Environment Canada Environnement Canada

Climatic Perspectives

Monthly review | FEBRUARY | Vol.9 1987

CLIMATIC HIGHLIGHTS

by
P. Scholefield, CCRM

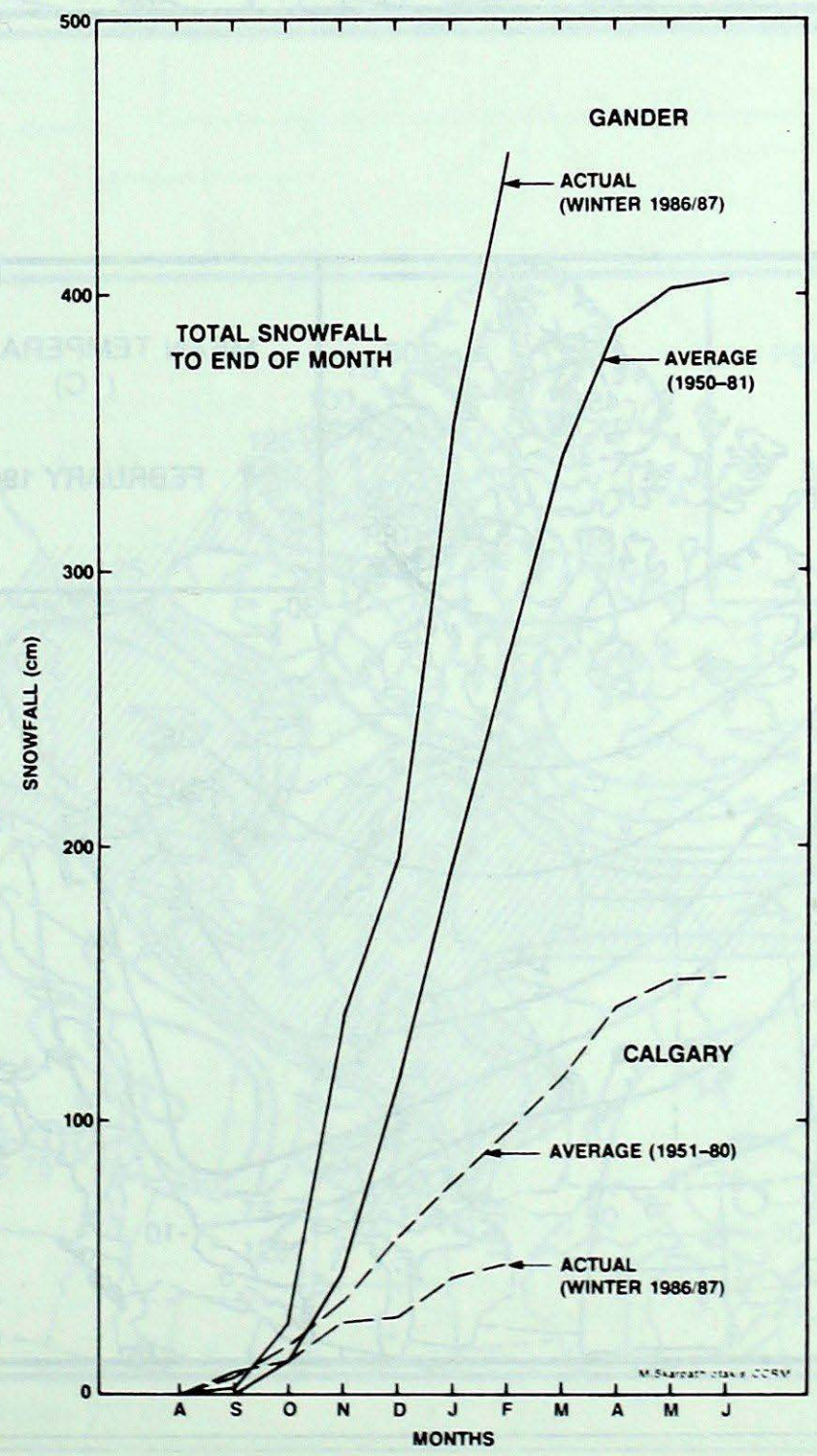
Continuation of Mild in the West Cold in the Maritimes

The extraordinary winter-long mild spell continued its grip on most of the country (shaded areas on temperature anomaly map page 2B) with the strongest anomlaies again occurring over the western provinces. This means there has now been three consecutive months of above normal temperatures over most of the country where the positive anomaly patterns have been surprisingly similar each month. Some areas on the west coast of B.C. have now experienced 7 consecutive months of warmer than normal weather. Daffodil growers have been required to use growth retardent to delay blooming until the traditional Easter period. Over southern Ontario and Quebec, a persistent high pressure system produced record amounts of sunshine, very little precipitation and near-normal temperatures.

In contrast, the East Coast cold spell has been extended to 5 months in the Baffin Island area and to 9 months in a small area encompassing most of New Brunswick and all of Prince Edward Island. It was a warmer than normal month over most of Newfoundland and Labrador for the first time since August 1986.

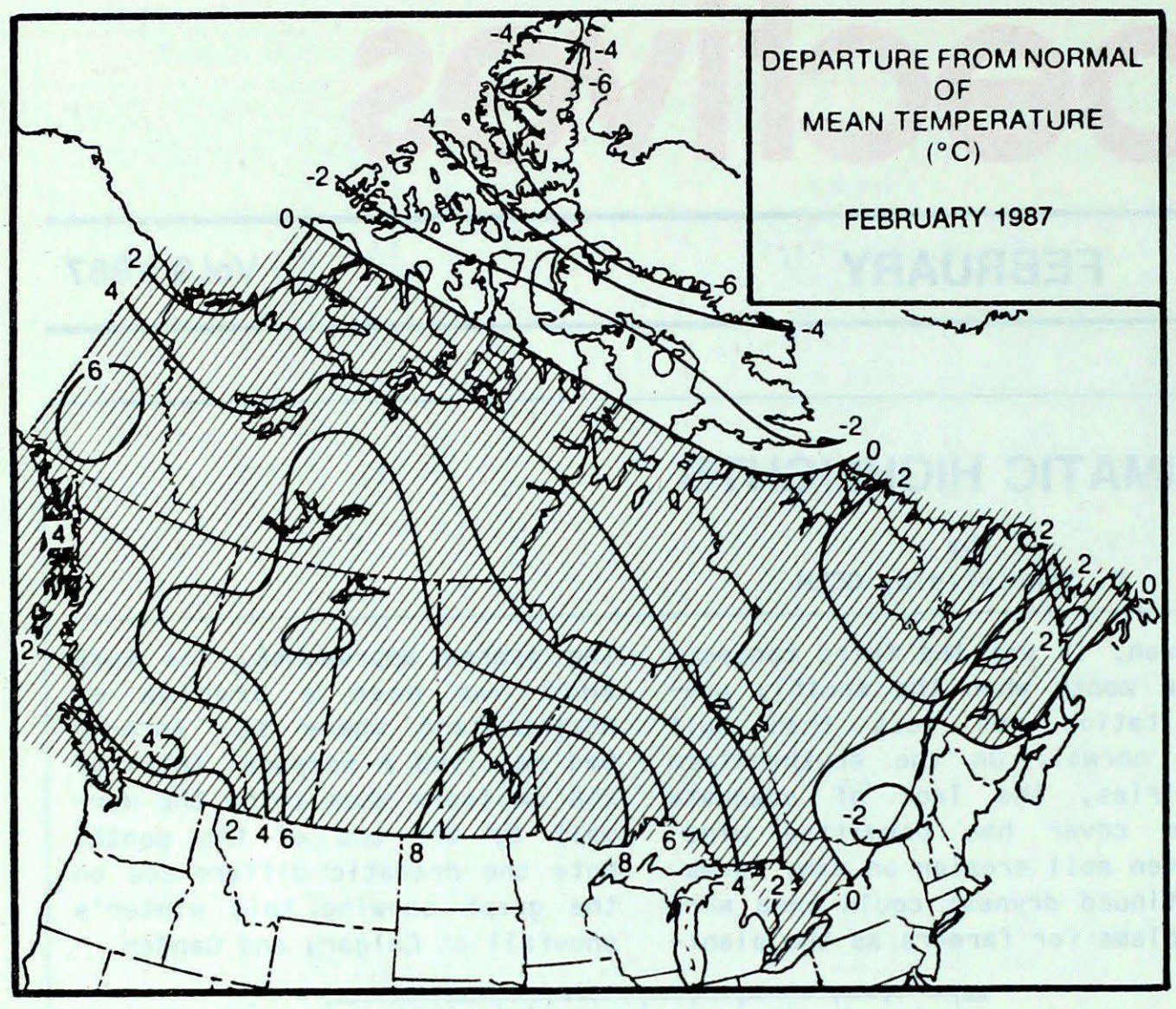
Shortage of Snow in the West Abundance in Newfoundland

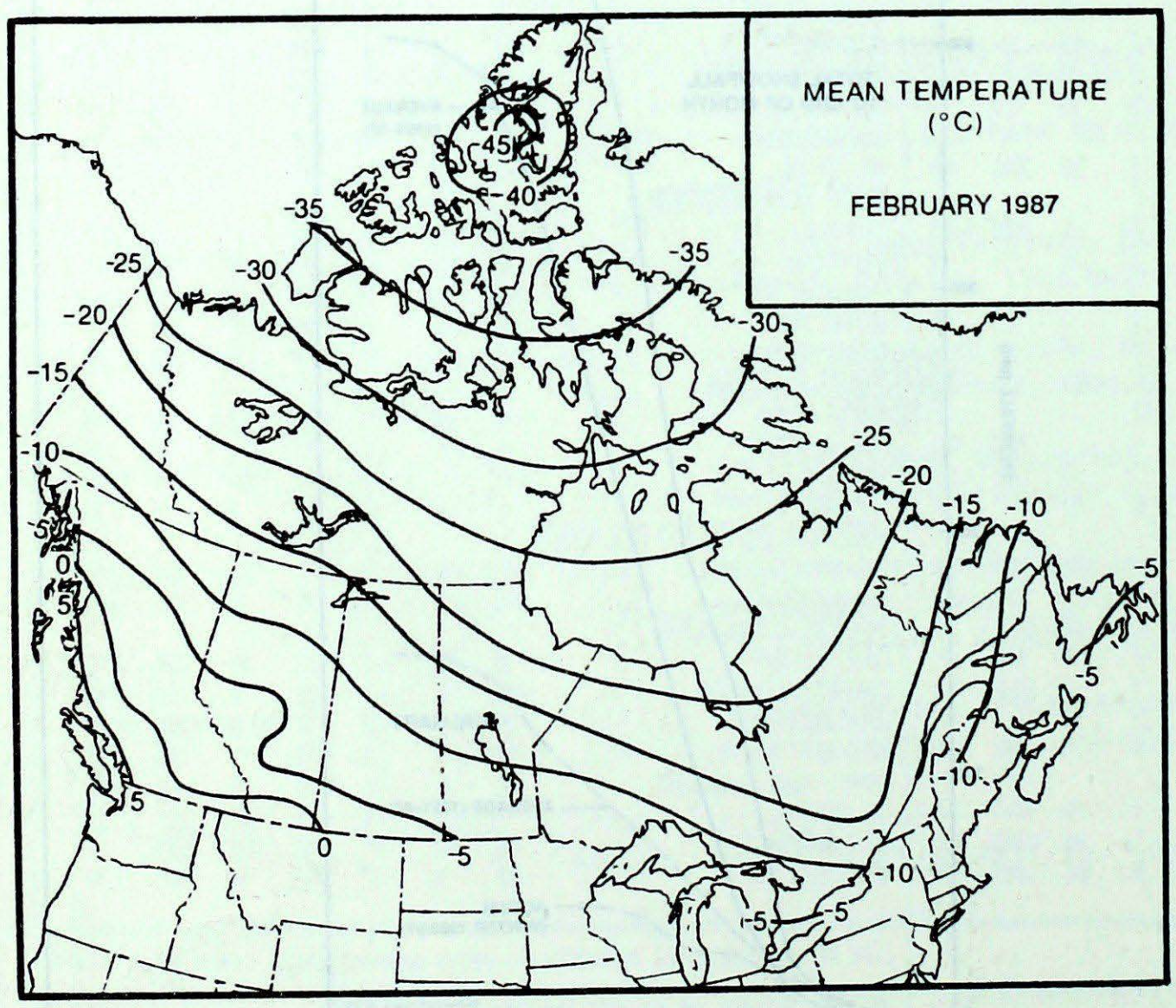
For an area encompassing southeastern B.C., southern Alberta and southwestern Saskatchewan, it was the third consecutive month when the monthly precipitation was less than half the normal. On the southwestern Prairies, the lack of adequate snow cover has permitted wind-driven soil erosion on many farms. Continued dryness could pose more problems for farmers as the planting season approaches. Too much snow has been a problem on Newfoundland where St. Anthony had received a seasonal total of 258 cm (more than twice the normal) by the end of the month. Note the dramatic differences on the graph showing this winter's snowfall at Calgary and Gander.



