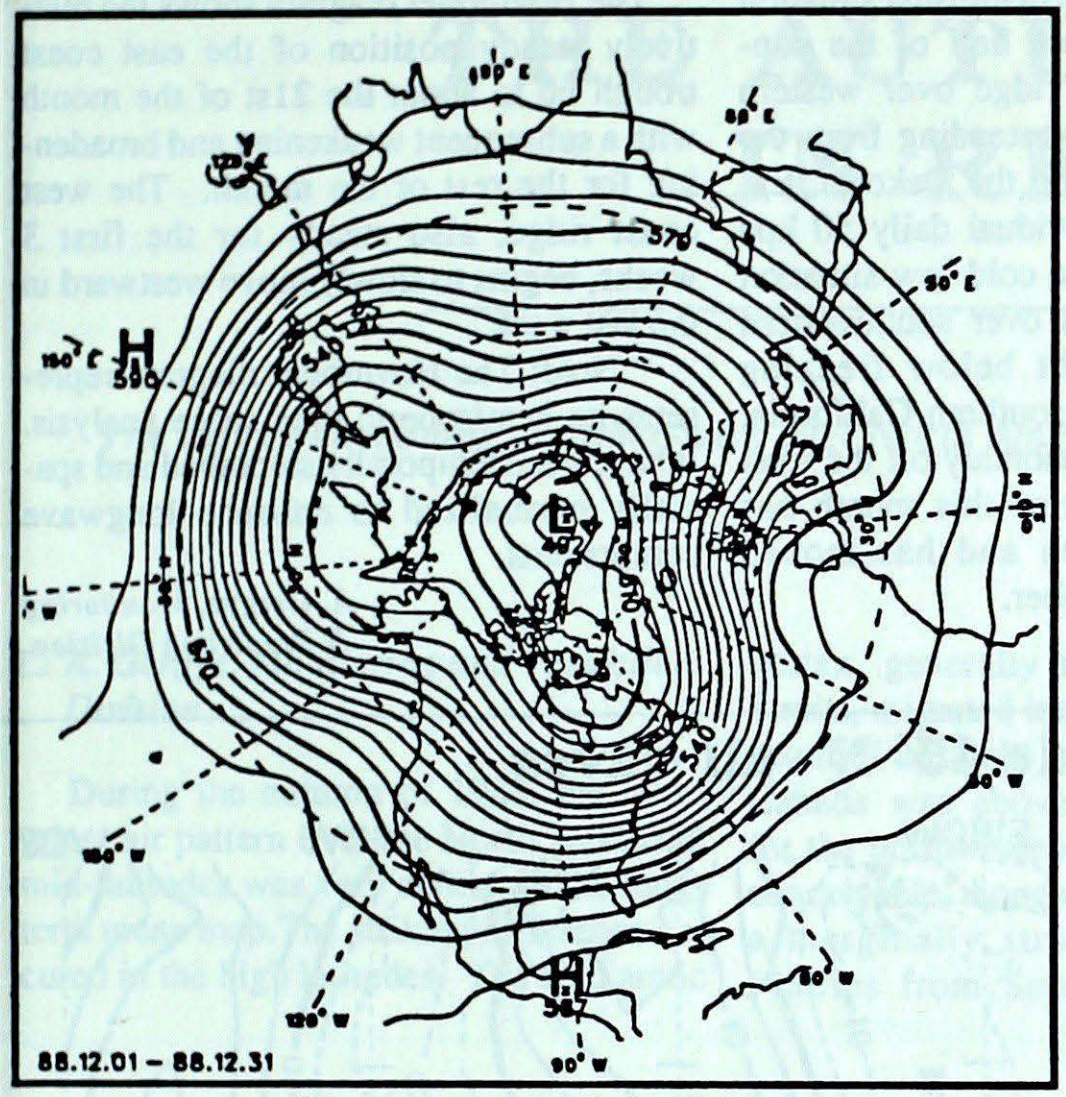
	1988	1987	NORMAL
BRITISH COLUMBIA			
Kamloops	1448	1330	1533
Penticton	1393	1298	1414
Prince George	2184	1965	2303
Vancouver	1149	1084	1218
Victoria	1279	1199	1280
YUKON TERRITORY			
Whitehorse	2893	2558	3025
NORTHWEST TERRITORIES			
Iqaluit	3814	3958	2853
Inuvik	4233	3821	4188
Yellowknife	3419	3015	3382
ALBERTA			
Calgary	2019	1840	2168
Edmonton Mun	2054	1849	2197
Grande Prairie	2424	2070	2536
SASKATCHEWAN			
Estevan	2105	1860	2085
Regina	2281	2022	2257
Saskatoon	2293	2082	2352
MANITOBA			
Brandon	2380	2153	2337
Churchill	3523	3339	3534
The Pas	2563	2413	2637
Winnipeg	2258	1986	2214
ONTARIO			
Kapuskasing	2488	2365	2468
London	1504	1427	1461
Ottawa	1813	1719	1721
Sudbury	2053	1946	2015
Thunder Bay	2232	2038	2176
Toronto	1515	1442	1459
Windsor	1341	1243	1274
QUÉBEC			
Baie Comeau	2373	2339	2318
Montréal	1762	1652	1642
Quebec	2046	1961	1942
Sept-Iles	2419	2387	2429
Sherbrooke	2016	1955	1981
Val-d'Or	2392	2336	2361
NEW BRUNSWICK			
Charlo	2123	2045	2056
Fredericton	1829	1843	1739
Moncton	1788	1796	1708
NOVA SCOTIA			
Halifax	1523	1508	1523
Sydney	1647	1590	1510
Yarmouth	1446	1496	1454
PRINCE EDWARD ISLAND			
Charlottetown	1703	1672	1603
NEWFOUNDLAND			
Gander	1932	1913	1854
St. John's	1734	1802	1746



