Environment Canada Environnement Canada

Climatic Perspectives

Monthly revue — OCTOBER — Vol.8 1986

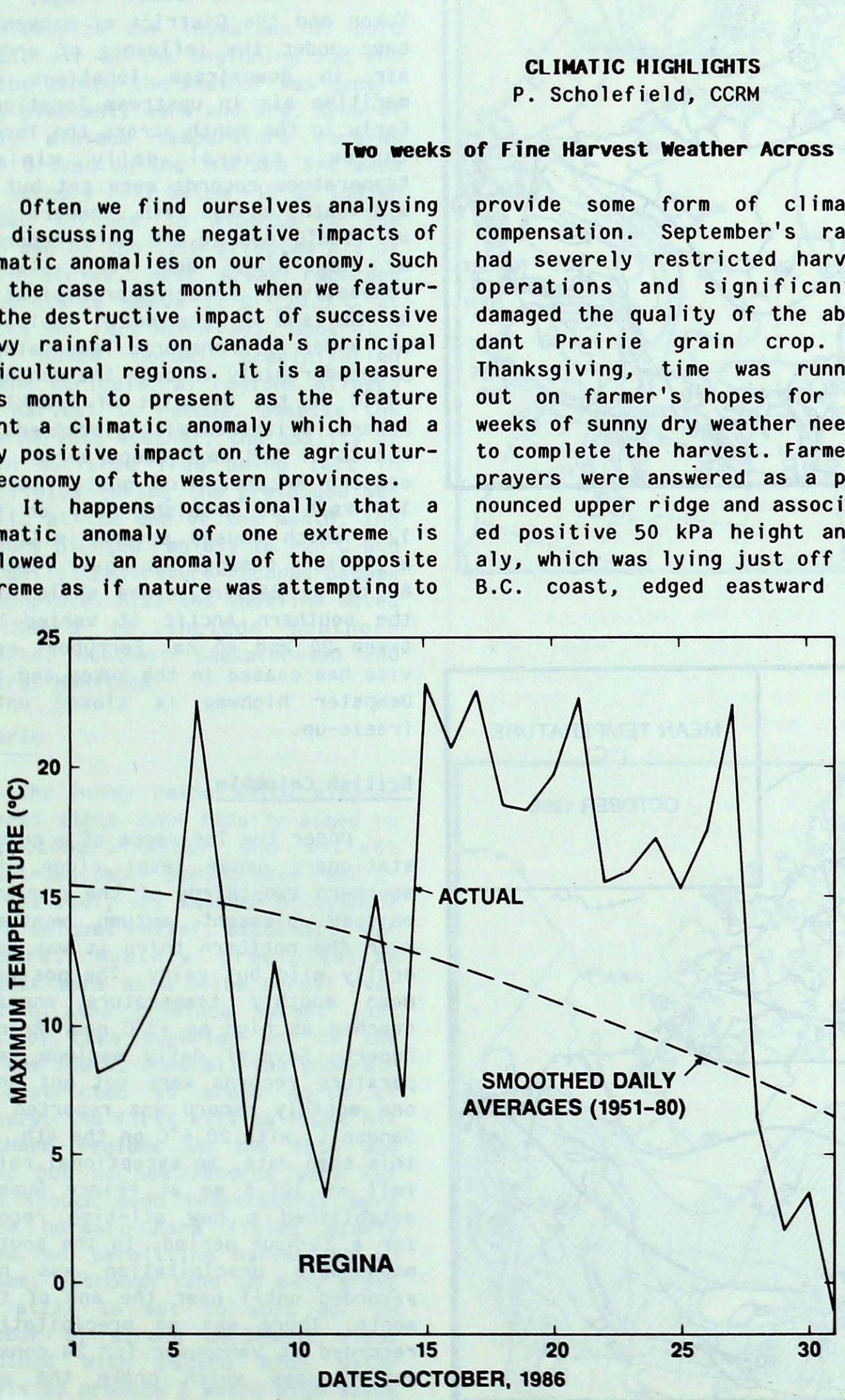
CLIMATIC HIGHLIGHTS

P. Scholefield, CCRM

Two weeks of Fine Harvest Weather Across the West

Often we find ourselves analysing and discussing the negative impacts of climatic anomalies on our economy. Such was the case last month when we featured the destructive impact of successive heavy rainfalls on Canada's principal agricultural regions. It is a pleasure this month to present as the feature event a climatic anomaly which had a very positive impact on the agricultural economy of the western provinces.