Canada

TEMPERATURE





ACROSS THE COUNTRY...

Yukon and Northwest Territories

January's temperature pattern continued into February. The Yukon and the Mackenzie District were very mild, the temperature were 2 to 7 degrees above normal. In contrast, eastern Arctic continued to endure cold winter weather. On several occasions, the readings dropped below -50 degrees. Eastern Arctic has now experienced below normal temperatures for nine consecutive months. Snowfall was well above normal in the Yukon, only Dawson received less than half the normal. Snowfall was sparse over Baffin Island, Cylde had less than 1 cm.

British Columbia

Once again this month, mild temperatures prevailed across British Columbia. The temperatures were nearly 6 degrees above normal in the northeast but fell to 2 degrees above the long-term mean in the central and southern interior regions. At Revelstoke, a monthly mean of 0.5 degrees proved to be the warmest February value on record. Precipitation pattern was less clear cut, normal to 50 per cent more than normal amounts fell along the coast. However, less than half the normal values were reported in the Interior.

Snowfall was below normal throughout most of British Columbia. Only Fort Nelson received more than its normal February share. The month was rather dull. Hours of bright sunshine were below normal; however, some coastal locations had up to 150 per cent of normal. Record high sunshine hours were received at Kelowna, 106 hrs.

Owing to the mild temperatures, bush logging roads were becoming soft and muddy and could not support heavy machineries. Logging operation was adversely affected. The mild weather also contributed to the early blossoming of daffodils.

PRECIPITATION

Prairie Provinces

Balmy temperatures averaging 4 to 9 degrees above normal brought record to near record warmth across the Prairies. Winnipeg recorded its second warmest February on record and established a record warm winter season (December to February mean of -9.4 degrees). At Edmonton, the same three month average was the second warmest since 1880. (-4.1 degrees). The warmest reading was 17.5 degrees at Lethbridge on Feb. 6. Several daily temperature records were set in eastern Prairies during the first 10 days of the month.

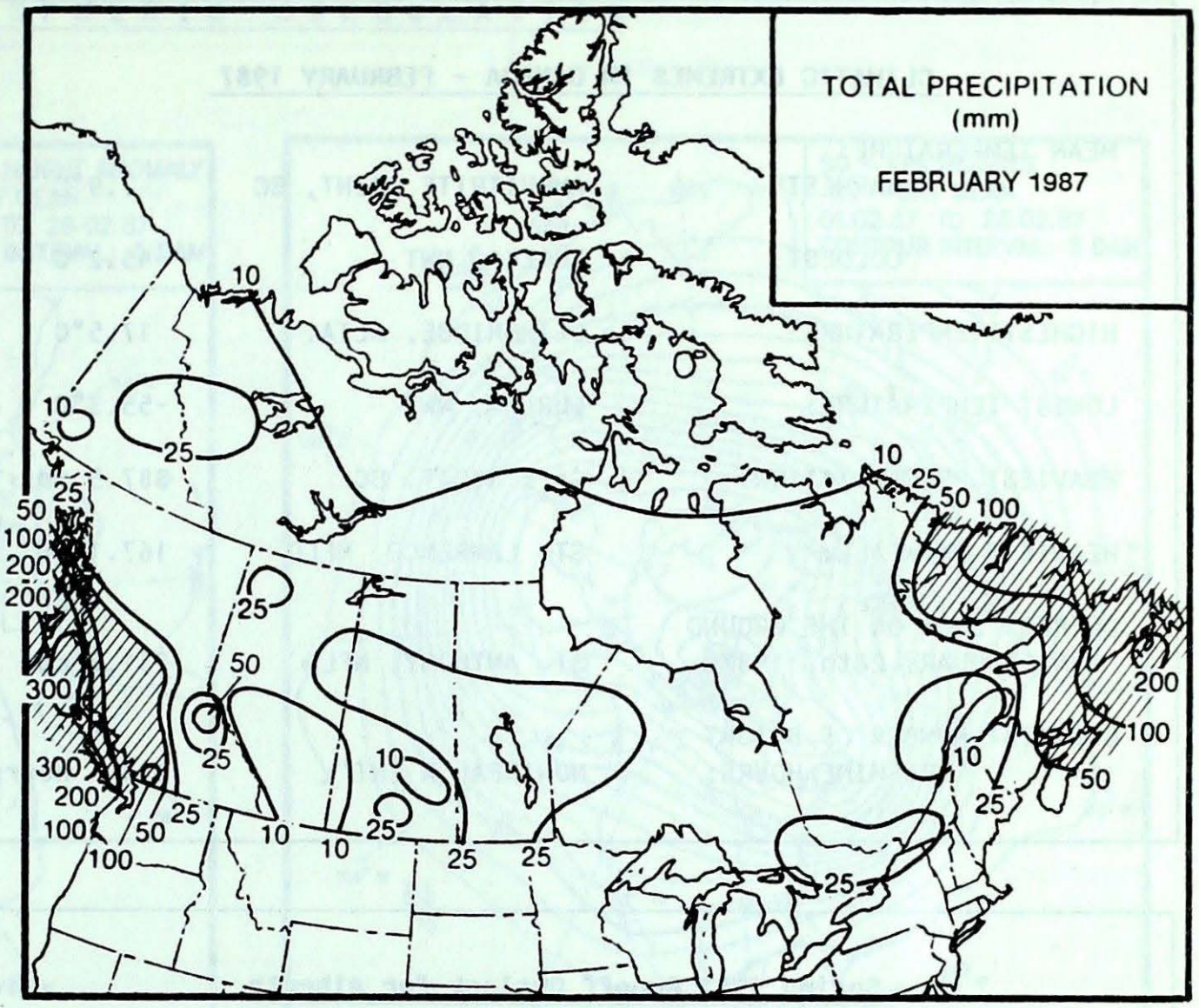
Snowfall was well below normal in Alberta. Amounts were less than 10 cm at Edmonton and Calgary. The least was at Medicine Hat with only 2.8 cm. In contrast, snowfall in Manitoba (30-60 cm) was more than double the February normal.

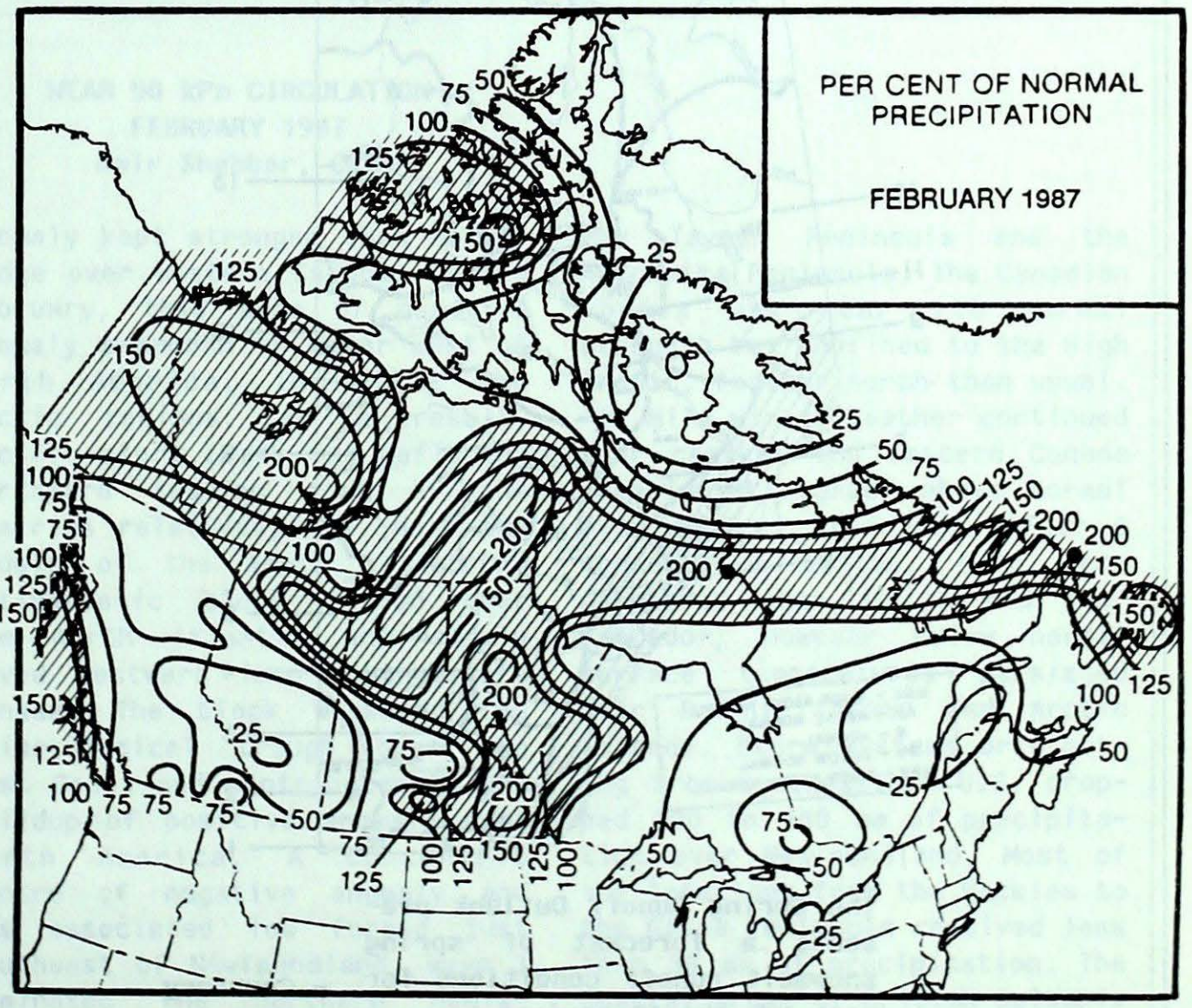
Ontario

Sunny, dry and mild weather produced a fine month of February in Ontario. Record amounts of bright sunshine were received throughout southern and central Ontario. Kingston and Sudbury received a record-breaking 174 hours of bright sunshine, making them the sunniest locations. Once again this month, mild temperatures covered the Province. Northern Ontario was especially mild, the readings were 6 to 9 degrees above normal. This marks the third successive month with much above normal temperatures, making this winter one of the mildest on record in Northwestern Ontario. Kenora's balmy -6.2 degrees was 8 degrees warmer than their normal and the highest February mean. In southern and central Ontario, the temperatures were 1 to 3 degrees above normal. Only eastern Ontario experienced below normal values.

Along the lower Great Lakes, snowfall was less than half the normal amounts. At Windsor, 4.4 cm was the least since February of 1953. In central and northwestern Ontario, snowfall was near normal.

Outdoor recreation opportunities abounded across the Province as the sunny skies and surprisingly stable snow cover allowed for good skiing and snowmobiling.