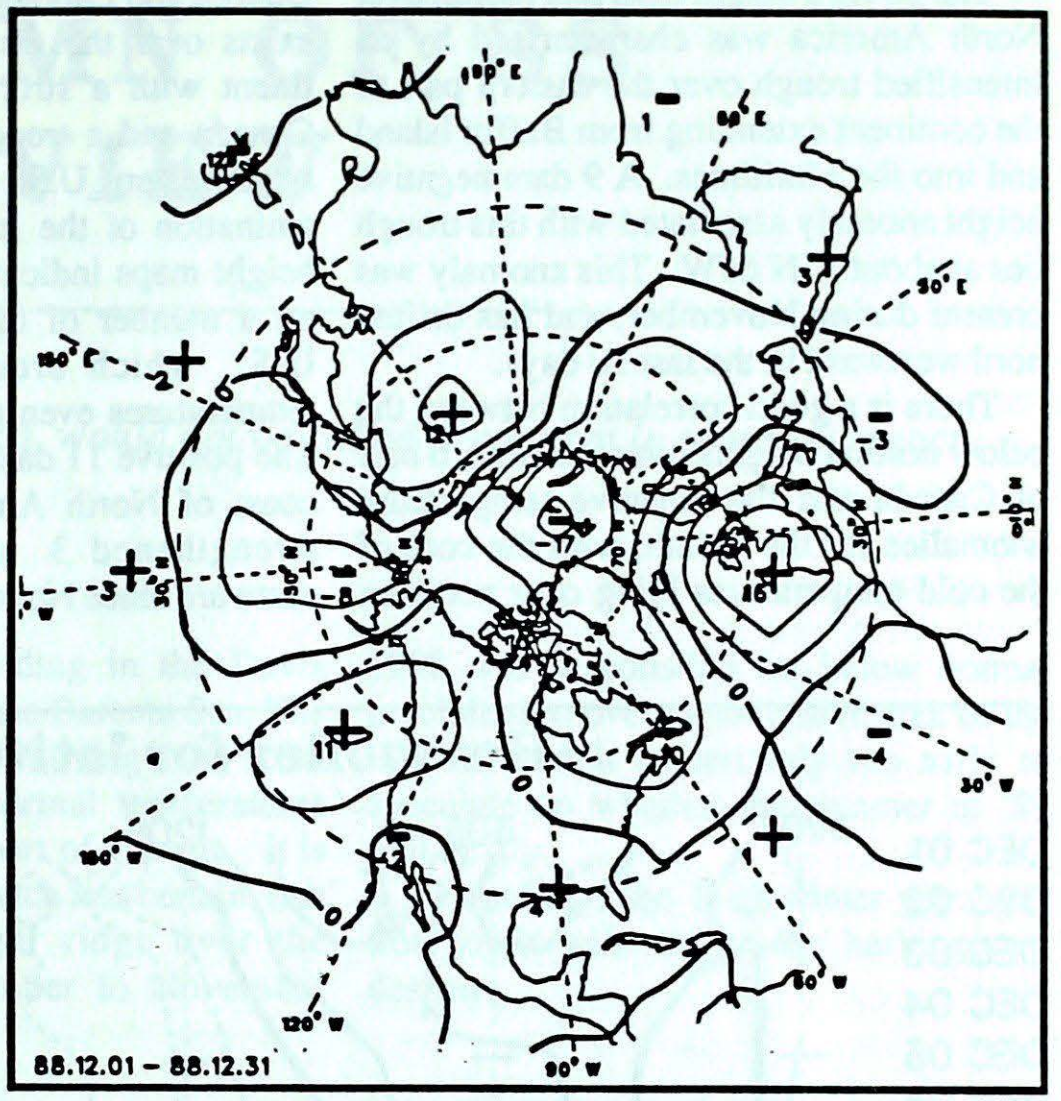


50 kPa ATMOSPHERIC CIRCULATION

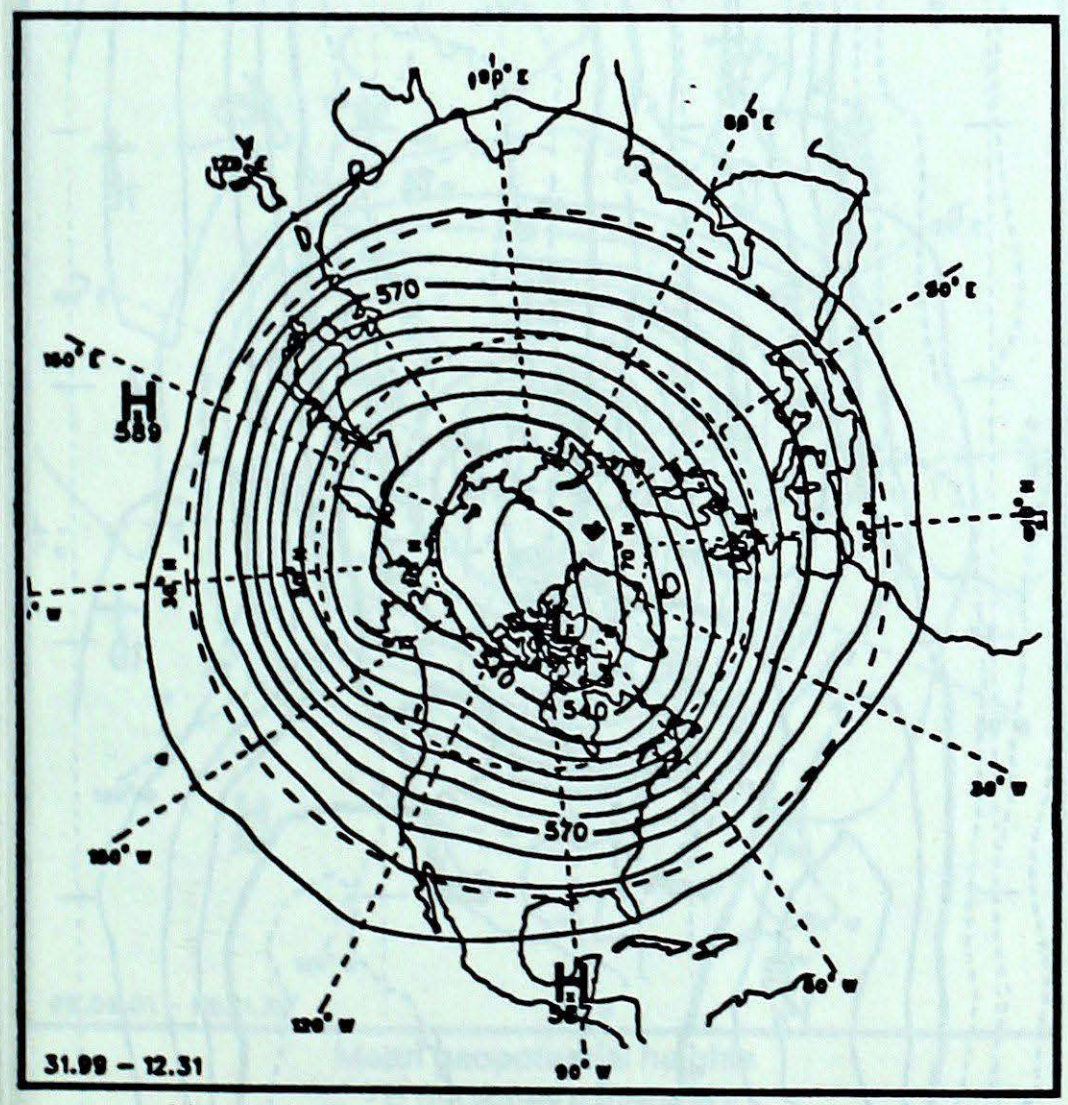
December 1988



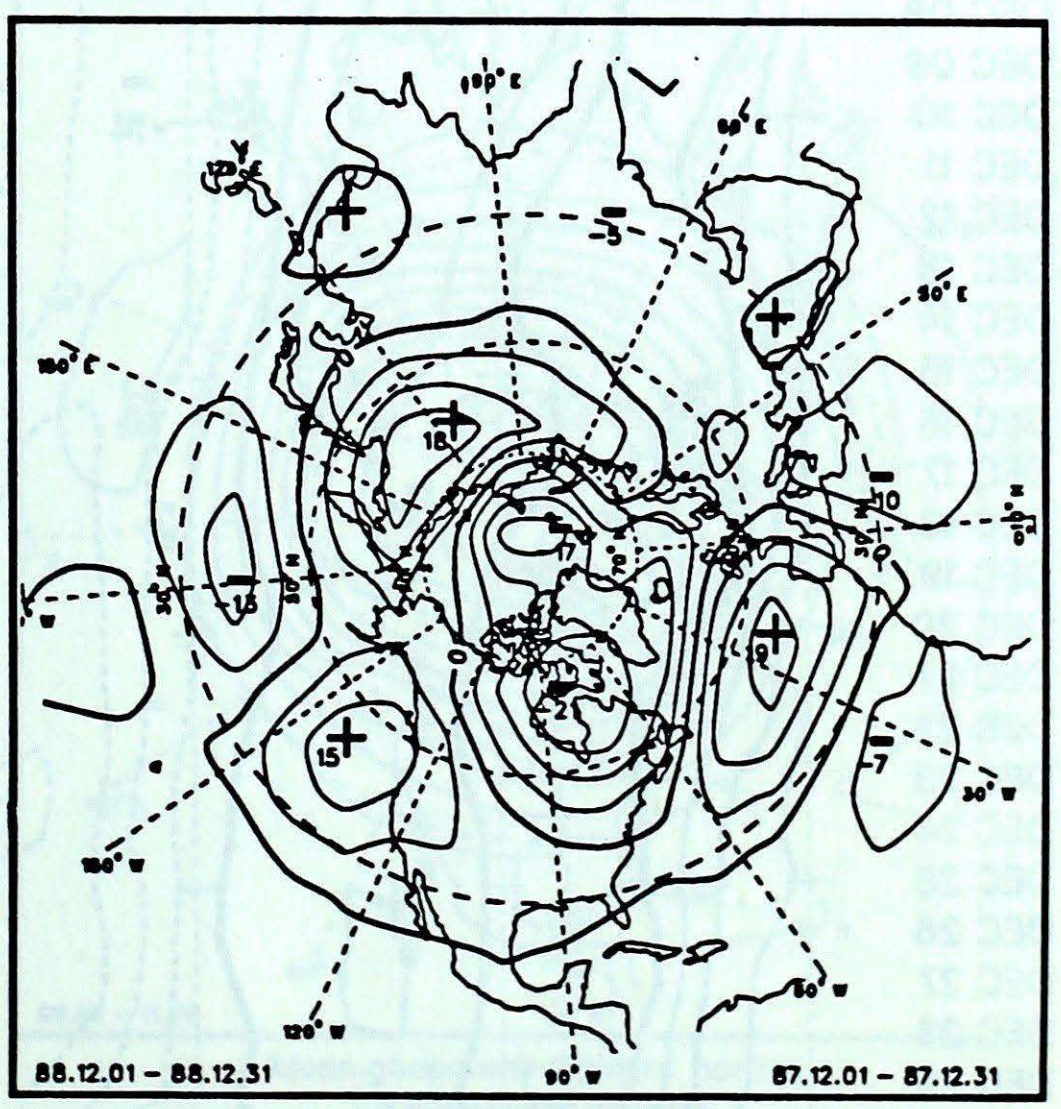
Mean geopotential heights
- 5 decametre interval -



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

December 1988

The 50 KPa height field this month over North America was characterized by an intensified trough over the eastern part of the continent extending from Baffin Island and into the Maritimes. A 9 dam negative height anomaly associated with this trough lies at about 55N 65W. This anomaly was present during November, and has drifted northwestward in the last 30 days.