It happens occasionally that a climatic anomaly of one extreme is followed by an anomaly of the opposite extreme as if nature was attempting to provide some form of climatic compensation. September's rains had severely restricted harvest operations and significantly damaged the quality of the abundant Prairie grain crop. By Thanksgiving, time was running out on farmer's hopes for two weeks of sunny dry weather needed to complete the harvest. Farmer's prayers were answered as a pronounced upper ridge and associated positive 50 kPa height anomaly, which was lying just off the B.C. coast, edged eastward and strengthened to become the dominant controlling feature in the month's weather over the western provinces. The result was at least two weeks of Indian Summer weather for all of the western Canadian agricultural districts. This permitted the Prairie grain harvest to be essentially completed by the month's end.



The dramatic impact of this climatic anomaly on the local weather is shown in the graph of daily maximum temperatures at Regina. Note that abnormally high temperatures were recorded on 13 consecutive days during the last half of the month when one would expect a pronounced seasonal cooling trend (dashed line shows normal maximum temperatures).

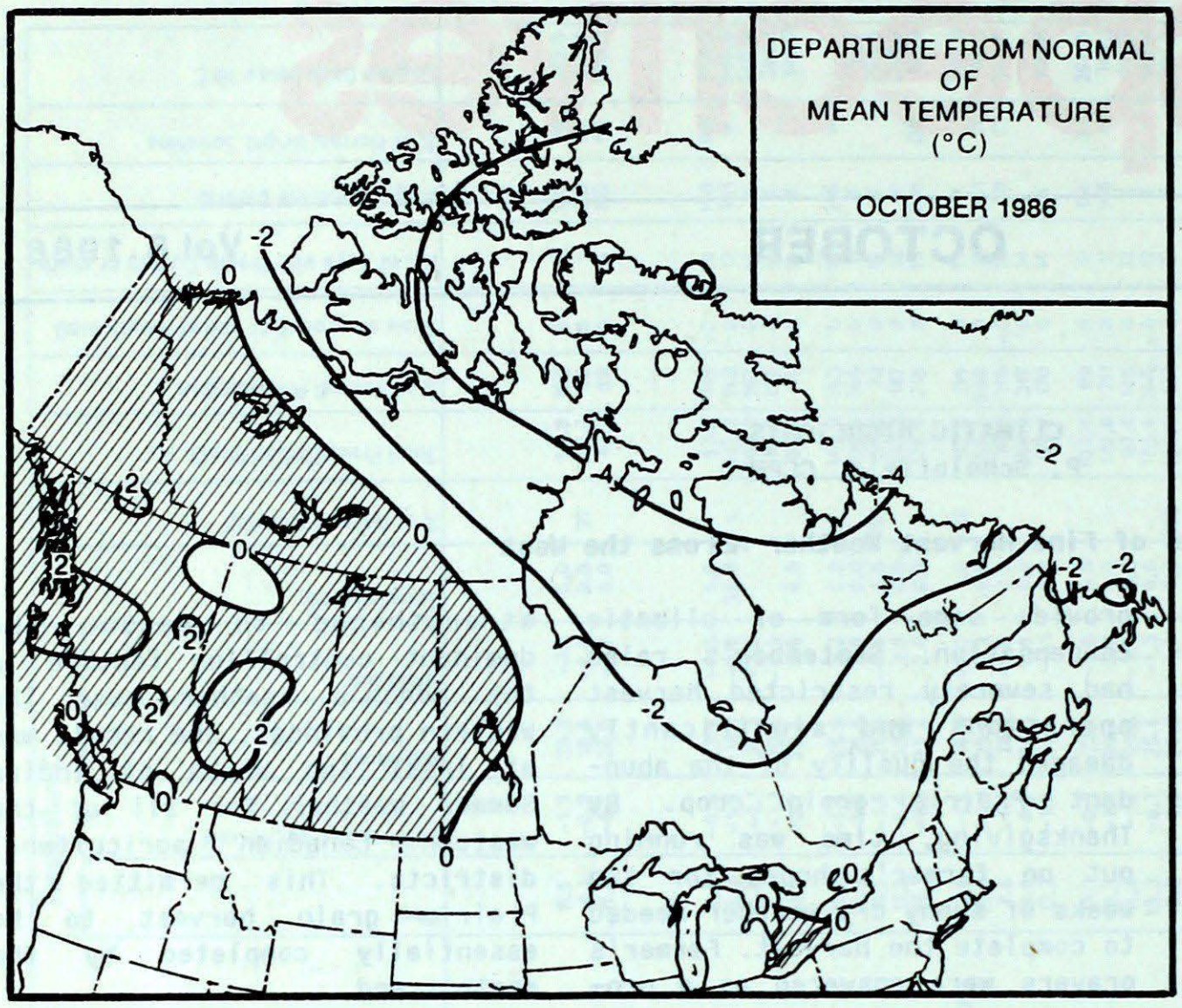
Record Dry Spell at Vancouver

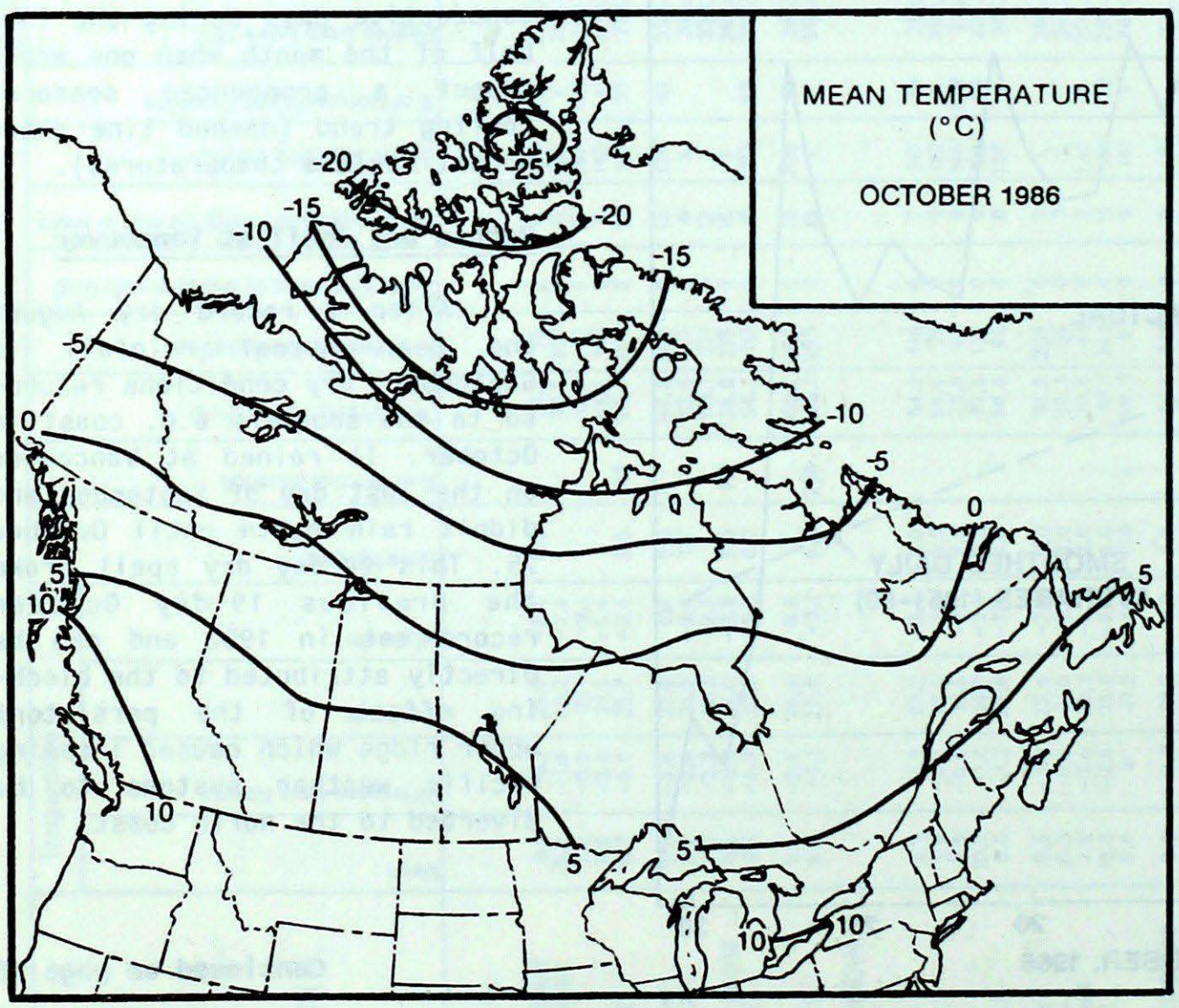
After a record dry August and near normal rainfall in September, dry conditions returned to the southern B.C. coast in October. It rained at Vancouver on the last day of September and didn't rain again until October 25. This 24-day dry spell broke the previous 19-day October record set in 1952 and can be directly attributed to the blocking effect of the persistent upper ridge which caused incoming Pacific weather systems to be diverted to the north coast.