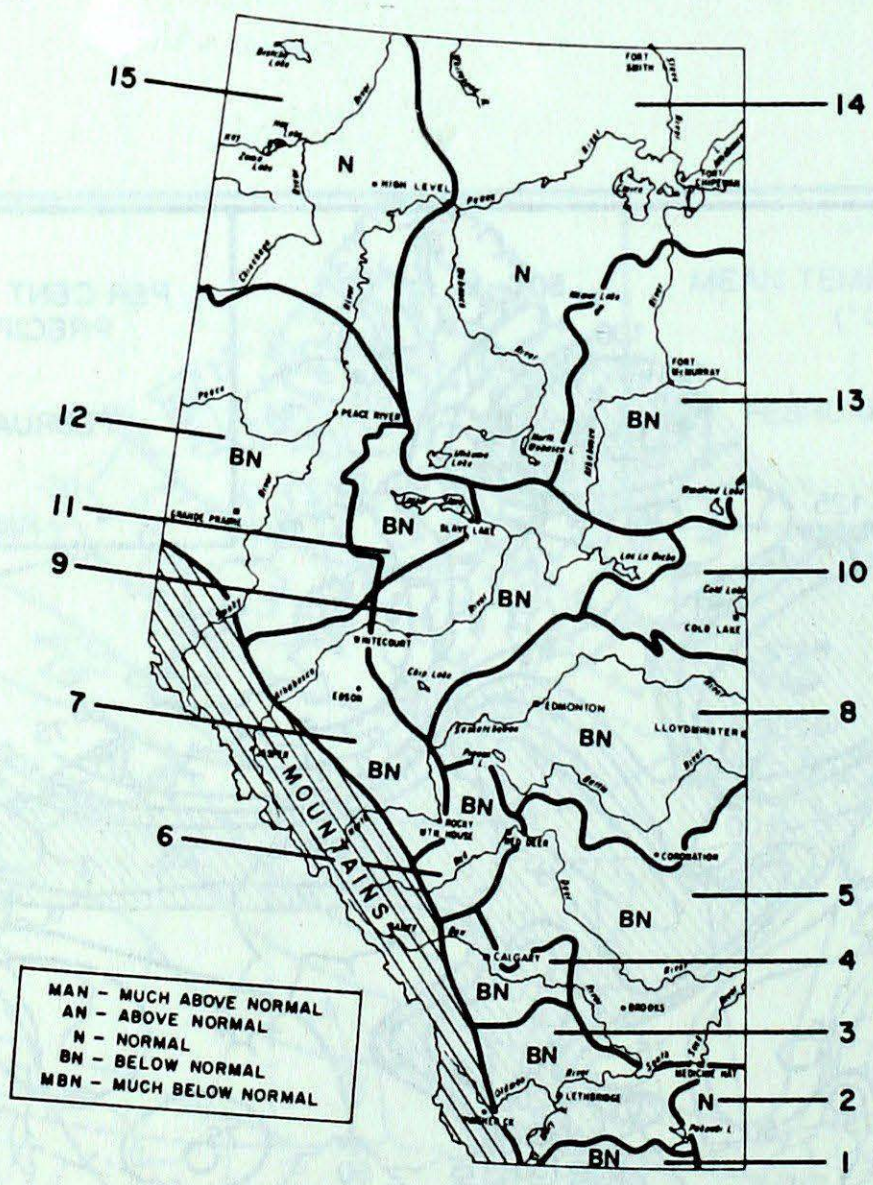


EXTREMES

CLIMATIC EXTREMES IN CANADA - FEBRUARY 1987

MEAN TEMPERATURE:		
WARMEST	AMPHITRITE POINT, BC	7.9°C
COLDEST	EUREKA, NWT	-45.2°C
HIGHEST TEMPERATURE:	LETHBRIDGE, ALTA.	17.5°C
LOWEST TEMPERATURE:	EUREKA, NWT	-55.3°C
HEAVIEST PRECIPITATION:	CAPE SCOTT, BC	387.5 mm
HEAVIEST SNOWFALL:	ST. LAWRENCE, NFLD	167.1 cm
DEEPEST SNOW ON THE GROUND ON FEBRUARY 28th, 1987:	ST. ANTHONY, NFLD	231.0 cm
GREATEST NUMBER OF BRIGHT SUNSHINE HOURS:	MONTREAL M INT'L	234 hours

Spring 1987 Runoff Outlook for Alberta



The Spring Runoff Outlook presents a forecast of spring snowmelt runoff conditions for each of the 15 regions.

- Courtesy Environment Canada

Quebec

A ridge of high pressure over western Quebec gave record breaking amounts of sunshine hours to southwestern areas. Over 200 hrs of sunshine were recorded over southern Laurentians and the Montreal area. At Montreal 206 hrs of sun was the most since 1978. Eastern Quebec experienced a mild and dry February. The temperatures were about 2 degrees below normal in southwestern areas, but reached 6 degrees above the long-term average at Schefferville. Precipitation was well below normal almost everywhere. Less than 10 mm fell at Sept-Iles, Baie Comeau, Roberval and Quebec City. Snowfall was less than 20 cm from Trois-Rivieres to Sept-Iles. Five stations received record low February snowfall including 7.4 cm at Sept-Iles.

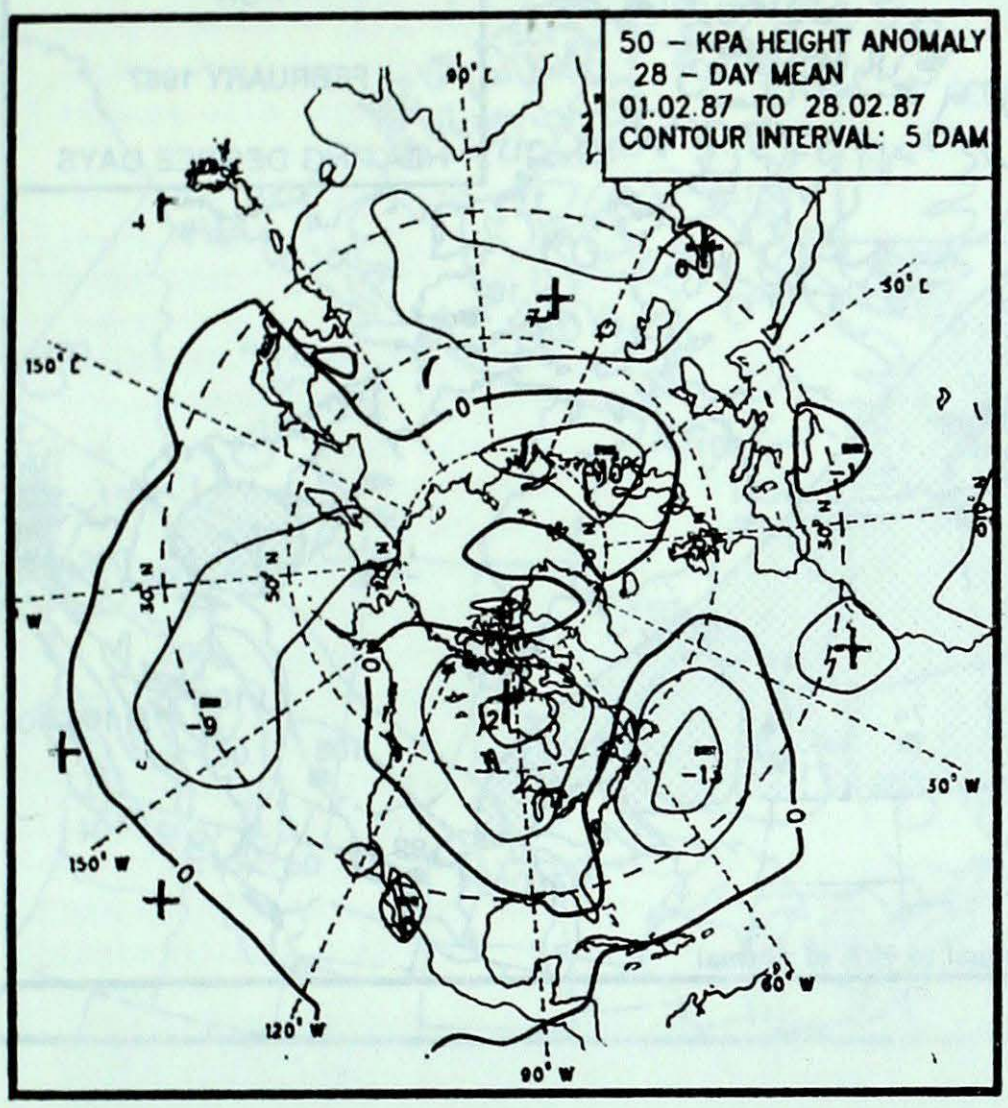
Atlantic Provinces

February was sunny, cold and dry in the Maritimes, but mild and snowy in Newfoundland and Labrador. The temperatures ranged from about 2 degrees below normal in Prince Edward Island to 4 degrees above average in eastern Labrador. In the Maritimes, precipitation was well below normal with many locations receiving less than half their normal amounts. Charlo's 9.7 cm of snow was the lowest February amount on record. A number of winter storms dumped over 100 cm of snow over Newfoundland. St. Lawrence Newfoundland received 167 cm, well in excess of three times the normal.

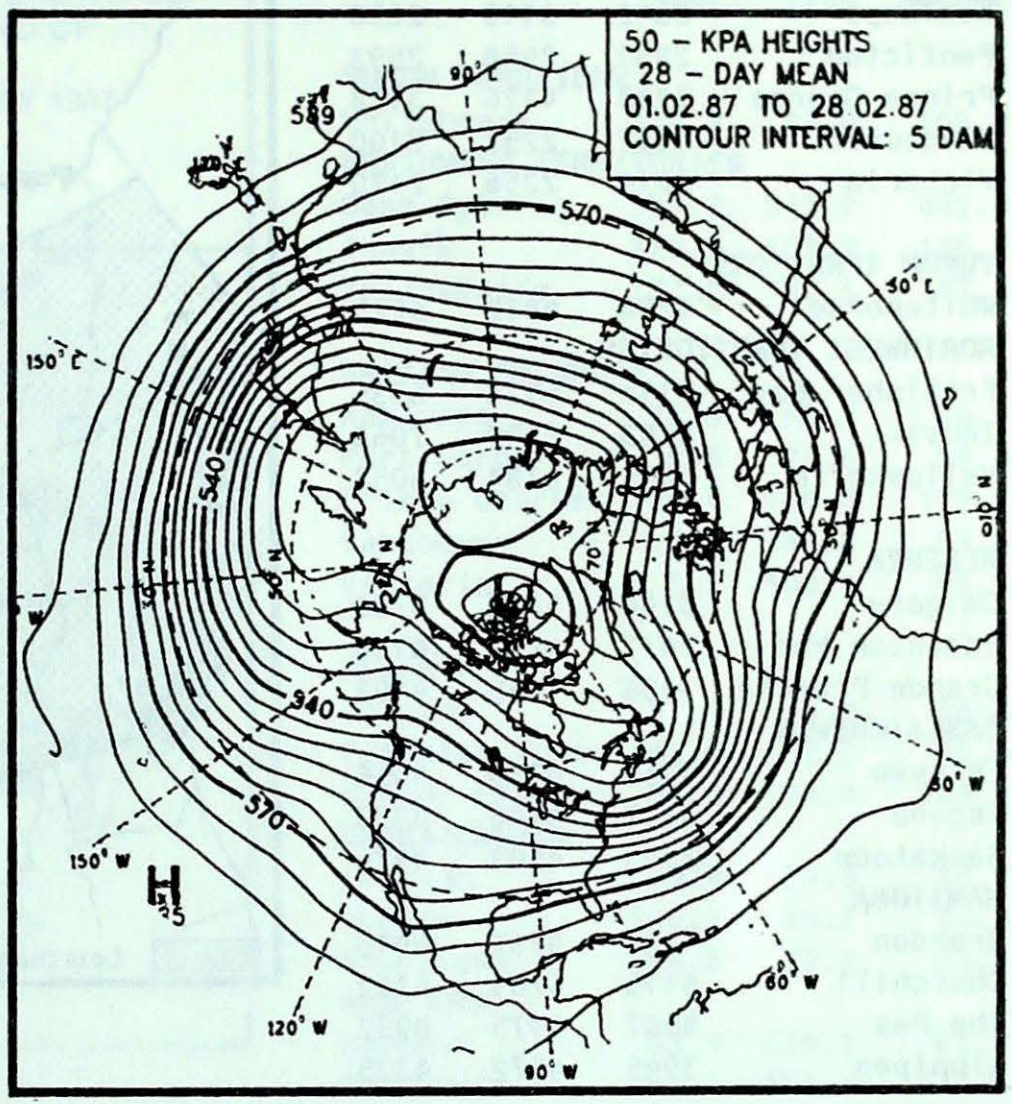
Once again this month, snow removal was a major problem. School and businesses were forced to close during these storms as snow drifts reached 6 to 10 metres.