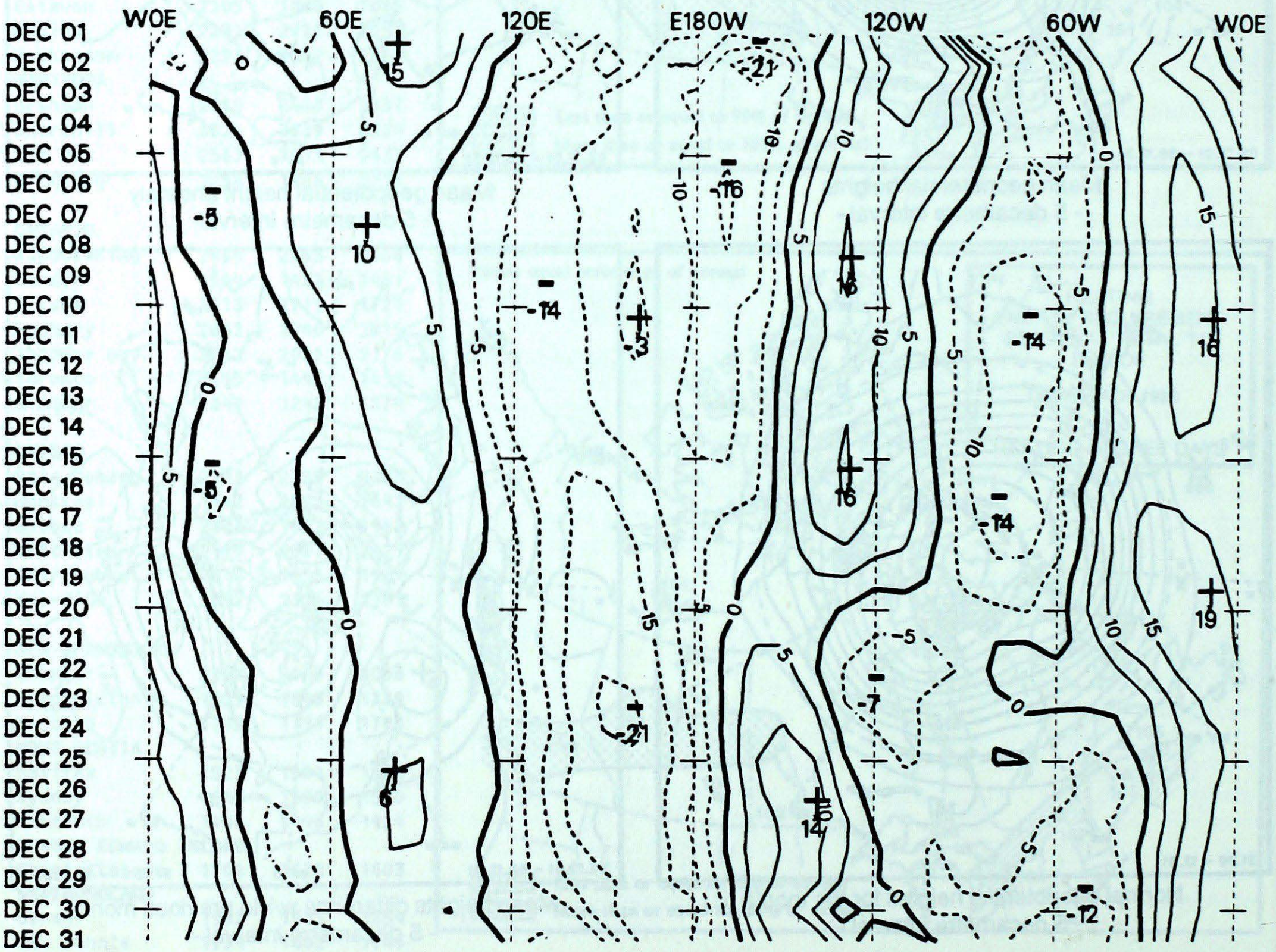
There is a good correlation between the below normal heights over the eastern half of Canada and the negative temperature anomalies for the month, with the core of the cold temperatures lying over northern Quebec and Labrador.An unusual situation exists over the western half of the continent with a strong ridge over western Canada and a trough extending from the southwestern U.S. into the Dakotas. Examination of the individual daily 50 kpa height maps indicate a cold low situation on a number of days over southwestern U.S. which brought below freezing temperatures even to southern California. The positive 11 dam anomaly off the west coast of North America this month has strengthened 3 dam and has moved eastward since November.

The Hovmoller diagram shows the relatively steady position of the east coast trough up to about the 21st of the month with a subsequent weakening and broadening for the rest of the month. The west coast ridge, also steady for the first 3 weeks, begins to slowly move westward in the last week.

* Note: The Hovmoller diagram represents an hemispheric time-space analysis. It have been temporally smoothed and spacially normalized to enhance longwave components.

A. Gergye, Monitoring & Prediction Division

Hovmöller for latitude 45° N - all waves



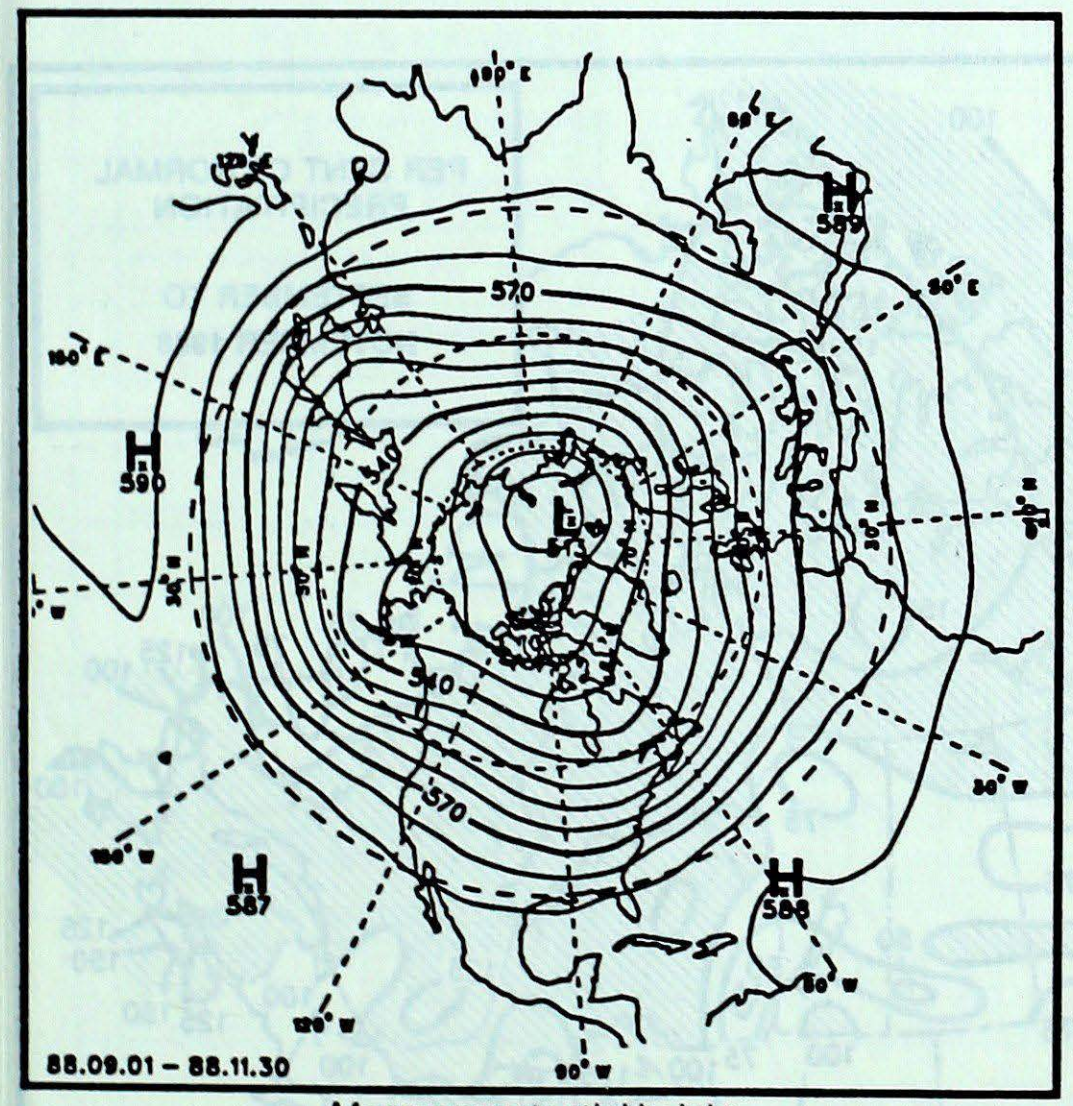
THE AUTUMN OF 88 IN REVIEW

The last three months, weather-wise over North America, would not be called prominent in terms of impact.