Continued on page 8B

Canada

TEMPERATURE





ACROSS THE COUNTRY

Yukon and Northwest Territories

The strong upper level ridge that persisted from the preceding month continued to influence the climate of the northwest through October. Depending on the position of the Pacific coast ridge, the Yukon and the District of Mackenzie came under the influence of arctic air in downstream locations and maritime air in upstream locations. Early in the month across the Territories, several daily minimum temperature records were set but by mid-month, on the 14th, temperatures of 19.6°C and 20.2°C were reported at Hay River and Fort Simpson respectively. Freezing precipitation at the end of the month inhibited all modes of transport. Temperatures plunged rapidly through the month to -40°C in the District of Franklin. Several blizzards with windspeeds in excess of 100 km/h swept across the eastern Arctic. Wind gusts reached 137 km/h at Frobisher Bay on the 12th which caused several millions of dollars damage. Snowcover reached 80 cm on Baffin Island while over the southern Arctic it varied between 20 and 40 cm. Ferryboat service has ceased in the Yukon and the Dempster highway is closed until freeze-up.

British Columbia

Under the influence of a quasi-stationary upper level ridge, the southern two-thirds of the province enjoyed pleasant autumn weather. Over the northern third it was generally mild but rainy. The positive mean monthly temperature anomaly reached as high as +3°C near Prince Rupert. Several daily maximum temperature records were set but only one monthly record was reported at Sandspit, with 20.6°C on the 4th. On this same date, an exceptional rainfall of 107.8 mm at Prince Rupert established a new all-time record for a 24-hour period. In the south, measurable precipitation was not recorded until near the end of the month. There was no precipitation recorded at Vancouver for 24 consecutive days which broke the old

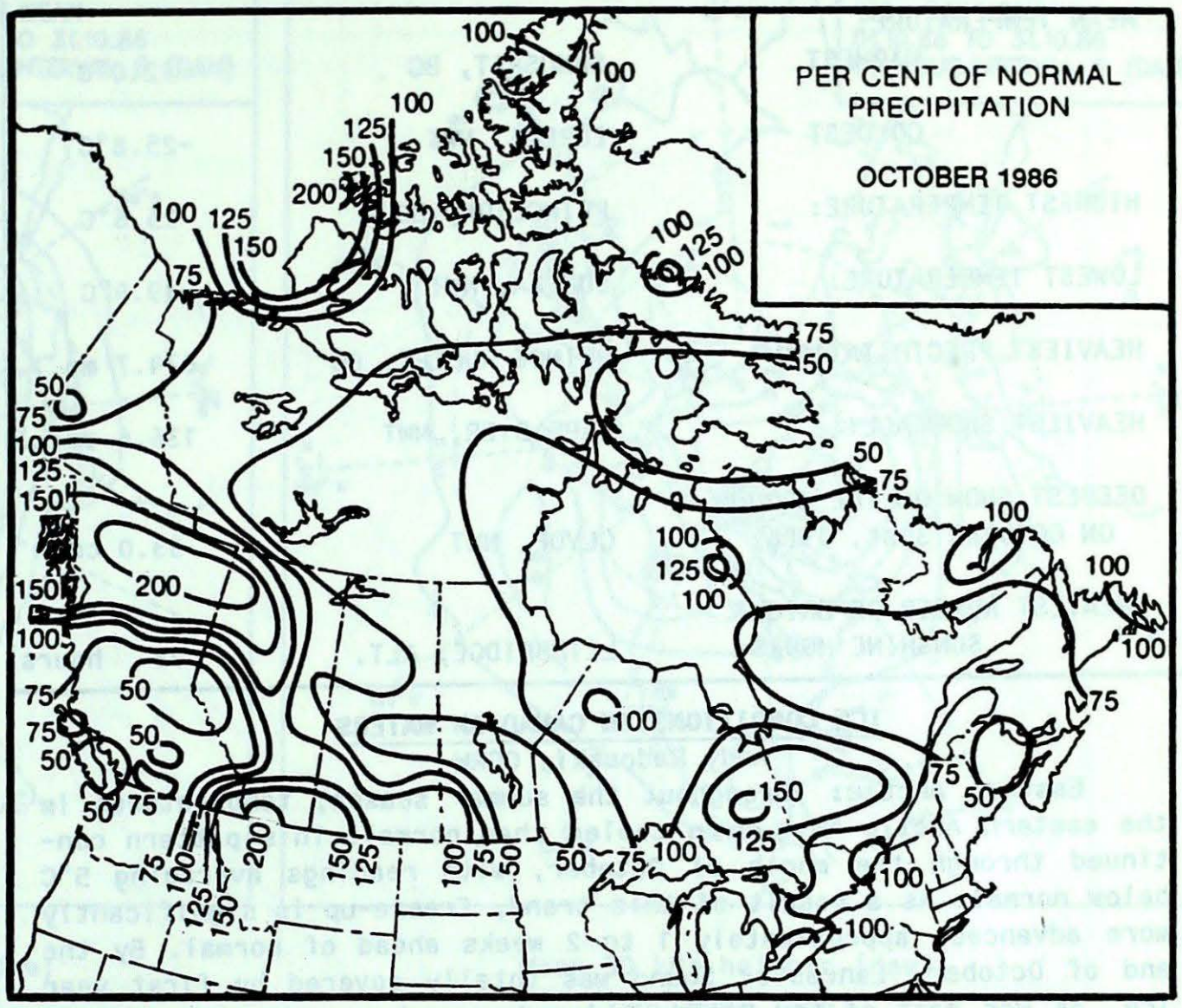
record of 19 days set in 1952. The first significant snowfall occurred north of 55°N between the 27th and 29th. Accumulations were generally in the order of 30 cm but Fort Nelson recorded 53.2 cm which was nearly three times the monthly normal.