The possibility of flooding due to large buildup of snow and ice on a number of Maritimes river was a cause to concern to the local residents. In the Maritimes, below normal rainfall and cold weather have kept deficient flows in many rivers.

ATMOSPHERIC CIRCULATION



Mean 50 kPa height anomaly (dam)
February 1987



Mean 50 kPa heights (dam)
February 1987

MEAN 50 kPa CIRCULATION
FEBRUARY 1987

Amir Shabbar, CCRM

The January 50 kPa circulation pattern continued into February over the north Pacific Ocean and western North America. In response to the warming of the sea surface temperatures, below normal heights persisted over northeastern Pacific Ocean but weakened considerably from its January value of negative 16 decameters. Towards the end of February, positive height anomaly and its associated ridge formed over the Gulf of Alaska. In the equatorial Pacific Ocean, sea surface temperatures were 1 to 2 degrees above normal over a large area east of the Dateline, and 2 degrees warmer than normal waters have now appeared along the west coast of Ecuador and Peru.

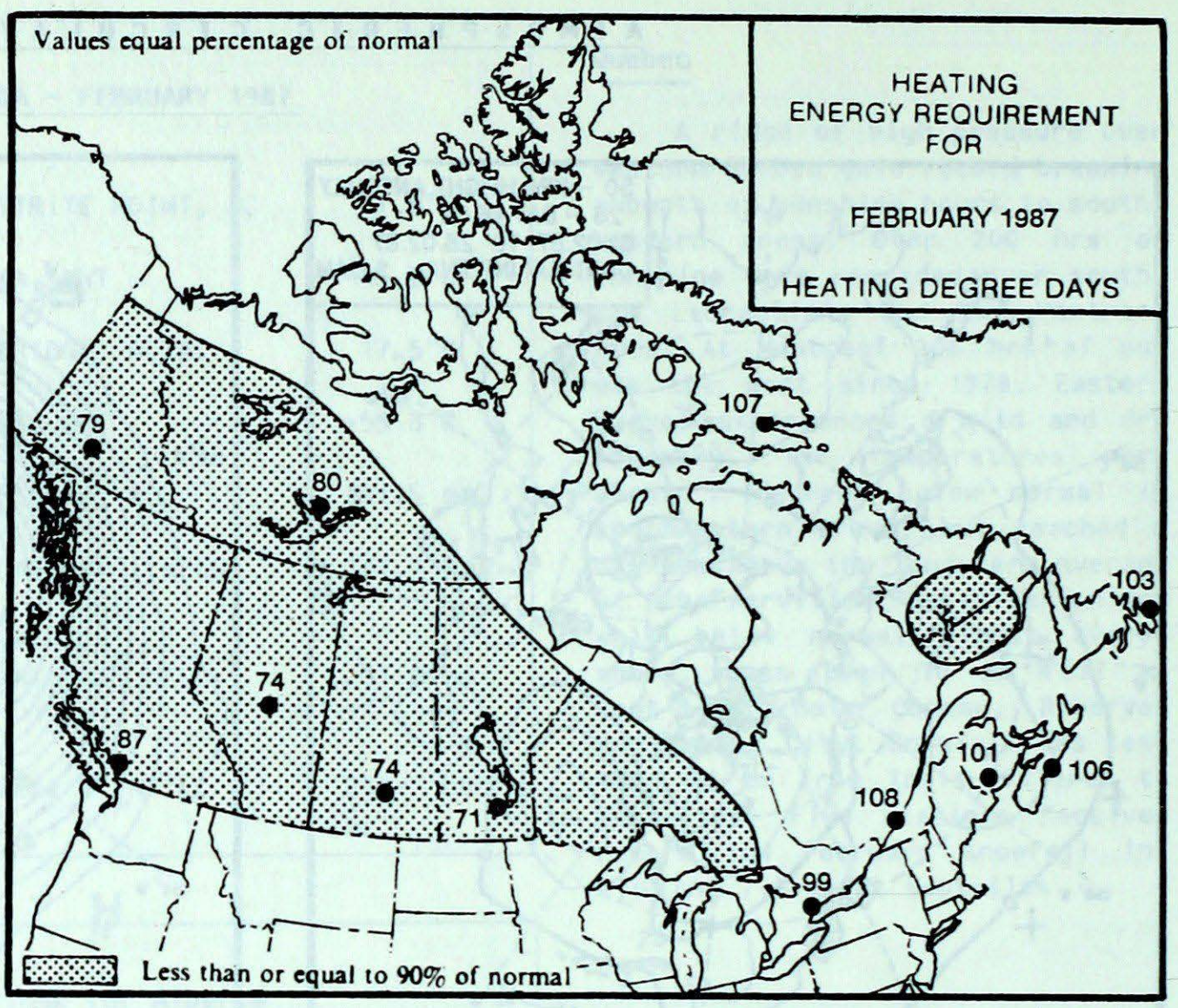
Unwinter like circulation continued over western North America. Persistent positive anomaly kept stronger than normal ridge over western Canada. During February, this area of positive anomaly expanded to cover most of North America, including the Arctic regions. As a result, Pacific storm track was deflected northward leaving most of the Prairies relatively dry. Near the middle of the month, a strong anticyclonic block formed over the north Atlantic and slowly moved westward into northeastern Canada. The block weakened the climatological trough over the East Coast and contributed to the buildup of positive anomaly over North America. A concentric centre of negative anomaly and its associated low formed just southeast of Newfoundland. Wave 3 dominated the northern hemispheric circulation with vortices over the High Canadian Arctic, the Taymyr Peninsula and the Kamchatka Peninsula. The Canadian vortex was near its normal strength but confined to the High Arctic, farther north than usual.

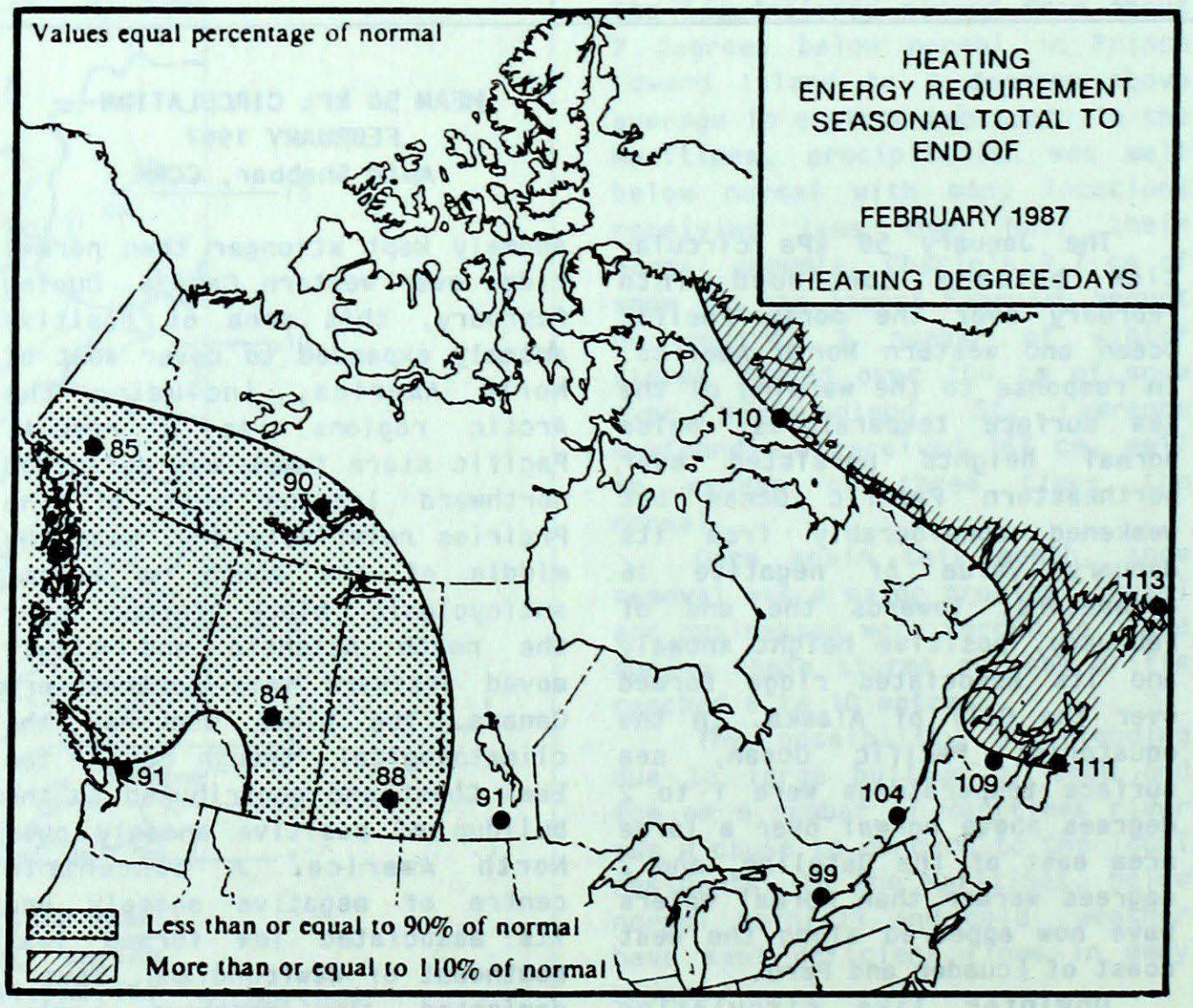
Mild winter weather continued over central and western Canada (nearly 10 degrees above normal over central Prairies). After 8 consecutive months, cold temperatures came to an end over Labrador; however below normal surface temperatures persisted over Baffin Island and Arctic Islands. Storm systems originating from southeastern U.S. dropped 100 to 140 mm of precipitation over Newfoundland. Most of the locations from the Rockies to the Gaspe Peninsula received less than 30 mm of precipitation. The coastal areas of British Columbia had 100 to 230 mm of rain.