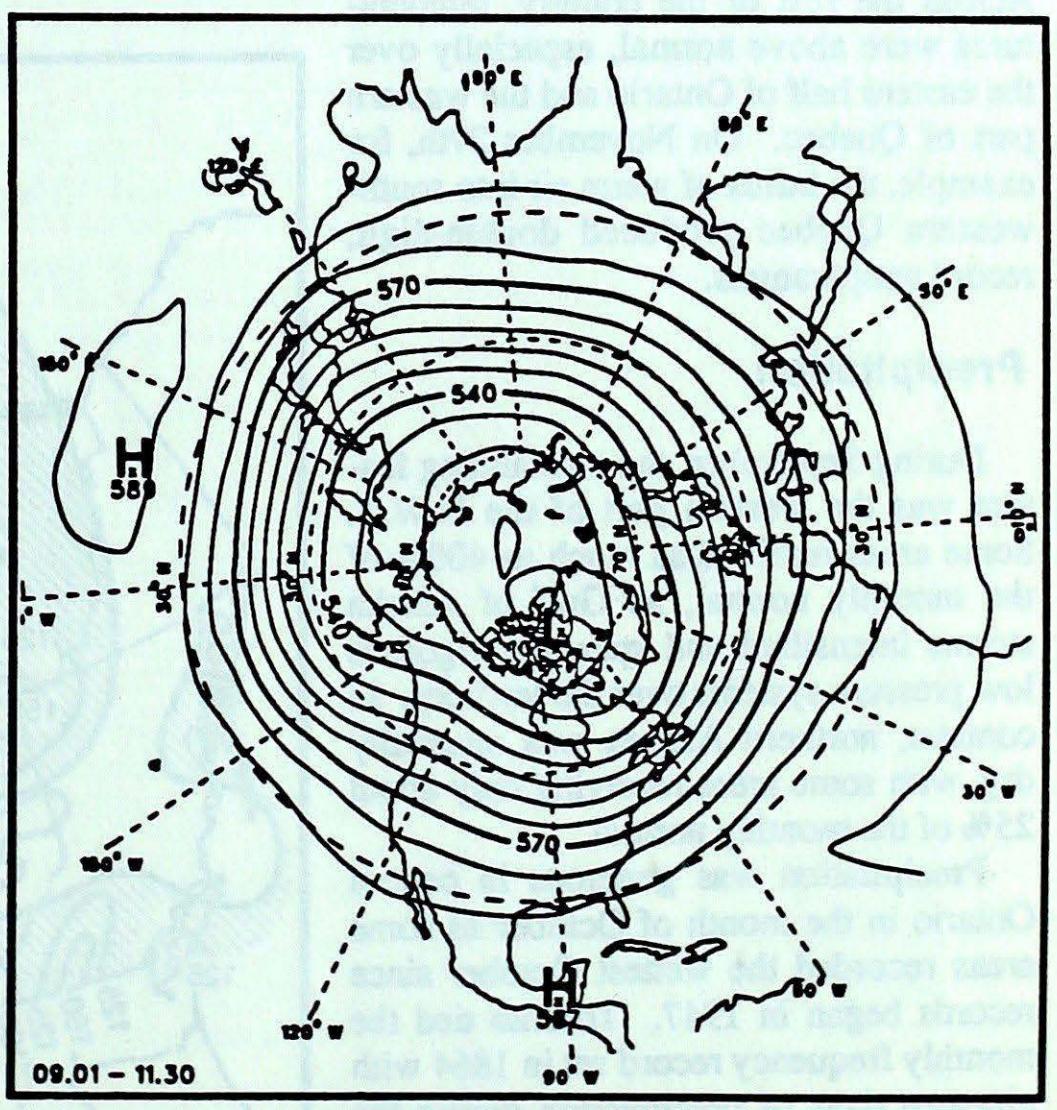
□ *A. Gergye, Monitoring and Prediction Division*

During the autumn of 1988, the mean upper air pattern over the North American mid-latitudes was very similar to the long-term mean map.The striking difference occured in the high latitudes. The cold arctic vortex, generally residing in the Davis Straits, migrated into the Barents Sea. The result of this cold pool moving away from Canada was above normal temperatures for the northwestern part of Canada. It is conceivable, though much less certain, that a marginally stronger ridge over the Prairies from September to November 1988 was responsible for below normal precipitation over an extensive area of the Prairies and it is certainly too early to speculate on whether the summer of '89 will be dry.

Hopefully, the final winter precipitation totals will not be the harbinger of despair.



Mean geopotential heights
- 5 decametre interval -



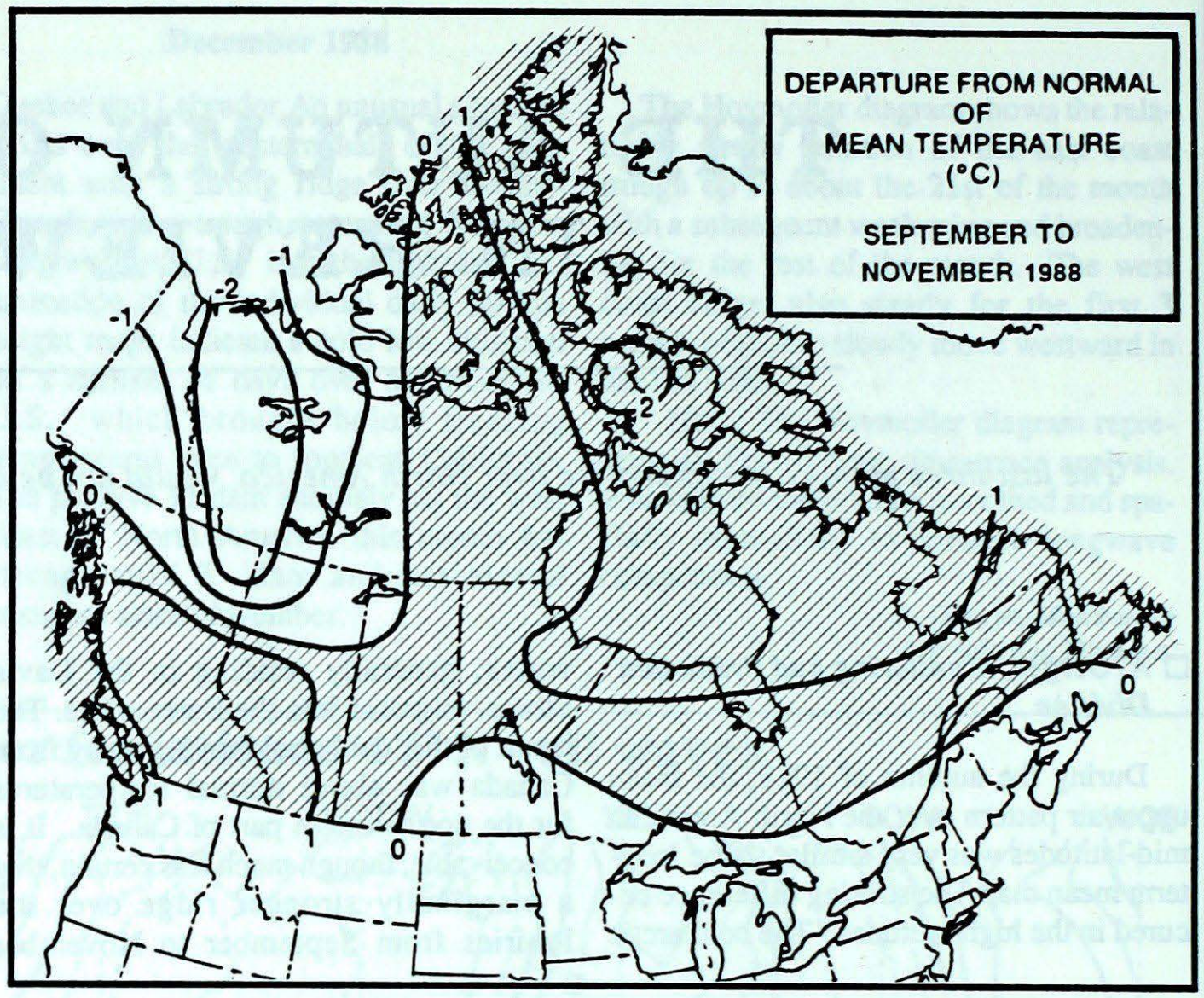
Mean geopotential height normal
- 5 decametre interval-

Mean geopotential height and long term normal at 50 kPa for the period Sep. 01 - Nov. 30, 1988

Temperature

Monthly temperature departures, generally above normal for most of country, were less than 2 degrees during the month of September, with the warm core lying over northern Manitoba and the Mackenzie District of the N.W.T. During October, an enhanced upper level ridge over B.C., producing a northwesterly flow east of the ridge, cut a 1000 mile wide swath of below normal temperatures stretching from the Yukon to the southern Quebec. The largest monthly departures were recorded through most of Ontario where temperatures were well below normal everywhere for the first time since February '88.