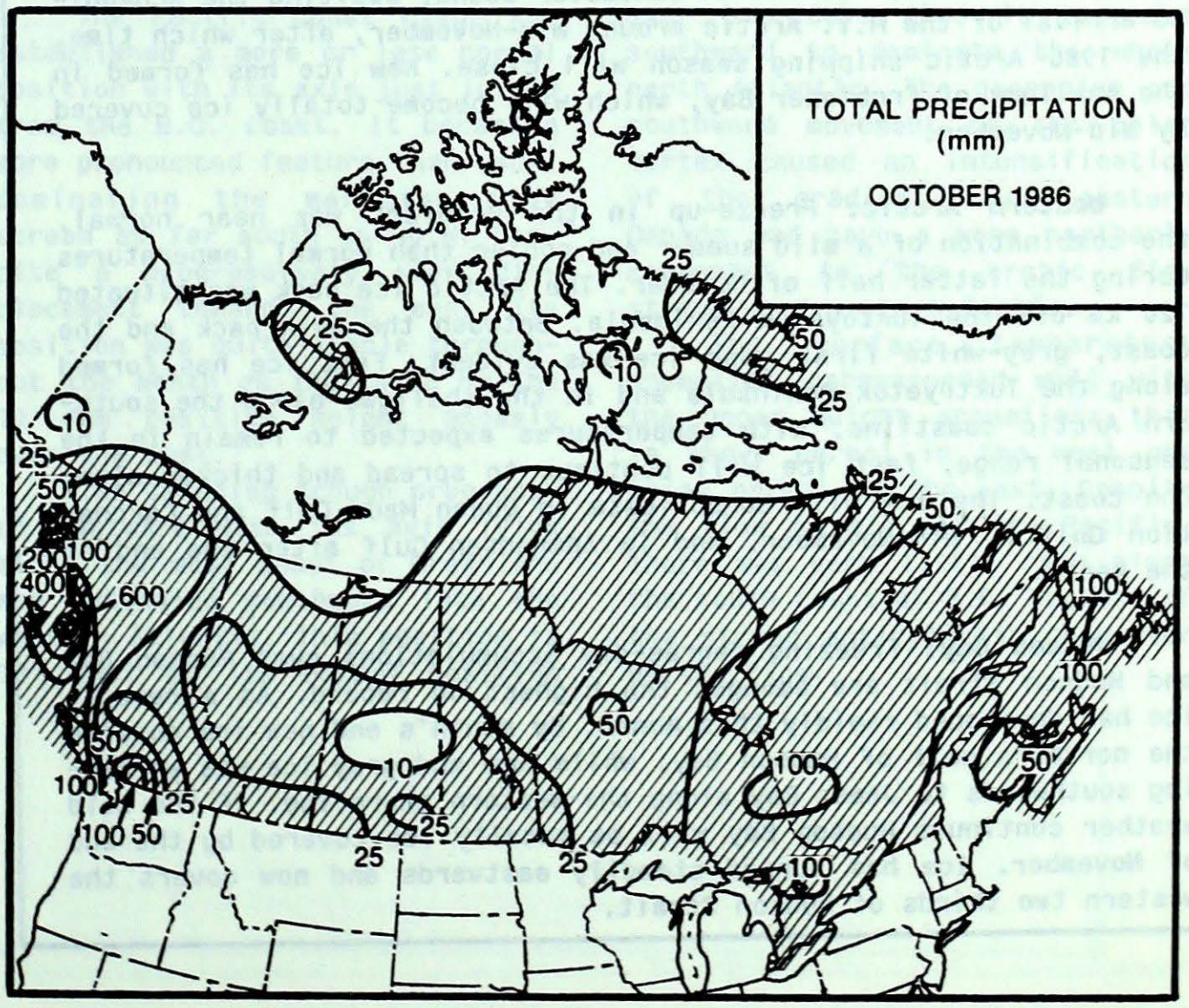
Prairie Provinces

Despite the invasions of cold arctic air at the beginning and end of the month, the weather was generally pleasant, warm and dry. Several daily minimum temperature records were broken on the 2nd and 3rd when the mercury fell below -10°C. Indian Summer arrived in Alberta on the 10th and by the 12th affected all of the Prairies. Most areas recorded temperatures above 20°C (25.5°C at Brooks and Fort McMurray). Generally well below normal precipitation in the agricultural regions allowed the harvest to resume. Despite the fine harvest weather, the quality of grain suffered from being left in the fields during the prolonged wet spell. At the end of the month, the mercury plunged rapidly to -20°C and low daily temperature records became commonplace. Also the snowline moved southward to include southern Alberta, southern Saskatchewan and central Manitoba.