ENERGY

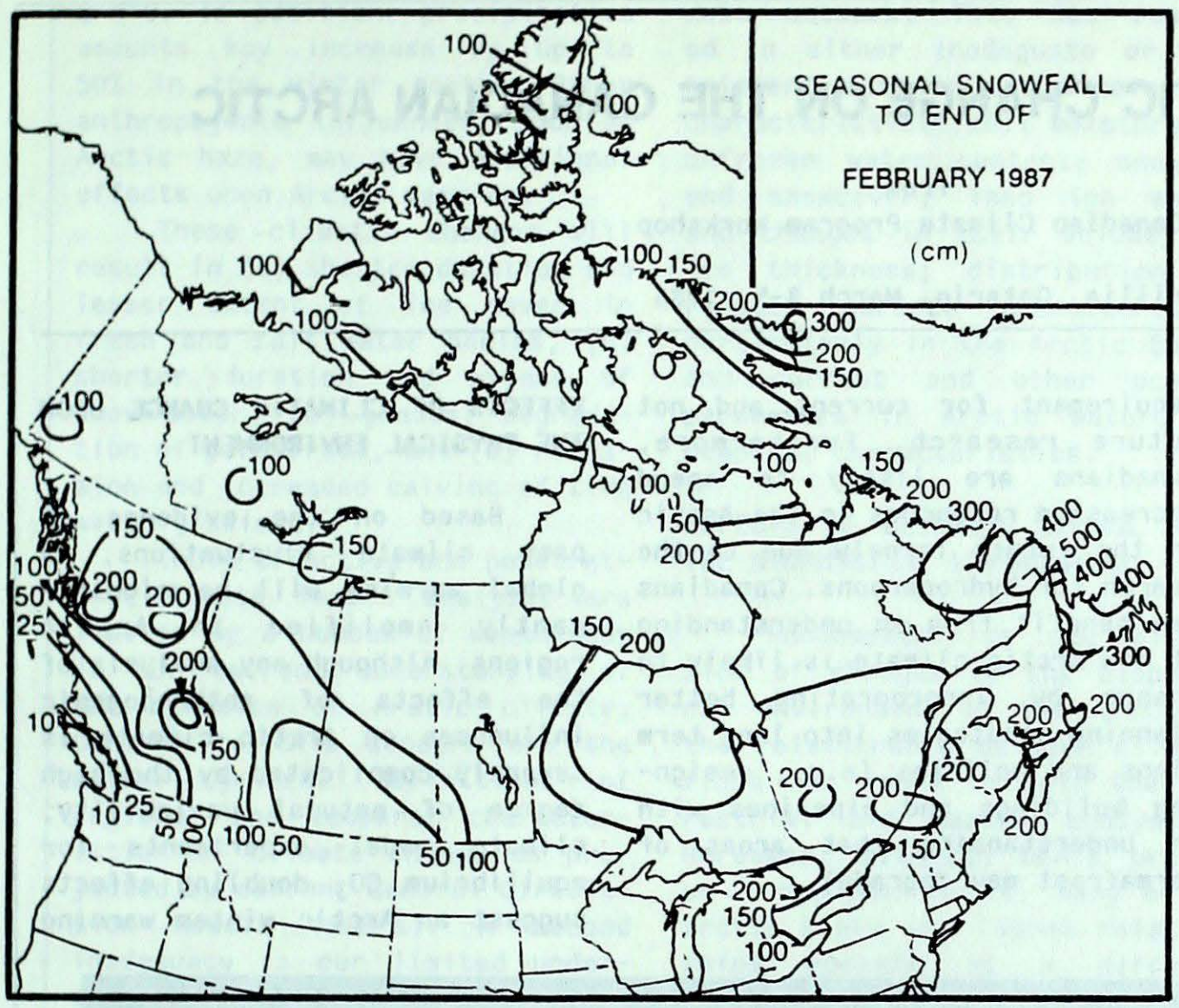
SEASONAL TOTAL OF HEATING DEGREE-DAYS TO END OF FEBRUARY

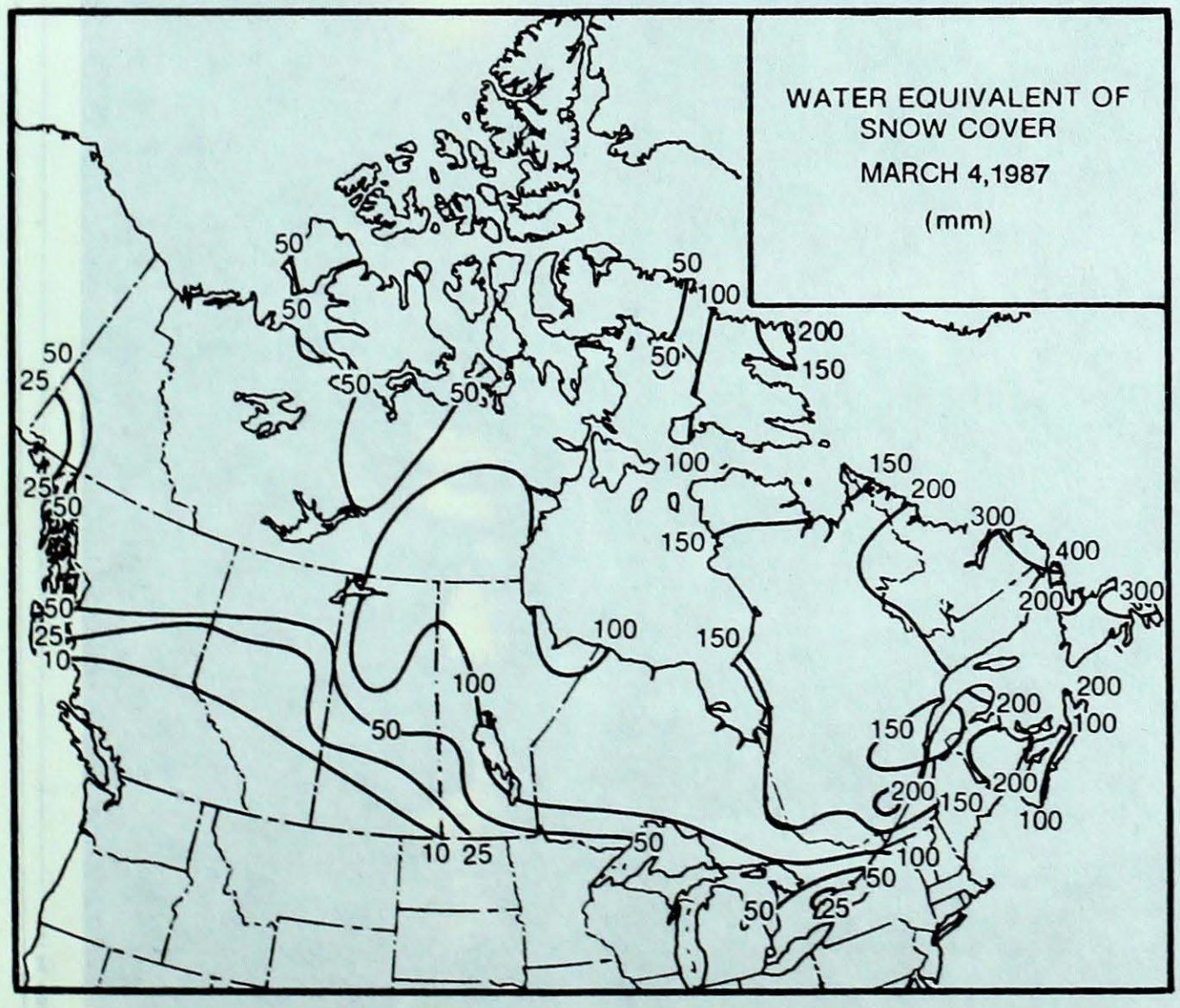
	1987	1985	NORMAL
BRITISH COLUMBIA			
Kamloops	2542	3113	2858
Penticton	2459	2958	2593
Prince George	3433	4126	3928
Vancouver	1912	2257	2100
Victoria	2014	2256	2120
YUKON TERRITORY			
Whitehorse	4290	4832	5025
NORTHWEST TERRITORIES			
Frobisher Bay	7194	5924	6535
Inuvik	6763	6959	7060
Yellowknife	5456	6181	6058
ALBERTA			
Calgary	3240	3816	3798
Edmonton Mun	3471	4037	4110
Grande Prairie	3956	4455	4498
SASKATCHEWAN			
Estevan	3453	4139	4056
Regina	3807	4848	4333
Saskatoon	3945	4503	4474
MANITOBA			
Brandon	4101	4762	4416
Churchill	6115	6269	6162
The Pas	4507	4975	4932
Winnipeg	3945	4572	4325
ONTARIO			
Kapuskasing	4467	4791	4561
London	2882	2881	2908
Ottawa	3389	3405	3418
Sudbury	3728	3930	3899
Thunder Bay	3796	4269	4096
Toronto	2893	2911	2907
Windsor	2491	2633	2606
QUÉBEC			
Baie Comeau	4325	4280	4164
Montréal	3397	3330	3248
Quebec	3828	3706	3643
Sept-Iles	4442	4352	4264
Sherbrooke	3804	3671	3781
Val-d'Or	4429	4539	4402
NEW BRUNSWICK			
Charlo	4020	3835	3630
Fredericton	3640	3473	3333
Moncton	3612	3405	3250
NOVA SCOTIA			
Halifax	3006	2847	2712
Sydney	3320	3063	2873
Yarmouth	2888	2718	2678
PRINCE EDWARD ISLAND			
Charlottetown	3450	3240	3082
NEWFOUNDLAND			
Gander	3697	3501	3301
St. John's	3457	3237	3068





SNOWFALL





SEASONAL SNOWFALL TOTALS (CM)
TO END OF FEBRUARY

	1987	1986	NORMAL
YUKON TERRITORY			
Whitehorse	106.2	99.0	105.9
NORTHWEST TERRITORIES			
Cape Dyer	357.2	541.2	442.0
Inuvik	129.0	101.2	129.9
Yellowknife	122.8	142.6	107.3
BRITISH COLUMBIA			
Kamloops	57.3	85.3	86.7
Port Hardy	8.6	27.6	59.8
Prince George	125.4	144.4	199.7
Vancouver	2.0	43.8	53.5
Victoria	5.2	100.9	43.5
ALBERTA			
Calgary	37.1	70.4	96.4
Edmonton Namao	53.4	88.2	99.6
Grande Prairie	68.0	94.8	141.2
SASKATCHEWAN			
Estevan	39.4	84.8	80.7
Regina	120.0	85.7	83.3
Saskatoon	50.8	72.2	83.1
MANITOBA			
Brandon	63.9	124.1	83.7
Churchill	143.5	154.1	131.6
The Pas	108.4	99.0	116.3
Winnipeg	107.5	99.5	90.6
ONTARIO			
Kapuskasing	207.5	208.7	237.3
London	137.4	195.3	171.5
Ottawa	138.4	134.2	182.2
Sudbury	196.6	175.7	194.4
Thunder Bay	102.6	195.7	158.4
Toronto	104.6	75.2	101.4
Windsor	88.1	146.6	93.2
QUEBEC			
Baie Comeau	223.4	303.4	276.5
Montréal	172.3	164.6	188.0
Quebec	175.6	238.4	272.1
Sept-Iles	197.1	265.7	317.9
Sherbrooke	228.4	203.7	236.1
Val-d'Or	215.2	193.2	237.4
NEW BRUNSWICK			
Charlo	206.9	192.2	292.8
Fredericton	223.0	208.4	219.1
Moncton	*	251.0	243.0
NOVA SCOTIA			
Shearwater	155.8	169.7	144.9
Sydney	248.0	252.8	223.3
Yarmouth	195.2	160.7	168.2
PRINCE EDWARD ISLAND			
Charlottetown	236.6	219.7	239.6
NEWFOUNDLAND			
Gander	472.4	258.2	269.9
St. John's	379.3	240.7	246.7

FEATURE

IMPACT OF CLIMATIC CHANGE ON THE CANADIAN ARCTIC

from
A Canadian Climate Program Workshop

Orillia, Ontario, March 3-5, 1986

The climate of the Arctic, along with the rest of the world, is expected to change over the next 70 years or so. The most probable change is in response to increasing Carbon dioxide (CO_2) and other trace elements which alter the radiation balance of the atmosphere.

This area of climate change is worthy of study since it can alter the Arctic as an environment for man, fauna and flora. The time frame of the problem and its complexity is such that there is a requirement for current and not future research. Furthermore, Canadians are likely to spend increasing resources in the Arctic in the future largely due to the search for hydrocarbons. Canadians can benefit from an understanding of how Arctic climate is likely to change by incorporating better planning strategies into long term plans and policies (e.g., designing buildings and pipelines with an understanding that areas of permafrost may degrade).

EFFECTS OF CLIMATIC CHANGE UPON THE PHYSICAL ENVIRONMENT

Based on the evidence of past climate fluctuations, a global warming will be significantly amplified in Arctic regions. Although any analysis of the effects of anthropogenic influences on Arctic climate is severely complicated by the high degree of natural variability, climate model experiments for equilibrium CO_2 doubling effects suggest an Arctic winter warming

Jacob Weiss

of 5-15°C and a summer warming of 2-4°C. In addition, precipitation amounts may increase by up to 50% in the winter months. Other anthropogenic influences, such as Arctic haze, may have additional effects upon Arctic warming.

These climatic changes will result in (a) shorter duration and lesser extent of ice cover in fresh and salt water bodies, (b) shorter duration and extent of snow cover, (c) gradual degradation of permafrost, and (d) recession and increased calving of tide water glaciers.