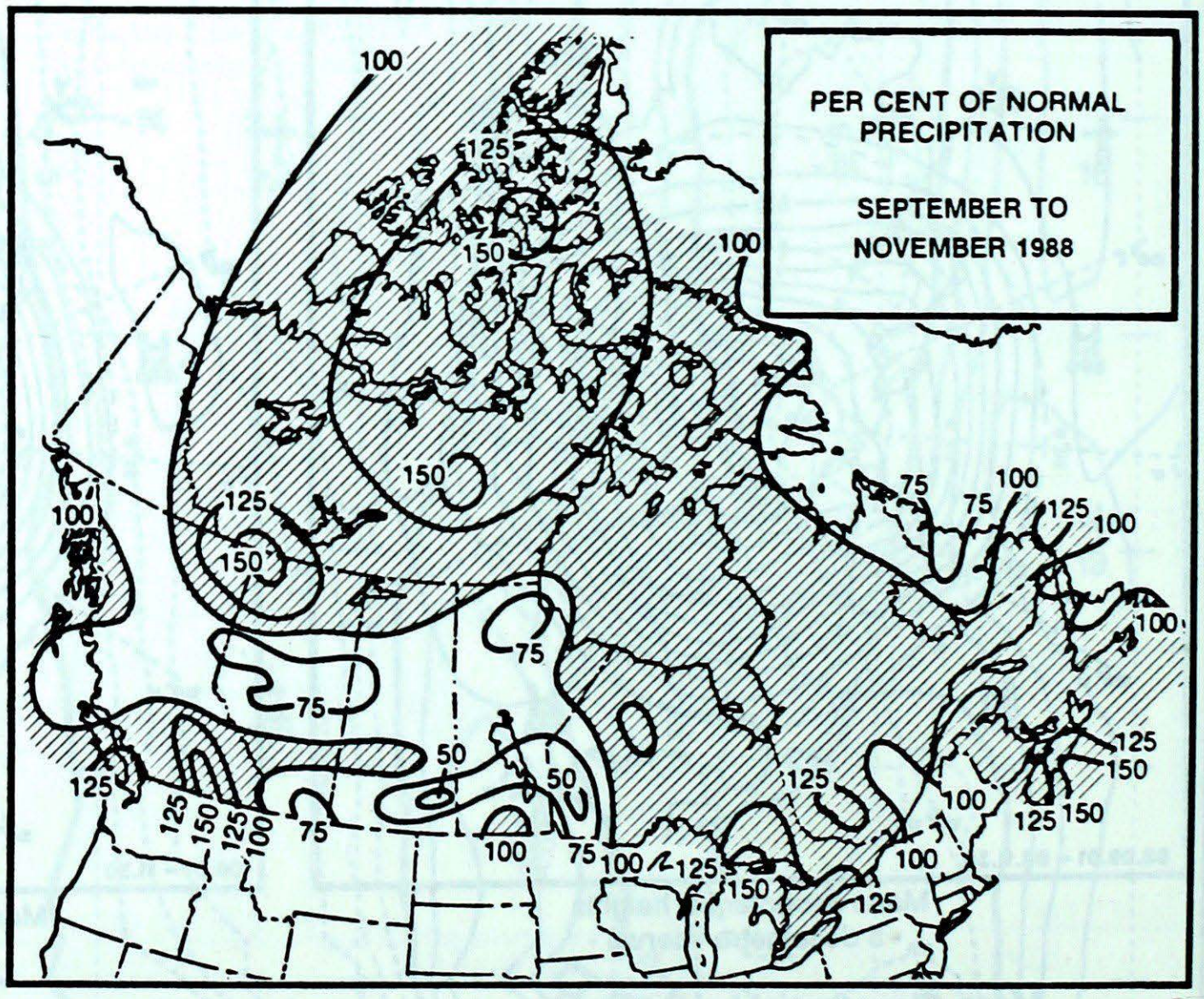
These departures resulted in the coldest October since 1981 at many locations and the coldest ever in extreme southwestern Ontario. November was bitterly cold in the northern half of the Yukon and the western half of the Arctic as daily minimum temperatures sank into the -30 to -40 C range by the end of the second week. Across the rest of the country, temperatures were above normal, especially over the eastern half of Ontario and the western part of Quebec. On November 27th, for example, the influx of warm air into southwestern Quebec produced double-digit, record temperatures.



Precipitation

During September, the outstanding feature was the western part of the N.W.T. Some areas received as much as 400% of the monthly normal, as Gulf of Alaska storms intensified and spawned vigorous low pressure systems over the territory. In contrast, northern Alberta was unusually dry, with some areas receiving only about 25% of the monthly normal.

Precipitation was generous in central Ontario in the month of October as some areas recorded the wettest October since records began in 1947. Toronto tied the monthly frequency record set in 1864 with nineteen days of precipitation during the month. November saw generous amounts



of precipitation along coastal B.C. and the southeastern part of the Yukon. Some areas of the Yukon were blasted with up to 85 cm of snow during a two-day period late in the month.

November, traditionally a wet month for the Prairies, was no exception, especially over the northern half. Stormy weather was the highlight for Newfoundland and Labrador as a series of intense low pressure systems brought strong winds and heavy precipitation. On the 21st, a slow moving storm dumped more than 40 cm of snow along the Labrador coast and 55 cm of snow to the eastern end of Newfoundland.

Impacts

Sept : The Niagara Peninsula of Ontario has a vintage year for grapes. Vegetable farmers in southern Ontario did not fare as well due to late spring frosts, hail, strong winds, and summer drought.

Sept : An intense storm in the Gulf of St. Lawrence on the 4th takes the lives of three fishermen.

Sept: A bumper crop for apples in the Maritimes. Potatoe crop is the largest in a decade.

Sept: Total production of prairie spring wheat is down considerably compared to 1987. Suprisingly, ample summer rain yields a bumper crop in northern and central Alberta.

DECEMBER 1988

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	4.4	1.2	15.8	-4.6	6.8	30	210.1	92	0	18	57	105	423.4
ALERT BAY	4.4	0.5	6.2	2.6	18.4	112	181.9	77	0		X		407.0
AMPHITRITE POINT	6.6	1.1	14.5	-1.2	0.0		366.3	81	0	23	X		353.5
BLUE RIVER	-6.3	1.0	3.2	-20.6	127.9	117	101.2	93	90	15	27	91	*
BULL HARBOUR	4.6	0.4	13.8	-2.6	8.6	65	283.1	94	0	24	X		415.3
CAPE SCOTT	5.7	0.6	13.3	0.2	19.3	162	279.9	81	0	20	X		382.1
CAPE ST.JAMES	5.6	0.6	9.9	0.8	3.8	32	159.2	83	0	20	53	*	384.1
CASTLEGAR	-1.6	0.3	7.3	-10.4	41.7	55	43.5	43	18	12	32	104	607.5
COMOX	4.5	0.8	10.9	-3.1	0.0		148.9	70	0	15	X		419.4
CRANBROOK	-6.7	-0.6	9.0	-24.0	17.5	33	22.9	59	14	5	52	*	765.1
DEASE LAKE	-13.7	2.3	4.1	-32.6	48.2	116	40.9	122	53	11	39	94	982.2
FORT NELSON	-16.6	4.4	5.9	-32.6	17.1	63	14.9	69	59	3	X 63	*	1072.3
FORT ST.JOHN	-9.2	4.0	7.0	-25.9	32.6	80	25.5	70	16	5	X		843.5
HOPE	3.2	1.6	13.5	-5.7	9.6	20	211.0	72	0	19	3	78	460.5
KAMLOOPS	-1.6	1.2	8.0	-15.6	19.1	63	24.4	75	11	9	55	115	605.6
KELOWNA	-2.3	0.2	7.0	-16.9	41.6	131	38.8	92	13	9	41	99	629.4
LANGARA	4.2	0.6	10.7	1.7	15.7	64	208.2	99	0	22	X		424.6
LYTTON	0.4	1.4	11.9	-13.0	21.9	53	41.5	55	16	8	56	126	546.7
MACKENZIE	-7.3	2.8	3.1	-26.5	62.9	79	60.5	68	42	14	22	60	784.2
MCINNES ISLAND	4.7	0.6	10.9	-1.3	3.1	18	319.2	105	0	20	X		411.5
PENTICTON	-0.9	-0.5	9.2	-13.3	25.3	109	30.4	97	1	10	41	105	587.1
PORT ALBERNI	3.4	*	10.0	-5.3	7.0	*	150.9	*	0	18	25	*	453.8
PORT HARDY	6.7	3.2	11.6	-3.2	4.2	27	204.6	73	0	19	46	101	427.7
PRINCE GEORGE	-6.9	1.0	9.3	-26.8	82.4	155	69.2	121	28	10	48	101	770.4
PRINCE RUPERT	1.8	0.2	10.0	-7.6	9.4	25	264.1	92	0	16	39	121	502.6
PRINCETON	-4.8	0.9	4.0	-18.8	27.4	61	29.5	56	11	8	40	*	*
QUESNEL	-5.4	1.7	9.7	-24.3	50.5	102	43.8	85	29	5	X		724.3
REVELSTOKE	-2.5	1.3	5.2	-15.3	138.4	99	105.3	73	62	15	27	101	636.3
SANDSPIT	4.1	0.7	10.3	-2.3	0.8	4	111.0	62	0	17	44	109	431.8
SMITHERS	-8.3	-0.7	4.8	-22.0	52.2	92	46.5	77	29	12	37	95	814.8
TERRACE	-3.4	0.0	4.2	-13.5	67.2	63	184.6	95	11	18	38	126	622.3
VANCOUVER INT'L	4.8	0.9	12.4	-2.8	3.0	17	190.2	104	0	21	X 57	118	409.4
VICTORIA GONZ. HTS													
VICTORIA INT'L	4.6	0.4	12.7	-3.5	0.0		114.6	72	0	15	56	108	414.2
VICTORIA MARINE	5.3	0.4	11.5	-1.6			*			18	X		394.7
WILLIAMS LAKE	-5.8	1.9	7.0	-23.9	48.3	97	41.8	101	33	11	47	95	736.1