Ontario

The heavy rains which plagued Ontario since June finally eased up in October. After the wettest August-September period ever recorded, the cool, dry weather of October was a welcome relief, especially for farmers. Monthly precipitation amounts were at a below normal over most of the province except just east of Lake Superior and in the extreme south. Snowfall was generally restricted to areas north of Sudbury. The first killing frost hit southern regions on the 10th and 11th, but no new records were set even though mean temperatures were below normal. Farm fields slowly dried out permitting harvesting to resume, although land in many areas was still to wet to work on. On October 6, strong northwest winds combined with record high water levels to produce 2 metre high waves along the shores of Lake Huron and Southern Georgian Bay. This caused considerable damage to lakefront





EXTREMES

CLIMATIC EXTREMES IN CANADA - OCTOBER 1986

MEAN TEMPERATURE:		
WARMEST	SANDSPIT, BC	12.0°C
COLDEST	EUREKA, NWT	-25.8°C
HIGHEST TEMPERATURE:	PRINCETON, BC	25.6°C
LOWEST TEMPERATURE:	EUREKA, NWT	-39.9°C
HEAVIEST PRECIPITATION:	PRINCE RUPERT, BC	674.7 mm
HEAVIEST SNOWFALL:	CAPE DYER, NWT	136.6 cm
DEEPEST SNOW ON THE GROUND ON OCTOBER 31st, 1986:	CLYDE, NWT	33.0 cm
GREATEST NUMBER OF BRIGHT SUNSHINE HOURS:	LETHBRIDGE, ALT.	208 hours

ICE CONDITIONS IN CANADIAN WATERS

Andy Radomski, CCRM

Eastern Arctic: Throughout the summer season, temperatures in the eastern Arctic have been cooler than normal. This pattern continued through the month of October, with readings averaging 5°C below normal. As a result of this trend, freeze-up is significantly more advanced, approximately 1 to 2 weeks ahead of normal. By the end of October, Lancaster Sound was totally covered by first year ice, as was most of Fox Basin. Old and second year ice had drifted into Barrow Strait and Viscount Melville Sound. The southern half of Baffin Bay was comprised of bergy water. If the cold temperature trend continues through November, pack ice, which now covers northern Baffin Bay should spread southwards to Hudson Strait shortly after the middle of month. Canada's most powerful ice breaker, the Louis St. Laurent, remains in Lancaster Sound, awaiting the scheduled arrival of the M.V. Arctic around mid-November, after which time, the 1986 Arctic shipping season will close. New ice has formed in the shallows of Frobisher Bay, which will become totally ice covered by mid-November.

Western Arctic: Freeze-up in the Beaufort was near normal, the combination of a mild summer and cooler than normal temperatures during the latter half of October. The Arctic ice pack was situated 120 km off the Tuktoyatuk Peninsula. Between the main pack and the coast, grey-white first year ice was evident. Fast ice has formed along the Tuktoyatuk Peninsula and in the shallows along the southern Arctic coastline. With temperatures expected to remain in the seasonal range, fast ice will continue to spread and thicken along the coast. The ice will consolidate in Queen Maud Gulf and Coronation Gulf by mid-November, and in Admundsen Gulf after the end of the month.

Hudson Bay: Freezing degree-day accumulations over Hudson Bay and Hudson Strait are amongst the highest on record. As a result, ice has developed rapidly this month. By month's end new ice covered the northern half of Hudson Bay, while new and grey ice was spreading southwards to James Bay along the western shoreline. If the cold weather continues Hudson Bay will be totally ice covered by the end of November. Ice has spread steadily eastwards and now covers the western two thirds of Hudson Strait.

homes, cottages and stores. In an effort to lower lake levels the outflow of water from Lake Ontario has been increased by 26%. This has caused the volume of flow in the St. Lawrence river to surpass that of the Mississippi, in October.