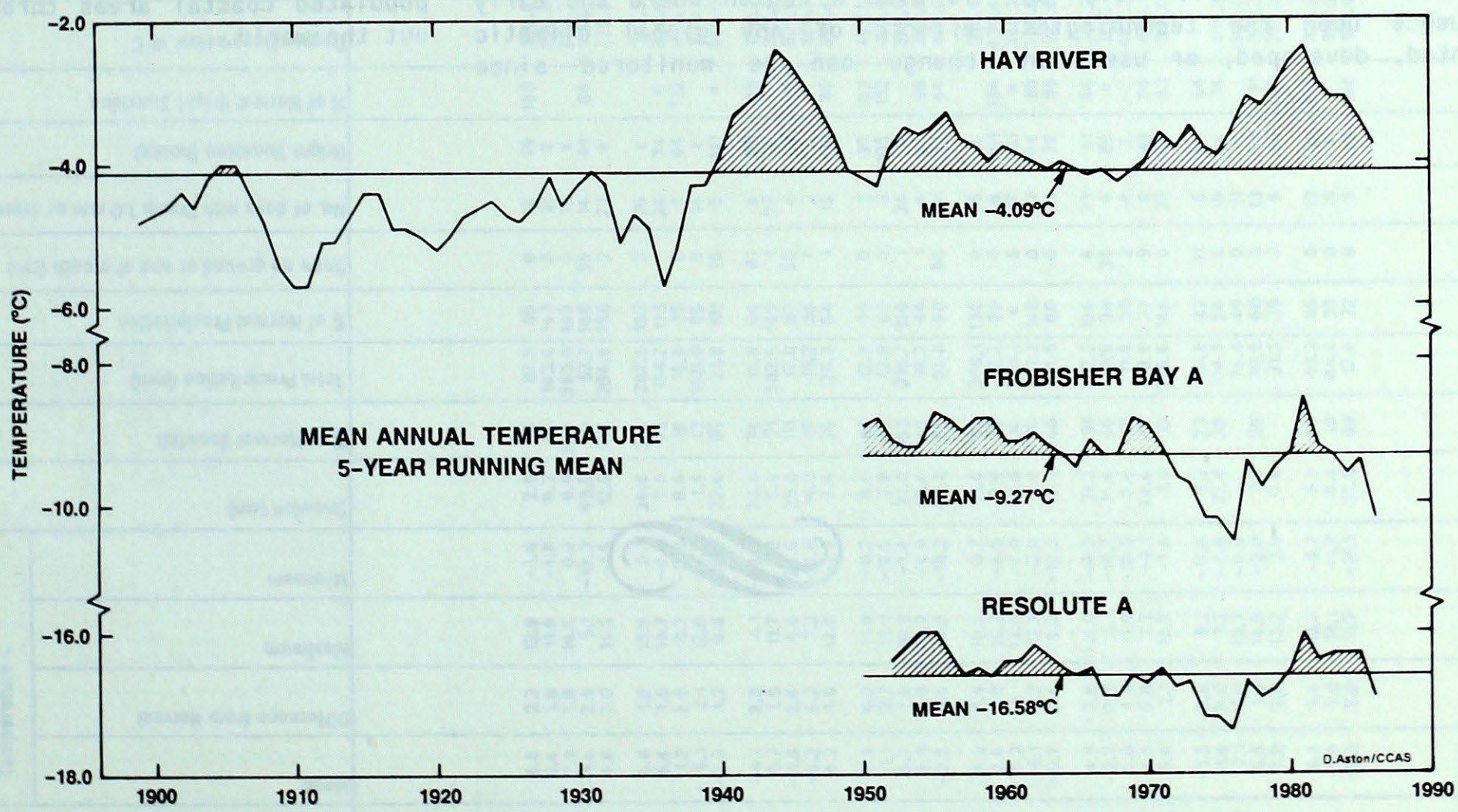
Truly effective and penetrating climate impact analyses are limited by a number of weaknesses in our current understanding of the dynamics of Arctic climate. Central to this concern are the rather general definitions of regional and temporal characteristics of climate change as projected by current General Circulation Models (GCM's). A second inadequacy is our limited understanding of baseline climatic variability, over the 10-20 year time period. This is not helped by the brevity and geographical sparseness of the baseline climate data network. This has resulted in either inadequate or non-existent data on cloud cover and characteristics; soil moisture and unfrozen water content; snowfall and snowcover; land ice masses and changes in their volume; sea ice thickness; distribution and related surface characteristics particularly in the Arctic Basin; and current and other oceanic parameters in Arctic waters and temporal characteristics.

EFFECTS OF CLIMATIC CHANGE UPON THE BIOPHYSICAL ENVIRONMENT

Fundamental to any discussion of changes to the biophysical environment of the Arctic is the relationship between climate, flora and fauna in both the terrestrial and marine ecosystems. Moreover, although GCM's predict on a regional scale, many of the arctic biota and faunal relationships operate at a different (i.e., smaller) scale (e.g., plant community structure; animal grazing habits, etc.) and therefore models of their behavior are not necessarily compatible with GCM predictions.

The likely impacts on the terrestrial biophysical environment due to climatic warming include an increase in both plant productivity and diversity, assuming no barriers to seed dispersal. These changes will, in turn, lead to increased productivity and diversity of both vertebrates and invertebrates. Vegetation changes will lead to changes in albedo and permafrost conditions. There will certainly be feedback to the large scale atmospheric circulation. Changes in macroscale circulation might give rise to either an increase or decrease in occurrence and location of thermal 'oases' which at present represent the greatest diversity of plants and wildlife.

The likely impacts on the marine (mostly aquatic) biophysical environment due to climatic warming include (a) a change in sea ice conditions and (b) an eventual rise in sea temperature. However, it is not clear whether these changes will mean either less or thinner sea ice, giving



Temperature trend at selected Arctic Stations. In the early 70's the climate in the western Arctic was getting warmer as shown in the Hay River time series. In contrast, Frosbisher Bay and Resolute show an opposite cooling trend during the same period. Note the recent cooling at all three stations.

either longer ice-free periods, or larger ice-free areas, or both.

EFFECTS OF CLIMATIC CHANGE UPON THE SOCIO-ECONOMIC ENVIRONMENT

The basic purpose in assessing climate and the effects of climatic change as they influence socio-economic activities in northern Canada is to enhance operations and to preserve flexibility in planning and decision-making, and to keep options open when the timing, magnitude or even direction of changes of climatic-induced parameters are not known.

There are numerous social or economic activities and concerns in Arctic regions which are likely to be highly sensitive to changes in climate. These include marine transportation, land transportation, layout and operation of settlements, tourism as an indigenous industry, living resources and their use and management, energy resources and their development and production, land use and occupancy, and sovereignty. For each of these concerns, climatic factors will have an influence upon the technologies invented, developed, or used, on the management structures put in place, and on the decisions made either in advance or by those affected.

A major constraint in predicting socio-economic impact lies in the general level of knowledge regarding the relationships between man's activities and climate-related phenomena. Information is needed on analytical approaches to assess socio-economic impacts of climate change, and the sensitivities of socio-economic activities to climate factors and climate change. This involves an understanding of the nature of socio-economic phenomena themselves, the rates at which biophysical and socio-economic systems response, their sensitivities to climate extremes, and the threshold levels of climate parameters for socio-economic response.

CONCLUSION

The Arctic is a polar heat sink. The physical processes that affect its temporal variability are poorly understood. The Arctic is also a region where the early effects of any global climatic change can be monitored since variability of climate is largest in polar regions. The effects of an increase in atmospheric CO_2, for example, are predicted by numerical simulations to be two or three times as high in the Arctic as in temperate latitudes. This is because of the feedback effects between the atmosphere, the terrestrial snow cover, and the ice-covered ocean. The first signs of Arctic climate change will be seen in changes in the nature, extent and direction of the snow and ice covers, and the Arctic temperatures.

If present trends in the accumulation of atmospheric CO_2 continue and if our climate models are realistic, the next 50 years will see a significant decrease in the extent and duration of terrestrial snow cover and sea ice. This will lead to a range of biophysical and socio-economic impacts, favourable or otherwise. Ultimately, changes in the size of polar glaciers and ice sheets will cause sea level changes which, if sufficiently rapid, would have enormous social and economic impacts on densely populated coastal areas throughout the world.

FEBRUARY 1987

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
BRITISH COLUMBIA													
ABBOTSFORD	6.6	2.2	13.9	-1.6	2.0	16	87.9	55	0	16	79	103	318.0
ALERT BAY	6.4	1.8	11.9	-1.8	9.3	95	193.6	143	0	21	X		328.9
AMPHITRITE POINT	7.9	1.8	14.6	0.2	9.6	309	360.6	103	0	18	X		283.7
BLUE RIVER	-1.6	2.9	5.1	-18.3	43.5	70	57.7	108	85	14	49	84	MSG
BULL HARBOUR	6.6	2.0	14.5	-1.5	12.5	120	286.0	158	2	23	X		320.3
CAPE SCOTT	6.8	1.5	13.9	0.1	20.6	214	387.5	153	3	25	X		312.3
CAPE ST.JAMES	6.4	1.6	10.7	-0.3	7.0	93	154.7	113		24	74	*	324.4
CASTLEGAR	1.2	2.0	9.7	-11.0	8.6	19	16.0	25	0	5	84	122	469.7
COMOX	6.1	2.1	12.8	-2.9	1.9	13	108.0	86	0	14	X		333.1
CRANBROOK	-2.3	1.2	8.6	-18.5	22.4	85	21.8	101	16	5	141	*	569.0
DEASE LAKE	-9.1	3.8	4.1	-32.4	23.0	74	15.8	64	61	4	59	55	758.2
ETHELDA BAY	5.7	1.8	11.7	-3.2	5.4	21	302.6	100	1	23	X		345.6
FORT NELSON	-11.5	5.4	4.6	-28.6	25.8	111	17.0	87	50	4	87	*	824.9
FORT ST.JOHN	-5.2	6.2	7.2	-21.8	14.0	45	15.2	55	7	2	X		650.7
HOPE	5.2	1.8	12.6	-2.5	8.4	26	126.3	64	1	15	41	85	358.4
KAMLOOPS	2.9	4.2	11.9	-8.2	8.0	62	12.0	75	0	2	97	103	423.5
KELOWNA	1.1	2.7	11.0	-9.5	7.8	53	12.8	60	0	3	105	152	472.4
LANGARA	5.2	1.6	10.9	-1.4	27.3	153	215.7	150	1	24	X		358.9
LYTTON	4.3	2.8	14.2	-4.9	13.4	48	18.2	46	1	4	86	98	385.5
MACKENZIE	-3.5	5.6	4.5	-18.2	48.0	93	52.8	90	60	14	32	44	607.0
MCINNES ISLAND	6.3	1.9	10.5	0.7	11.0	58	309.1	138	0	26	X		326.9
PENTICTON	2.6	2.0	10.2	-6.6	8.0	70	19.2	96	0	6	101	134	430.4
PORT ALBERNI	5.2	*	13.0	-7.0	7.8	*	206.1	*	5	17	61	*	360.3
PORT HARDY	6.1	2.2	12.2	-2.8	3.8	36	237.2	148	0	22	64	85	333.6
PRINCE GEORGE	-0.7	5.4	9.8	-12.3	14.3	40	31.6	80	6	11	78	89	523.6
PRINCE RUPERT	4.9	2.6	11.9	-4.3	21.2	91	232.2	104	6	23	41	64	366.2
PRINCETON	-2.2	0.8	6.1	-16.7	11.4	46	10.8	36	36	6	85	*	MSG
QUESNEL	0.0	4.9	11.9	-10.0	5.4	18	11.8	36	2	4	X		483.3
REVELSTOKE	0.5	2.8	7.7	-9.1	33.4	43	33.6	37	9	6	49	88	489.1
SANDSPIT	5.6	2.1	10.7	-1.6	1.6	10	166.4	146	0	22	69	83	347.0
SMITHERS	-1.5	3.8	8.1	-17.0	7.2	23	19.6	62	11	6	54	64	
TERRACE	1.6	3.0	7.2	-4.8	27.8	38	104.5	84	0	19	54	74	459.3
VANCOUVER HARBOUR	7.1	1.9	13.7	-0.6			76.8	49	0	11	X		306.6
VANCOUVER INT'L	6.5	1.9	14.5	-2.0	1.8	24	78.0	68	0	13	80	91	322.3
VICTORIA GONZ. HTS	7.8	2.0	13.2	2.9	0.0		21.5	29	0	6	96	100	286.0
VICTORIA INT'L	6.4	1.6	12.7	-2.7	5.2	64	65.2	65	0	13	92	106	325.9
VICTORIA MARINE	7.0	1.6	14.1	-1.7	0.4	10	86.0	55	0	15	X		307.5
WILLIAMS LAKE	-2.2	2.0	11.7	-16.1	22.8	89	17.4	72	9	5	93	86	513.9