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													
DAWSON	-19.7	6.2	3.1	-39.9	22.5	63	10.1	24			xxx		
MAYO	-16.4	7.8	3.4	-39.1	16.4	66	16.4	72	25				1146.0
WATSON LAKE	-19.0	4.5	1.8	-38.6	25.7	55	21.0	57	46	9	35	111	887.2
WHITEHORSE	-10.6	6.0	2.6	-28.1	12.6	52	10.0	49	9	3	23	100	
NORTHWEST TERRITORIES													
ALERT	-29.3	0.7	-15.5	-40.6	7.3	87	6.5	82	51	2	0		1464.6
BAKER LAKE	-29.9	-1.7	-26.9	-32.9	25.0	287	14.6	178	56	5	3	42	1484.4
CAMBRIDGE BAY	-29.3	0.7	-18.3	-37.6	3.8	60	3.0	55	10	1	0		1466.2
CAPE DYER	-22.3	-2.0	-9.6	-40.1	41.2	66	41.2	72	122	5	X		1248.4
CAPE PARRY	-21.5	3.5	-7.6	-34.6	5.8	57	3.0	44	12	0	X		1225.5
CLYDE	-27.2	-2.8	-13.7	-41.6	14.6	184	13.6	174	36	3	0		1400.2
COPPERMINE	-25.3	0.6	-7.7	-41.2	19.0	165	11.7	105	46	5	0		1343.7
CORAL HARBOUR	-27.7	-2.2	-9.1	-40.8	3.1	28	2.8	27	16	1	37	129	1417.4
EUREKA	-34.3	0.5	-19.7	-47.3	2.0	80	2.0	83	11	0	0		1621.6
FORT RELIANCE	-25.1	-1.2	4.1	-43.3	28.2	147	12.6	84	31	3	X		1335.0
FORT SIMPSON	-20.6	3.9	5.2	-37.7	10.9	45	8.2	34	29	3	40	136	1196.2
FORT SMITH	-20.5	1.1	6.6	-41.0	6.9	27	4.6	20	32	1	46	162	1194.1
IQALUIT	-25.6	-3.8	-7.5	-37.2	10.0	40	8.4	38	11	2	40	204	1352.0
HALL BEACH	-32.2	-4.8	-17.5	-42.1	0.8	8	0.8	9	42	0	X		1557.2
HAY RIVER	-18.0	2.9	8.1	-37.0	5.6	21	5.6	22	33	2	X		1089.1
INUVIK	-20.5	6.7	2.3	-38.3	16.6	79	11.7	67	35	3	0		1195.3
MOULD BAY	-29.5	1.7	-16.2	-41.7	15.7	392	9.9	275	26	2	0		1473.8
NORMAN WELLS	-20.4	6.1	3.9	-33.5	8.3	43	4.9	26	9	2	22	166	1191.3
POND INLET	-33.8	-5.1	-23.0	-42.2	3.0	18	2.2	16	43	1	X		1607.0
RESOLUTE	-29.7	-0.4	-18.0	-39.4	1.6	30	1.0	20	22	0	0		1478.2
YELLOWKNIFE	-23.0	1.0	1.3	-42.0	14.8	67	7.0	38	25	3	30	144	1272.0
ALBERTA													
BANFF	-7.5	1.4	6.5	-25.0	43.6	96	25.6	67	24	5	X		
CALGARY INT'L	-5.0	2.8	10.0	-24.8	12.7	61	4.8	30	3	2	101	103	713.1
COLD LAKE	-11.4	2.8	5.0	-32.5	16.2	61	12.9	52	12	6	73	95	910.3
CORONATION	0.4	1.4	9.8	-32.3	30.4	135	21.6	110	22	4	83	99	865.6
EDMONTON INT'L	.2	5.9	7.1	-27.8	12.8	49	12.2	55	9	3	66	85	782.6
EDMONTON MUNI.	.5	3.9	8.9	-24.1	15.4	56	14.0	56	10	5	70	89	759.4
EDMONTON NAMAO	-7.1	4.7	9.1	-25.0	21.3	78	16.4	62	12	7	X		778.6
EDSON	-8.7	3.3	15.4	-30.1	22.8	102	17.2	106	16	5	88	134	826.6
FORT CHIPEWYAN	-18.5	2.2	5.0	-42.0	8.3	30	8.3	33	33		X		

DECEMBER 1988

STATION	Temperature C Mean	Difference from Normal	Maximum	Minimum	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
FORT MCMURRAY	-13.5	3.5	9.5	-36.3	26.9	91	15.8	63	31	4	62	100	977.0
GRANDE PRAIRIE	-9.2	4.2	8.8	-28.0	22.3	65	18.3	57	10	5	84	a	842.5
HIGH LEVEL	-16.2	4.1	6.9	-40.9	22.7	73	15.2	61	48	6	31	83	1060.7
JASPER	-7.3	1.9	11.2	-25.5	37.8	115	25.6	78	20	4	72	a	784.7
LETHBRIDGE	-4.8	1.0	16.4	-31.5	23.7	92	19.2	87	2	3	100	110	706.0
MEDICINE HAT	-5.6	2.0	16.2	-28.5	15.6	82	16.4	100	10	3	68	78	733.8
PEACE RIVER	-11.3	4.0	7.1	-22.2	19.6	75	17.7	81	12	6	X		909.1
RED DEER	-9.1	2.3	13.9	-30.9	19.8	92	17.2	85	19	6	X		839.8
ROCKY MTN HOUSE	-8.7	0.4	15.6	-32.7	26.8	107	18.8	84	15	5	X		825.6
SLAVE LAKE	-10.4	3.7	6.6	-28.6	25.6	81	16.6	60	21	5	63	109	881.3
WHITECOURT	-8.8	4.3	8.5	-25.5	24.9	90	26.6	99	9	8	X		831.5
SASKATCHEWAN													
BROADVIEW	-11.5	2.0	8.0	-32.5	19.4	91	15.1	82	12	7	90	94	914.4
COLLINS BAY	-21.2	0.9	1.5	-39.9	54.8	144	34.0	110	45	5	65	a	1213.0
CREE LAKE	-18.3	1.8	4.1	-43.1	23.4	72	12.2	51	42	5	37	66	1124.8
ESTEVAN	-10.5	0.6	9.9	-29.1	33.6	171	27.6	141	11	6	88	85	880.6
KINDERSLEY	-11.5	1.3	9.4	-35.1	28.6	138	23.6	122	17	5	X		915.3
LA RONGE	-15.4	2.0	9.0	-36.4	19.1	69	16.2	74	28	6	X		1036.8
MEADOW LAKE	-12.3	2.7	4.8	-35.3	14.0	54	8.6	32	7	5	68	a	939.5
MOOSE JAW	-10.1	0.6	9.6	-32.8	27.9	110	25.8	121	18	7	90	104	870.3
NIPAWIN	-13.6	a	5.8	-32.7	15.3	a	9.4	a	9	2	92	a	978.2
NORTH BATTLEFORD	-11.4	2.7	6.5	-32.8	11.1	48	10.7	50	6	5	X		913.3
PRINCE ALBERT	-12.2	4.3	6.9	-33.2	7.6	31	5.2	23	4	2	89	125	937.3
REGINA	-11.5	1.3	6.1	-33.6	18.6	89	17.1	102	13	5	83	98	913.9
SASKATOON	-11.8	2.3	6.6	-34.9	21.8	101	16.2	81	15	5	X		922.7
SWIFT CURRENT	-9.5	0.4	11.0	-29.6	37.5	181	39.9	200	20	5	70	82	829.0
WYNYARD	-11.7	2.0	6.2	-34.6	22.4	90	19.2	86	13	6	X 106	119	919.3
YORKTON	-12.6	2.0	7.6	-33.6	24.4	102	21.2	93	11	7	82	94	967.4
MANITOBA													
BRANDON	-12.4	2.0	4.4	-29.3	17.8	90	12.8	67	11	4	X		942.9
CHURCHILL	-23.8	-1.6	3.0	-36.2	25.6	112	17.3	82	33	5	48	86	1294.3
DAUPHIN	-12.3	2.0	9.6	-31.5	27.8	106	23.4	96	12	8	76	81	938.4
GILLAM	-22.8	0.0	2.3	-37.4	24.0	75	15.0	35	42	5	X		1263.8
GIMLI	-13.7	1.8	5.0	-32.9	40.7	162	25.5	109	24	9	101	99	983.6
ISLAND LAKE	-20.0	-0.2	3.3	-41.5	36.0	61	26.4	60	58	8	X		1177.6
LYNN LAKE	-22.3	-0.5	3.9	-42.6	39.8	119	15.7	55	53	7	37	59	1249.7
NORWAY HOUSE	-18.4	a	4.5	-41.2	23.2	a	19.0	a	17	7	X	a	1128.5
PORTAGE LA PRAIRIE											X		