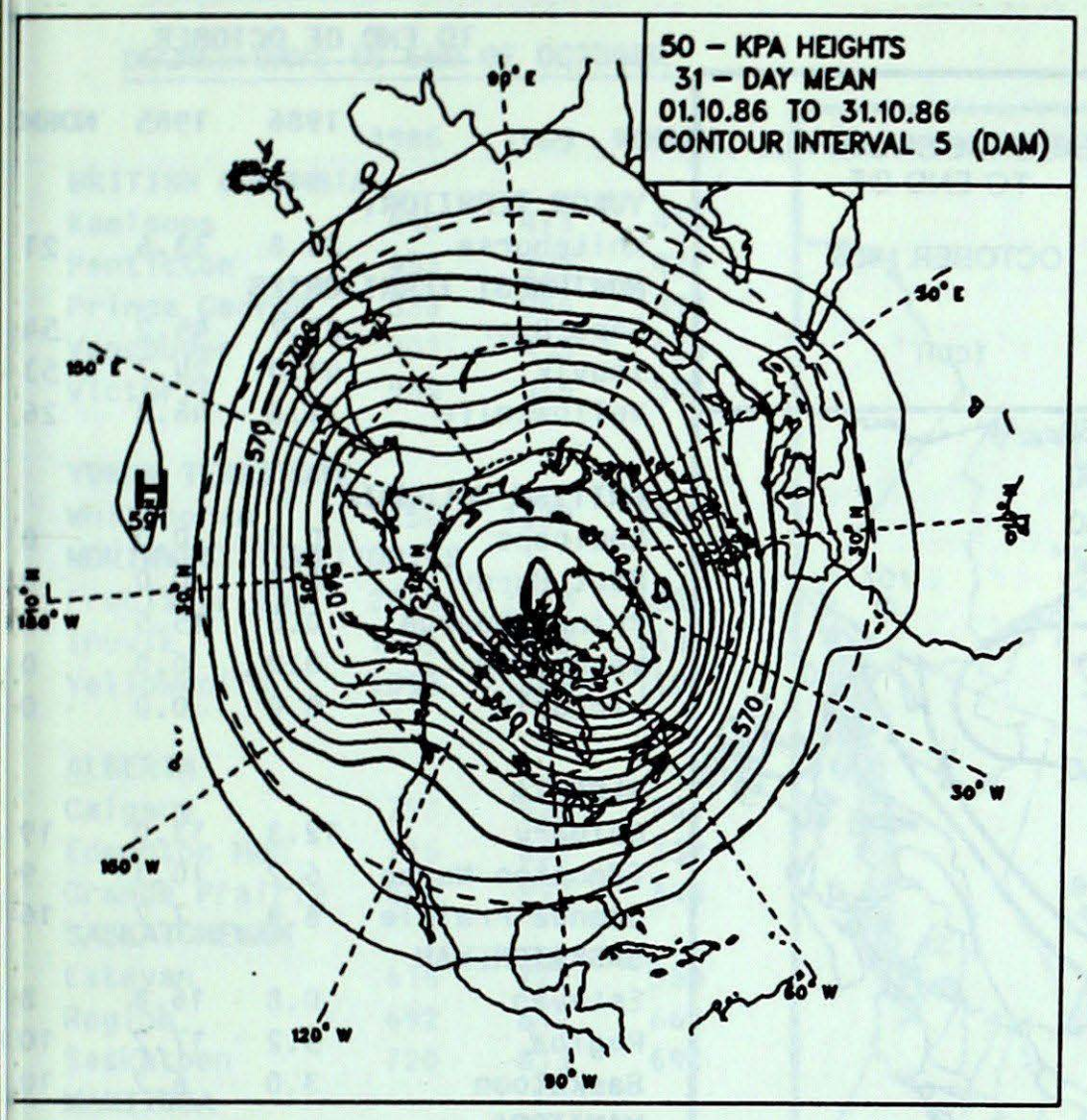
Québec

For the past several months the trend in Québec has been towards cooler temperatures. Almost every station reported monthly means below normal. There were several arctic outbreaks accompanied by snow and cold temperatures especially over the north. Nighttime temperatures plunged below freezing throughout the province and, in the north, below freezing temperatures persisted all day for most of the week. Kuujjuaq and Gaspé had the coldest mean monthly temperatures since 1972. Even though precipitation was below normal (except for the east-central region) snow was recorded as far south as Ottawa-Hull. At Inukjuak snowcover accumulation reached 64.8 cm which was 1.5 cm greater than the previous October record set in 1933.