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YUKON TERRITORY													
BURWASH	-11.7	6.3	4.8	-29.5	13.2	173	8.6	111	9	4	X		831.8
DAWSON	-18.8	5.8	-3.0	-32.8	8.3	31	3.6	14	44	1	X		1029.0
MAYO	-13.8	6.1	-0.1	-29.9	51.6	288	30.2	184	29	8	X		875.5
WATSON LAKE	-14.3	4.4	2.4	-34.5	37.1	115	22.7	89	51	11	48	56	898.8
WHITEHORSE	-6.8	6.4	4.2	-21.5	25.8	169	15.0	112	23	7	76	83	696.1
NORTHWEST TERRITORIES													
ALERT	-36.9	-3.3	-16.8	-47.2	2.2	39	2.2	42	31	0	0		1538.3
BAKER LAKE	-29.2	3.4	-15.5	-38.1	17.6	325	11.8	240	70	4	73	68	1321.5
CAMBRIDGE BAY	-32.4	2.0	-14.2	-44.1	5.8	126	2.8	70	29	0	86	166	1410.6
CAPE DYER	-26.4	-3.7	-9.0	-44.5	TR		TR		52	0	X		1244.8
CAPE PARRY	-26.7	3.0	-7.0	-42.5	8.2	100	4.8	90	21	1	X		1250.5
CLYDE	-35.3	-7.6	-22.7	-47.4	0.6	9	0.6	9	35	0	97	241	1492.5
COPPERMINE	-27.1	4.0	-8.7	-43.0	13.0	203	8.8	141	28	3	66	86	1262.3
CORAL HARBOUR	-27.9	1.5	-13.1	-42.3	2.3	24	2.3	26	29	1	92	80	1285.3
EUREKA	-45.2	-7.2	-31.7	-55.3	1.0	38	1.0	41	17	0	0		1770.8
FORT RELIANCE	-19.3	7.8	-6.8	-43.8	19.5	147	9.4	89	42	5	X		1045.7
FORT SIMPSON	-17.8	5.0	-5.5	-33.0	24.4	129	23.4	123	46	5	73	75	1002.8
FORT SMITH	-13.9	7.9	0.7	-32.0	18.5	100	12.2	76	64	5	56	49	892.5
IQALUIT	-29.3	-3.4	-15.4	-44.3	2.8	11	2.8	12	17	1	128	132	1324.6
HALL BEACH	-33.0	-0.9	-17.1	-45.7	2.2	25	1.4	16	34	0	X		1429.1
HAY RIVER	-14.5	7.2	-0.9	-33.0	18.4	94	18.4	102	56	6	X		908.1
INUVIK	-27.7	1.2	-1.8	-47.3	21.2	168	13.8	131	46	4	57	87	1279.1
MOULD BAY	-38.1	-2.9	-16.5	-53.9	5.4	163	3.9	130	42	1	2	43	1571.2
NORMAN WELLS	-23.7	2.5	-3.2	-40.5	27.2	157	26.2	162	17	5	149	195	1181.4
POND INLET	-36.4	-2.4	-21.9	-45.4	5.8	63	4.6	86	15	3	X		1524.0
RESOLUTE	-36.2	-3.0	-20.3	-46.0	5.6	180	4.9	163	16	2	24	135	1516.6
YELLOWKNIFE	-17.7	7.4	-4.6	-33.6	45.0	343	26.1	233	28	9	52	50	996.4
ALBERTA													
BANFF	-2.7	3.6	11.0	-21.5	19.6	59	13.0	46	35	3	X		
BROOKS	-1.5	8.0	15.0	-20.0	6.1	41	4.0	27	2		133	*	
CALGARY INT'L	-1.5	5.8	16.4	-17.6	5.4	28	2.8	18		1	154	120	545.6
COLD LAKE	-7.5	6.1	5.8	-23.6	13.5	74	9.0	56	19	5	115	91	713.5
CORONATION	-5.4	6.3	10.1	-22.2	10.0	50	7.8	45	4	4	136	102	653.5
EDMONTON INT'L	-4.5	6.9	7.2	-17.7	6.9	32	6.9	39	5	3	117	98	630.2
EDMONTON MUNI.	-3.3	6.3	8.9	-16.0	7.4	34	7.4	39	7	5	114	98	596.4
EDMONTON NAMAO	-3.7	7.2	7.6	-17.7	11.5	53	5.6	27	5	3	X		606.2
EDSON	-5.3	4.6	11.8	-24.7	14.2	47	8.8	45	25	3	83	71	653.8
FORT CHIPEWYAN	-12.8	7.9	1.0	-34.5	13.4	73	13.4	89	41		X		

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FORT MCMURRAY	-7.4	8.0	6.6	-23.7	31.0	141	30.0	159	32	8	101	78	711.4
GRANDE PRAIRIE	-7.5	4.6	5.1	-21.7	20.8	78	20.3	85	17	5	89	*	713.0
HIGH LEVEL	-12.4	6.1	4.5	-30.3	29.7	144	27.2	171	63	8	73	58	851.6
JASPER	-1.3	5.2	10.1	-18.4	7.4	34	5.8	28	7	3	83	*	540.3
LETHBRIDGE	0.2	5.6	17.5	-26.2	14.9	69	11.5	60	7	4	150	122	499.1
MEDICINE HAT	0.1	7.8	16.4	-19.6	2.8	15	3.8	22		2	160	130	501.2
PEACE RIVER	-7.4	6.1	6.0	-24.6	15.1	58	15.3	72	14	5	X		711.2
RED DEER	-4.5	6.2	11.6	-18.2	12.3	63	8.9	50	6	2	X		629.3
ROCKY MTN HOUSE	-3.8	3.6	16.9	-19.6	14.0	60	9.2	46	2	5	X		610.9
SLAVE LAKE	-5.4	6.9	6.9	-18.9	15.2	69	11.8	58	8	5	98	86	653.7
SUFFIELD	0.0	8.8	15.0	-18.2	4.5	*	4.2	*	1	1	152	*	503.8
WHITECOURT	-4.2	6.0	11.9	-19.5	11.2	42	9.7	40	18	3	X		622.3
SASKATCHEWAN													
BROADVIEW	-7.0	7.6	4.5	-24.6	19.8	132	17.2	136	7	6	107	78	699.6
COLLINS BAY	-15.8	5.3	-1.1	-31.4	30.9	142	21.1	119	3	8	98	*	946.5
CREE LAKE	-13.0	6.7	3.0	-36.5	49.2	273	29.8	222	48	10	79	58	869.1
ESTEVAN	-3.6	8.4	8.3	-15.6	8.6	48	12.6	73	6	3	111	82	603.3
HUDSON BAY	-9.7	6.3	4.1	-29.8	23.0	113	16.0	99	36	5	89	*	774.5
KINDERSLEY	-5.3	7.2	7.1	-22.0	10.0	64	7.6	47		2	X		653.7
LA RONGE	-11.1	6.2	7.1	-30.6	30.1	128	29.6	193	59	8	X		815.2
MEADOW LAKE	-9.5	5.3	5.4	-29.6	11.6	75	9.0	56	18	3	108	*	771.2
MOOSE JAW	-3.9	7.6	7.6	-21.4	36.5	194	26.1	169	7	5	128	102	611.9
NIPAWIN	-11.0	*	5.1	-28.8	45.4	*	19.0	*	34	6	79	*	812.1
NORTH BATTLEFORD	-8.5	5.6	4.2	-25.5	13.2	85	9.0	62	10	2	X		752.8
PRINCE ALBERT	-10.2	6.3	5.5	-26.3	19.8	120	18.0	120	20	5	102	83	789.4
REGINA	-6.1	7.5	5.4	-19.0	22.2	121	16.5	102	13	5	110	90	675.5
SASKATOON	-8.3	6.3	3.7	-24.9	16.2	88	13.4	81	14	2	X		737.3
SWIFT CURRENT	-3.1	7.2	10.2	-21.7	13.0	72	16.9	98	5	6	121	105	590.2
WYNYARD	-8.1	6.4	4.6	-21.7	11.8	66	8.8	57	8	5	X 97	71	730.9
YORKTON	-7.8	7.7	4.7	-23.4	10.0	52	8.8	48	5	4	84	65	723.5
MANITOBA													
BRANDON	-8.0	7.7	3.5	-20.8	32.4	164	32.6	174	15	8	X		727.2
CHURCHILL	-22.6	3.3	-7.8	-35.5	28.0	191	17.4	132	29	4	130	98	1136.8
DAUPHIN	-7.4	8.2	4.8	-26.0	45.8	244	33.6	192	21	8	68	50	713.4
GILLAM	-18.5	5.4	-3.9	-35.2	25.4	113	14.8	80	78	5	X		1020.2
GIMLI	-6.6	10.4	6.6	-21.0	55.9	276	46.6	261	44	8	60	39	689.0
ISLAND LAKE	-13.6	6.7	-0.3	-32.1	39.6	187	29.2	204	57	8	X		884.5
LYNN LAKE	-16.0	6.2	0.3	-32.2	39.0	258	20.1	134	51	9	67	50	967.7
NORWAY HOUSE	-12.0	*	1.8	-30.5	64.2	*	53.8	*	52	14	* X	*	839.4
PILOT MOUND													
PORTAGE LA PRAIRIE	-5.7	8.9	5.3	-19.4	54.7	396	40.9	191	42	8	X		662.3

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THE PAS	-11.2	6.8	3.6	-28.7	30.5	147	19.2	124	35	5	71	53	821.4
THOMPSON	-15.7	6.6	0.7	-35.3	31.0	276	25.8	265	47	10	83	57	942.3
WINNIPEG INT'L	-6.4	9.2	3.3	-20.5	42.2	223	40.8	233	32	7	58	40	684.0
ONTARIO													
ATIKOKAN	-6.0	9.4	6.1	-28.3	22.0	68	14.7	67	34	5	69	51	671.3
BIG TROUT LAKE	-16.7	4.7	0.8	-40.0	34.0	*	27.2	143	83	9			972.2
EARLTON	-12.9	1.2	4.8	-31.2	34.5	73	32.2	68	37	7	X		866.0
GERALDTON	-11.4	6.5	4.9	-39.5	23.6	71	19.8	59	41	8	X		882.1
GORE BAY	-6.9	2.8	4.4	-26.6	30.9	82	13.8	32	50	3	X		698.4
HAMILTON RBG	-3.5	0.8	5.5	-21.2	7.4	26	25.6	47	1	3	155	*	
HAMILTON	-5.0	1.3	3.4	-23.5	19.6	65	18.2	34		6	X		643.7
KAPUSKASING	-13.5	2.7	6.3	-34.8	20.1	45	16.6	38	30	7	X		882.2
KENORA	-6.2	8.2	5.5	-20.1	24.0	94	22.6	98	31	5	X		677.1
KINGSTON	-8.1	-1.1	3.0	-27.1	24.4	68	22.6	38	12	6	170	132	730.9
LANSDOWNE HOUSE											X		
LONDON	-5.2	0.9	3.8	-23.7	18.4	47	19.6	32	8	7	140	144	651.0
MOOSONEE	-17.3	1.2	4.9	-34.6	15.5	51	12.3	41	69	6	148	121	988.3
MOUNT FOREST													
MUSKOKA	-9.7	-0.1	5.2	-33.0	31.5	61	25.8	41	37	6	X		785.7
NORTH BAY	-9.7	1.6	4.8	-30.1	47.8	94	41.6	74	19	8	167	133	767.8
OTTAWA INT'L	-9.6	-0.1	5.5	-27.3	28.2	56	25.0	41	44	4			774.3
PETAWAWA	*		3.7	-30.5	44.3	97	33.4	65	31	7	X		
PETERBOROUGH	-8.6	-0.1	3.3	-29.5	16.7	53	17.9	36	32	4	X		744.7
PICKLE LAKE	-10.9	7.8	4.8	-37.0	39.4	144	23.1	90	68	9	X		821.9
RED LAKE	-8.5	8.3	2.9	-26.3	27.6	120	20.8	100	43	9	75	*	741.0
ST. CATHARINES	-3.7	0.0	5.4	-16.5	12.0	53	15.4	34	0	2	X		607.5
SARNIA	-3.0	1.5	6.5	-20.8	12.6	53	18.3	40		4	134	126	587.7
SAULT STE. MARIE	-6.4	3.6	5.6	-32.0	17.4	27	15.6	22	8	6	142	125	682.9
SIMCOE											X		
SIOUX LOOKOUT	-7.2	8.5	4.6	-26.9	26.6	94	26.8	97	41	8	X		706.9
SUDBURY	-9.6	2.9	4.0	-29.4	52.0	116	44.6	94	56	8	174	132	773.8
THUNDER BAY	-6.0	7.0	4.8	-30.3	21.6	70	14.1	49	6	4	111	75	671.5
TIMMINS	-13.2	2.4	6.2	-31.9	25.2	47	20.8	46	56	7	X		871.9
TORONTO	-3.2	0.7	4.8	-20.9	12.4	43	28.2	54		3			594.1
TORONTO INT'L	-5.8	0.3	4.2	-23.8	10.0	37	14.8	32		3	X		665.8
TORONTO ISLAND	3.3	8.1	6.3	-20.3	10.8	43	17.1	35		4			596.6
TRENTON	-7.1	-0.6	4.0	-25.0	17.8	50	20.5	35	9	3	X		703.8
WATERLOO-WELL	-6.7	0.1	4.3	*	10.6	34	10.8	19	4	5	X		692.1
WAWA	-9.5	*	3.3	-33.1	25.6	*	22.6	*	35	6		*	770.2
WIARTON	-5.9	1.6	4.3	-14.0	29.4	48	21.6	33	10	5	147	142	667.1
WINDSOR	-1.9	1.9	7.6	-16.8	4.4	19	17.1	33	0	2	X		556.8