STATION	Temperature C Mean	Difference from Normal	Maximum	Minimum	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
THE PAS	-15.7	1.9	6.7	-36.2	18.1	63	12.6	57	16	3	82	111	1043.8
THOMPSON	-22.0	-0.3	5.0	-43.4	25.6	57	22.2	57	38	10	68	100	1239.0
WINNIPEG INT'L	-12.8	1.2	6.5	-30.4	26.6	128	22.5	117	19	7	100	107	955.3
ONTARIO													
BIG TROUT LAKE	-20.5	-0.6	0.1	-35.0	25.6	a	24.0	81	56	7	100	a	1190.2
EARLTON	-13.7	-1.1	4.0	-32.2	48.1	89	49.9	88	26	7	X		980.7
GERALDTON	-17.3	-1.9	2.8	-39.2	44.3	127	37.2	95	42	9	X		1094.4
GORE BAY	-5.9	-0.4	7.2	-24.2	95.4	163	64.7	86	22	14	X		739.6
HAMILTON RBG	-1.6	0.3	13.5	-18.2	15.6	51	47.0	63		7	112	a	
HAMILTON	-2.6	0.8	12.2	-19.0	28.0	81	62.7	80	2	10	X		640.4
KAPUSKASING	-16.4	-1.7	1.4	-34.0	70.0	131	61.6	115	56	12	X		1070.0
KENORA	-13.7	0.4	2.6	-31.0	36.2	117	35.8	114	37	8	X		959.0
KINGSTON	-4.2	0.0	9.4	-21.6	30.4	63	44.6	48	3	12	72	93	691.4
LANSDOWNE HOUSE	-19.1	-0.8	1.0	-42.6	48.0	132	42.4	136	44	6	X		1173.8
LONDON	-2.8	0.7	10.0	-20.5	48.7	94	74.4	85		13	76	136	642.6
MOOSONEE	-18.7	-2.7	1.2	-35.5	44.9	112	38.2	94	44	9	63	107	1145.2
MUSKOKA	-7.2	-0.1	8.6	-28.6	79.7	108	97.3	99	21	16	X		779.7
NORTH BAY	-10.1	-0.4	5.1	-26.6	73.4	120	65.2	86	28	13	75	97	870.3
OTTAWA INT'L	-8.3	-0.6	8.0	-24.0	40.0	71	44.5	55	15	11	98	a	815.3
PETAWAWA	-10.1	-0.4	8.3	-32.8	38.4	70	31.8	49	16	11	X		871.3
PETERBOROUGH	-6.1	-0.1	9.6	-25.1	47.7	123	56.4	75	9	11	X		747.7
PICKLE LAKE	-18.5	-0.8	2.3	-34.8	49.0	119	47.6	129	67	10	X		1132.1
RED LAKE	-16.3	-0.5	5.2	-35.7	48.0	150	39.8	139	71	13	98	a	1053.7
ST. CATHARINES	-1.1	-0.1	13.3	-19.1	25.2	87	39.4	55		11	X		590.0
SARNIA	-2.4	-0.2	10.8	-23.6	21.8	57	39.6	48		10	96	146	631.5
SAULT STE. MARIE	-7.1	-0.4	7.5	-26.7	106.8	140	82.7	103	24	24	70 X	112	778.5
SIOUX LOOKOUT	-15.8	-0.7	3.8	-35.4	52.0	151	51.2	151	71	11	X		1050.2
SUDBURY	-10.3	-0.1	5.0	-26.8	64.8	113	66.2	101	26	9	71	84	878.1
THUNDER BAY	-12.4	-1.3	5.9	-29.3	64.3	139	49.5	118	38	10	113	120	942.0
TIMMINS	-15.3	-1.3	6.0	-32.8	68.9	96	66.3	104	36	10	X		1030.0
TORONTO	-1.0	0.6	10.7	-17.0	18.8	55	43.2	59	0	9			588.5
TORONTO INT'L	-2.8	0.7	11.7	-20.0	15.2	46	31.5	48	0	7	X		645.8
TORONTO ISLAND	-1.4	0.5	8.6	-16.0	10.2	35	35.6	49	0	7			600.8
TRENTON	-4.5	0.0	10.6	-22.7	31.6	67	38.6	46	4	11	X		698.4
WATERLOO-WELL	-3.9	0.4	10.0	-22.6	34.0	91	63.3	89	6	7	X		679.2
WAWA	-12.4	a	4.7	-32.0	125.8	a	94.8	a	57	14		a	942.1
WIARTON	-3.7	0.0	9.6	-11.2	178.8	193	111.2	103	6	17	61	131	673.4
WINDSOR	-1.6	0.3	13.9	-16.6	22.6	79	54.8	75	0	11	X		607.1

DECEMBER 1988

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	-14.1	-2.0	3.7	-34.3	76.0	89	71.4	90	27	16	X		985.1
BAIE COMEAU	-12.1	-1.7	4.0	-31.9	112.0	145	80.6	88	38	14	91	a	932.7
BLANC SABLON	-10.8	-3.7	1.9	-26.0	81.6	97	83.4	78	10	15	86	a	885.9
CHIBOUGAMAU	-17.5	-1.6	1.0	-37.4	122.6	182	84.2	134	56	21	65	83	1099.1
GASPE	-8.9	-1.7	1.0	-23.4	51.0	59	45.8	39	14	10	91	a	841.0
INUKJUAK	-17.8	0.1	-1.6	-32.1	43.4	187	41.0	182	27	15	42	156	1111.2
KUUJJUAQ	-23.5	-5.1	-9.0	-33.6	14.6	37	12.8	33	27	5	83	155	1281.1
KUUJJUARAPIK	-17.5	-1.6	-0.8	-34.1	38.2	90	34.3	81	13	12	31	60	1100.5
LA GRANDE RIVIERE	-19.1	a	-2.2	-35.8	47.0	a	46.5	a	40	11	27	a	1146.3
MANIWAKI	-10.9	-0.9	6.6	-31.1	58.2	101	48.4	67	19	11	84	120	887.1
MATAGAMI	-17.2	-1.0	1.2	-35.9	91.0	150	76.3	137	41	17	52	77	1091.9
MONT JOLI	-9.6	-1.3	4.5	-24.4	79.6	88	78.9	83	35	18	49	82	855.8
MONTREAL INT'L	-7.7	-0.8	9.8	-23.6	29.0	49	37.2	42	5	8	93	116	795.7
MONTREAL M INT'L	-9.8	a	7.6	-24.6	38.4	a	40.6	a	9	9	104	a	862.3
NATASHQUAN	-12.2	-3.0	3.0	-29.7	72.8	108	65.4	60	22	14	102	115	937.9
QUEBEC	-10.6	-1.6	6.4	-28.3	68.6	79	63.6	55	30	15	91	120	887.0
ROBERVAL	-13.4	-0.7	4.2	-30.4	76.7	96	72.0	89	45	16	86	a	972.3
SCHEFFERVILLE	-23.4	-4.4	-7.4	-38.1	15.6	30	15.0	30	30	7	87	a	1284.9
SEPT-ILES	-12.9	-1.9	2.9	-30.5	96.6	108	84.7	80	20	15	96	98	959.8
SHERBROOKE	-9.6	-1.4	8.0	-30.8	41.8	55	47.3	51	9	13	82	a	855.0
STE AGATHE DES MONTS	-12.0	-1.6	7.1	-31.2	69.8	75	65.2	58	35	15	74	96	931.2
ST-HUBERT	-7.8	-0.8	9.8	-23.4	24.7	37	40.3	40	5	10	0		798.9
VAL D'OR	-14.3	-1.1	3.5	-34.0	63.0	98	61.4	87	26	15	76	89	1000.2
NEW BRUNSWICK													
CHARLO	-11.0	-2.6	5.0	-25.5	80.3	87	58.5	57	47	12	97	105	897.4
CHATHAM	-8.2	-1.3	7.2	-24.2	35.6	51	22.4	20	9	5	119	120	812.5
FREDERICTON	-7.6	-1.1	8.9	-24.3	31.8	46	40.3	34	8	9	123		792.3
MONCTON	-6.7	-1.3	9.9	-21.8	39.4	54	58.9	48	3	8	118	130	765.6
SAINT JOHN	-5.6	-0.8	9.4	-22.0	42.6	64	64.5	39	8	9	132		732.2