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	Mean	Difference from Normal	Maximum	Minimum									
QUEBEC													
BAGOTVILLE	-15.0	-1.2	0.0	-30.5	15.4	25	10.9	19	25	4	X		923.4
BAIE COMEAU	-10.9	1.6	2.3	-24.1	10.2	13	7.0	11	35	3	149	*	809.2
BLANC SABLON	-7.6	2.4	2.7	-18.5	112.6	110	113.4	104	87	19	53	*	
CHIBOUGAMAU	-18.4	-0.9	2.0	-39.2	16.2	30	11.8	23	70	5	144	115	1018.7
GASPE	-8.8	1.3	5.3	-27.3	65.8	99	59.8	66	62	6	125	*	751.1
INUKJUAK	-23.4	1.6	-9.1	-39.6	18.6	213	18.0	209	40	5	142	132	1159.9
KUUJJUAQ	-20.4	2.0	-7.3	-40.2	24.6	72	23.0	69	33	20	74	68	1082.2
KUUJJUARAPIK	-22.5	0.1	-2.0	-42.7	17.7	73	16.9	71	46	7	97	78	1135.1
LA GRANDE RIVIERE	-21.1	*	-2.4	-38.6	17.8	*	16.6	*	75	7	107	*	1097.6
MANIWAKI	-12.3	-0.1	7.7	-32.6	24.6	53	19.4	38	44	5	177	139	838.8
MATAGAMI	-17.9	-0.1	5.0	-34.4	25.0	61	11.1	26	49	5	143	111	1007.0
MONT JOLI	-11.1	-0.6	-0.2	-24.2	11.4	15	10.8	14	11	3	133	116	815.8
MONTREAL INT'L	-11.3	-2.3	4.4	-30.6	36.4	67	33.2	50	29	6	206	160	819.7
MONTREAL M INT'L	-11.4	*	4.5	-30.7	26.4	*	24.8	*	34	5	234	*	822.9
NATASHQUAN	-10.2	1.1	3.8	-23.7	49.0	87	43.9	55	33	11	101	77	742.6
QUEBEC	-11.6	-0.8	2.8	-27.3	10.6	15	9.4	12	54	2	182	160	827.5
ROBERVAL	-14.1	0.6	1.5	-29.9	7.7	12	7.3	12	60	2	155	*	881.5
SCHEFFERVILLE	-17.9	3.3	-1.4	-37.9	56.9	126	54.7	127	78	11	74	*	1005.5
SEPT-ILES	-10.1	2.4	4.8	-22.5	7.4	10	7.6	9	23	3	130	94	786.5
SHERBROOKE	-12.8	-1.9	5.4	-30.7	36.8	65	21.7	35	38	8	154	*	863.0
STE AGATHE DES MONTS	-11.7	0.4	7.7	-32.1	32.6	39	27.4	31	78	6	201	159	831.7
ST-HUBERT	-11.2	-2.2	3.6	-29.6	31.8	56	29.4	40	31	6	0		816.5
VAL D'OR	-15.2	-0.3	4.5	-33.7	22.0	43	18.2	35	41	6	155	114	928.6
NEW BRUNSWICK													
CHARLO	-9.6	1.0	3.6	-24.2	9.7	13	5.6	7	45	2	150	110	772.4
CHATHAM	-8.5	0.3	5.4	-23.5	41.0	63	33.4	38	74	6	136	103	742.4
FREDERICTON	-8.5	-0.1	4.8	-24.2	43.4	68	42.4	47	46	4	143	*	743.1
MONCTON	-9.2	-1.5	4.2	-24.1	84.0	122	93.4	94	35	7	154	125	760.5
SAINT JOHN	-9.0	-1.5	4.2	-25.1	46.0	72	42.4	36	45	4	148	118	756.2

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	-7.3	-1.9	4.6	-21.6	48.3	77	40.8	45	47	7	X		708.0
HALIFAX INT'L	-7.4	-1.3	6.6	-20.0	45.8	69	42.2	31	25	5	*		711.7
SABLE ISLAND	-2.7	-1.7	7.5	-12.5	18.0	56	54.4	46		12	74	101	580.7
SHEARWATER	-5.9	-1.4	6.5	-18.0	31.7	60	30.1	24	3	5	151	116	668.7
SYDNEY	-7.4	-1.5	4.3	-21.2	53.1	77	99.9	80	22	10	93	84	711.7
TRURO													
YARMOUTH	-4.7	-1.5	2.4	-14.9	55.4	102	47.0	41	33	8	120	129	635.3
PRINCE EDWARD ISLAND													
CHARLOTTETOWN	-9.0	-1.5	3.8	-22.7	77.9	118	75.4	77	58	10	X		756.6
SUMMERSIDE	-8.4	-1.2	4.6	-21.4	61.2	109	55.8	67	50	6	118	94	741.8
NEWFOUNDLAND													
ARGENTIA											X		
BATTLE HARBOUR	-8.5	1.2	2.6	-26.4	83.8	100	103.8	145	222	16	X		739.0
BONAVISTA	-4.7	0.5	3.7	-12.6	94.4	209	136.4	157	139	9	X		635.2
BURGEO	-5.1	0.1	4.4	-16.8	82.8	162	131.2	100	69	12	*		646.9
CARTWRIGHT	-9.7	2.9	1.5	-28.2	138.9	211	136.3	201	214	16	40	37	762.7
CHURCHILL FALLS	-16.9	2.0	-0.1	-37.6	122.4	206	97.8	167	164	15	92	73	976.5
COMFORT COVE	-6.4	0.6	3.3	-20.9	82.8	112	113.3	119	111	14	X		904.7
DANIEL'S HARBOUR	-6.3	1.4	3.7	-20.2	76.2	102	50.2	61	159	18	30	40	680.0
DEER LAKE	-7.0	2.0	2.8	-21.0	101.2	154	82.8	113	171	10	X		920.7
GANDER INT'L	-6.3	0.5	3.0		117.2	153	129.1	129	69	12	67	67	680.8
GOOSE	-11.6	2.9	2.3	-34.3	155.9	257	131.5	219	89	17	41	35	828.6
PORT-AUX-BASQUES	-5.9	-0.2	4.4	-20.3	84.0	121	93.0	80	50	20	63	*	669.0
ST ANTHONY	-7.9	3.3	1.3	-18.3	162.5	268	164.5	200	231	21		*	698.5
ST JOHN'S	-5.0	-0.5	3.9	-15.3	132.4	177	175.1	125	108	12	60	*	643.4
ST LAWRENCE	-4.5	0.0	4.5	-14.1	167.1	345	203.3	188	99	15		*	
STEPHENVILLE	-6.1	0.1	3.1	-16.4	140.2	184	143.8	160	75	19	26	*	675.5
WABUSH LAKE	-18.2	2.6	-0.3	-34.7	30.5	58	25.4	53	69	8	75		1001.3

AGROCLIMATOLOGICAL STATIONS — FEBRUARY 1987

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	6.3	1.8	14.0	-1.0	0.0	67.5	38	0	19	72	47.0	56.5
KAMLOOPS												
SIDNEY												
SUMMERLAND												
ALBERTA												
BEAVERLODGE	-5.0	5.2	7.0	-19.0	25.0	24.0	95	19	6	87	0.0	0.0
ELLERSLIE												
FORT VERMILLION												
LACOMBE	-4.4	6.1	11.0	-20.5	15.0	10.4	58		3	126	0.0	0.0
LETHBRIDGE												
VAUXHALL												
VEGREVILLE	-7.4	6.0	5.5	-25.5	15.5	16.0	115	25	3		0.0	0.0
SASKATCHEWAN												
INDIAN HEAD	-6.6	7.2	4.5	-23.0	7.2	6.2	35		2		0.0	0.0
MELFORT	-9.8	6.5	3.0	-25.5	5.0	5.0	31	38	2	90	0.0	0.0
REGINA	-8.0	5.8	4.0	-25.0	20.7	25.6	173	4	5		0.0	0.0
SASKATOON	-8.3	6.2	4.5	-25.0	16.6	16.6	76	10	4	117	0.0	0.0
SCOTT	-8.2	6.2	5.0	-25.0	4.1	3.8	29	12	1	103	0.0	0.0
SWIFT CURRENT SOUTH	-2.8	7.2	10.5	-22.0	11.8	13.7	91	5	5	126	0.8	3.1
MANITOBA												
BRANDON	-7.2	8.0	5.1	-24.5	37.8	37.8	189	37	6		0.0	0.0
GLENLEA	-6.5	9.9	3.0	-24.5	40.3	40.3	147	62	8	59	0.0	0.0
MORDEN	-5.4	8.0	5.0	-20.0	60.4	60.4	316	34	11	82	0.0	0.0
ONTARIO												
DELHI	-5.6	0.2	5.0	-23.5	9.0	18.6	33	TR	4	134	0.0	0.0
ELORA	-7.3	1.8	1.7	-28.0		15.0	30	21			0.0	0.0
GUELPH	-6.7	-0.2	2.5	-28.5	2.0	15.4	31	19	3	126	0.0	0.0
HARROW	-1.8	2.0	7.0	-17.0	0.0	1.7	4	0	1	150	0.0	0.0
KAPUSKASING												
MERIVALE												
OTTAWA	-9.6	-0.1	5.0	-27.0	27.6	27.1	50	29	6	199	0.0	0.0
SMITHFIELD												
VINELAND STATION	-3.1	-0.5	5.7	-16.4	5.2	17.0	31	TR	4	129	0.0	0.0
WOODSLEE												
QUEBEC												
LA POCATIERE	-11.8	-1.6	3.0	-25.0	5.1	5.3	8	55	1	182	0.0	0.0
L'ASSUMPTION	-12.8	-2.2	4.5	-34.5	23.6	24.6	40	48	6	203	0.0	0.0
LENNOXVILLE												
NORMANDIN	-16.5	-0.4	-3.0	-33.7	6.8	5.8	11	24	3	175	0.0	0.0
ST. AUGUSTIN												
STE CLOTHILDE												
NEW BRUNSWICK												
FREDERICTON												
NOVA SCOTIA												
KENTVILLE												
NAPPAN												
PRINCE EDWARD ISLAND												
CHARLOTTETOWN												
NEWFOUNDLAND												
ST. JOHN'S WEST												