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									
NOVA SCOTIA													
GREENWOOD	-4.1	a	11.1	-22.1	64.9		68.1		2	11	X		688.1
HALIFAX INT'L	-4.4	-1.5	9.2	-19.3	49.0	90	62.6	34	0	8	a		693.0
SABLE ISLAND	1.2	-1.4	10.6	-7.6	32.4	172	95.4	66	0	12	79	146	521.4
SHEARWATER	-2.9	-1.4	8.7	-17.5	28.5	75	59.4	40	6	7	126	135	648.9
SYDNEY	-3.6	-1.8	7.8	-14.3	53.5	81	74.5	45	5	10	99	148	668.3
YARMOUTH	-1.6	-1.3	9.6	-15.5	40.2	91	73.4	51		14	78	126	606.6
PRINCE EDWARD ISLAND													
CHARLOTTETOWN	-5.6	-1.7	7.5	-18.1	83.2	114	75.6	58	12	15	X		732.7
SUMMERSIDE	-5.8	-1.8	7.5	-17.4	50.9	84	62.5	58	8	13	90	122	735.1
NEWFOUNDLAND													
BATTLE HARBOUR	-11.2	-4.4	3.2	-26.4	78.6	a	74.6	159	64	16	X		906.4
BONAVISTA	-2.7	-1.2	6.9	-12.8	114.4	294	114.4	119	46	17	X		640.4
BURGEO	-2.5	-0.9	6.0	-13.2	58.3	114	80.5	44	10	20	0		662.2
CARTWRIGHT	-13.4	-4.3	2.1	-27.9	50.5	74	50.5	67	43	11	88	144	970.9
CHURCHILL FALLS	-21.9	-4.3	-6.6	-36.3	37.4	60	29.2	46	63	10	122	146	1235.9
COMFORT COVE	-6.1	-2.3	5.0	-17.0	89.2	124	95.5	89	65	14	X		745.3
DANIEL'S HARBOUR	-4.0	-0.1	4.4	-13.3	91.6	131	99.9	109	29	25	26	87	293.2
DEER LAKE	-6.3	-1.0	5.2	-21.0	160.9	186	140.0	126	65	21	X		757.2
GANDER INT'L	-5.6	-1.8	5.7	-17.3	116.8	164	119.3	110	50	18	90	131	733.3
GOOSE	-18.0	-5.0	-3.5	-29.4	43.2	58	34.2	47	37	9	98	133	1371.7
PORT-AUX-BASQUES	-3.1	-1.4	4.9	-12.2	76.8	141	91.9	59	27	19	43	a	654.7
ST ANTHONY	-8.7	-1.0	1.3	-23.4	121.5	194	110.5	100	36	21		a	814.1
ST JOHN'S	-3.0	-1.5	9.2	-13.2	66.7	102	130.0	80	14	18	73	128	951.4
ST LAWRENCE	-2.1	-1.1	8.0	-11.5	46.8	143	79.2	64	10	11		a	624.2
STEPHENVILLE	-4.0	-1.4	4.4	-13.3	91.6	81	99.9	88	29	25	28		293.2
WABUSH LAKE	-21.6	-3.0	-6.1	-29.1	42.0	80	39.9	55	41	9	83	a	228.4

AGROCLIMATOLOGICAL STATIONS — DECEMBER 1988

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	4.6	1.6	13.0	-3.5	5.4	194.1	74	0	19	47	35.3	2271.5
KAMPLOOPS	**	**	**	**	**	**	**	***	**	**	**	**
SIDNEY	5.5	1.2	12.5	-2.0	0.0	131.5	83	0	18	50	41.3	1976.5
SUMMERLAND	-1.3	-0.2	7.5	-13.0	31.0	31.2	95	7	10	48	0.0	2293.9
ALBERTA												
BEAVERLODGE	-8.0	3.6	8.0	-27.0	21.0	16.0	50	18	5	79	0.0	1388.7
ELLERSLIE	**	**	**	**	**	**	**	***	***	**	**	**
LACOMBE	-8.4	3.1	10.0	-29.5	27.0	18.7	101	20	5	77	0.0	1463.4
LETHBRIDGE	**	**	**	**	**	**	**	***	***	**	**	**
VEGREVILLE	-9.0	5.0	5.0	-30.0	11.7	11.7	69	10	3	**	0.0	1582.3
SASKATCHWAN												
INDIAN HEAD	-11.2	1.8	8.0	-34.5	24.8	17.0	79	18	5	**	0.0	1545.5
MELFORT	-13.3	3.2	6.0	-34.0	11.6	12.9	51	13	6	69	**	1810.5
REGINA	-12.3	0.7	6.0	-39.0	19.2	20.9	115	13	5	**	0.0	1927.8
SASKATOON	-11.0	2.7	7.0	-34.5	18.2	18.2	71	8	6	81	0.0	1997.0
SCOTT	-11.9	2.3	4.5	-32.5	15.6	14.0	68	11	6	84	0.0	1682.9
SWIFT CURRENT	-8.8	1.5	11.5	-30.5	16.6	30.7	191	15	5	68	2.3	2053.2
MANITOBA												
BRANDON	-12.3	1.8	6.0	-32.0	15.0	15.0	74	17	3	**	0.0	2094.8
GLENLEA	-10.7	3.7	10.0	-32.0	28.4	28.4	122	11	5	103	0.5	2362.0
MORDEN	-14.0	-1.7	3.5	-31.0	32.0	32.2	144	30	9	87	0.0	2077.1
ONTARIO												
DELHI	-2.9	0.0	12.0	-21.0	56.6	108.6	127	5	12	84	0.0	2285.7
ELORA	-4.9	0.3	8.8	0.0	**	43.2	60	9	***	**	**	**
GUELPH	-4.2	-0.1	10.0	-24.0	29.0	49.0	69	6	8	93	0.2	2045.5
HARROW	-1.6	0.1	11.0	-20.5	7.4	22.0	30	1	4	91	3.8	2587.5
KAPUSKASING	-16.4	-1.7	4.0	-38.0	74.7	58.8	115	41	14	72	0.0	1386.4
OTTAWA	-7.0	0.5	8.1	-23.6	7.5	26.8	37	9	7	99	0.0	2140.8
SMITHFIELD	-3.8	0.7	10.7	-23.0	28.5	76.7	79	5	11	**	0.0	2327.8
VINELAND	-0.9	0.1	13.0	-16.5	12.0	42.4	58	1	9	96	2.5	2338.3
WOODSLIE	**	**	**	**	**	**	**	***	***	**	**	**

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
QUEBEC												
LA POCATIERE	-8.5	-0.3	6.5	-24.0	30.8	28.3	31	9	11	89	0.0	1644.5
L'ASSOMPTION	**	**	**	**	**	**	**	***	***	**	**	**
LENNOXVILLE	**	**	**	**	**	**	**	***	***	**	**	**
NORMANDIN	-15.3	-1.2	3.0	-37.0	69.6	61.4	87	20	11	92	5.7	1363.8
STE.CLOTILDE	-6.6	0.1	12.5	-25.5	21.0	31.7	37	8	8	91	0.0	2086.0
NEW BRUNSWICK												
FREDERICTON	-7.1	-0.7	9.0	-22.5	16.0	33.9	28	0	8	123	0.0	1840.9
NOVA SCOTIA												
KENTVILLE	-3.8	-1.4	11.5	-18.0	53.6	57.1	44	4	11	83	4.1	1762.8
NAPPAN	-5.3	-1.3	9.5	-22.0	52.9	57.9	49	4	7	103	1.5	1757.3
PRINCE EDWARD ISLAND												
CHARLOTTETWN	-5.2	-1.7	8.0	-18.0	78.4	73.6	66	5	14	91	0.0	1721.4
NEWFOUNDLAND												
ST.JOHN'S WEST	**	**	**	**	**	**	**	***	***	**	**	**