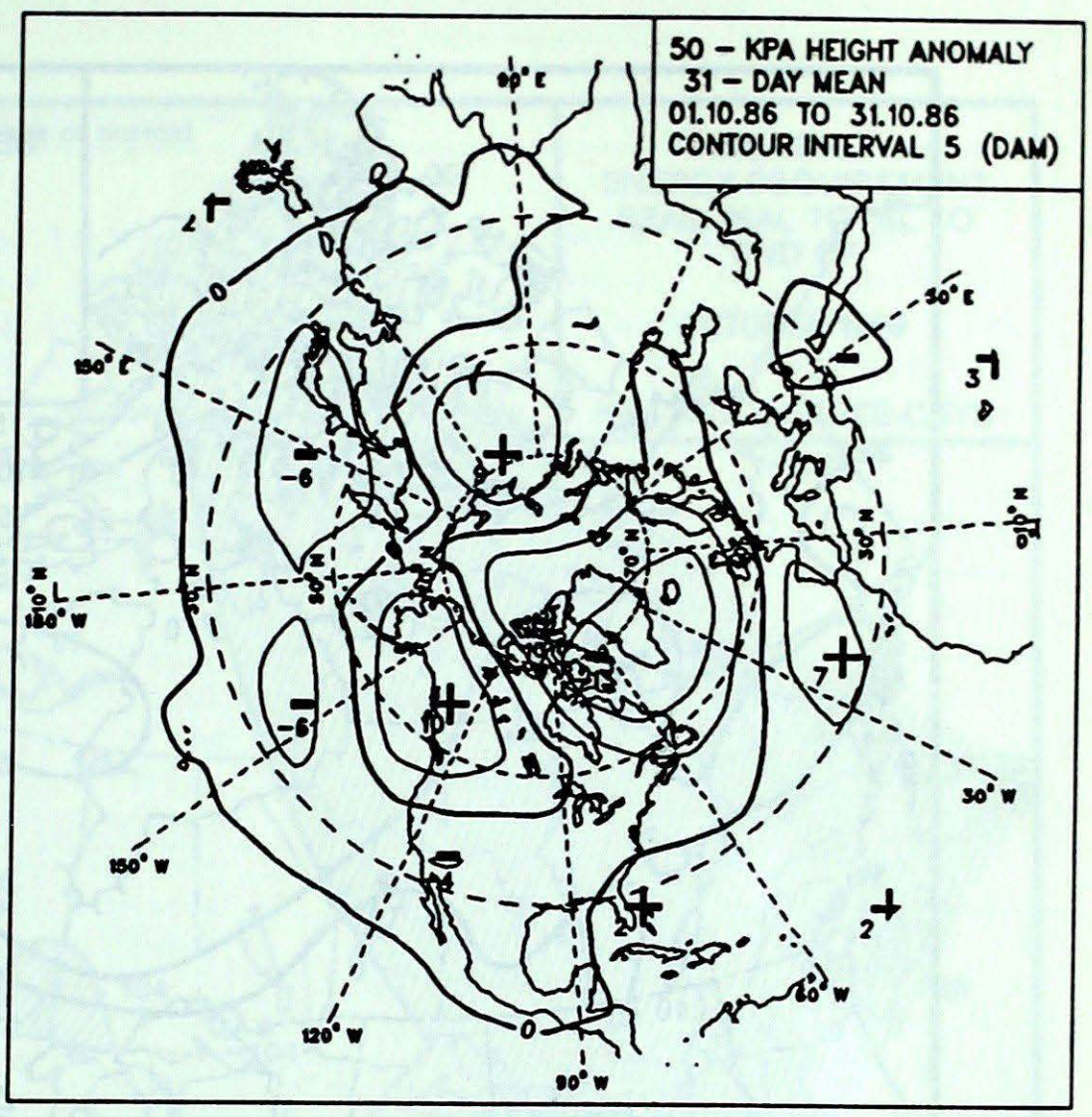
Atlantic Provinces

Cold weather continued in the maritimes where monthly mean temperatures were below normal for the 5th consecutive month. In most localities, it was the coldest October since 1974. Numerous weather systems passed through the Atlantic Provinces because of the strength of the upper level flow and the more easterly position of the upper level trough off the coast. These systems produced strong winds along with precipitation. On October 6, in Nova Scotia, a line of thunderstorms spawned either a tornado or a waterspout at Dublin Shore causing some damage. At Nain, Labrador on the 25th, wind gusted to 128 km/h. Precipitation amounts were generally below normal. Reservoir levels in Nova Scotia dropped 5% to leave them at 41% of their capacity. Over Labrador, cold temperatures were partly compensated for by well above normal amounts of sunshine.

ATMOSPHERIC CIRCULATION



Mean 50 kPa height anomaly (dam)
October 1986



Mean 50 kPa heights (dam)
October 1986

MEAN 50 kPa CIRCULATION
OCTOBER 1986
Alain Caillet, CCRM

The mean upper level circulation for October continued to intensify as the seasonal, northern hemispheric cooling continued. The geopotential height falls related to this cooling were most significant at high latitudes particularly over northeastern Canada. The monthly mean map shows a pronounced arctic vortex over Ellesmere Island which had shifted southward from its position last month over the north pole. There has also been a strengthening of the persistent wave features over North America; that is, the ridge over the west coast and the extensive trough over eastern Canada.

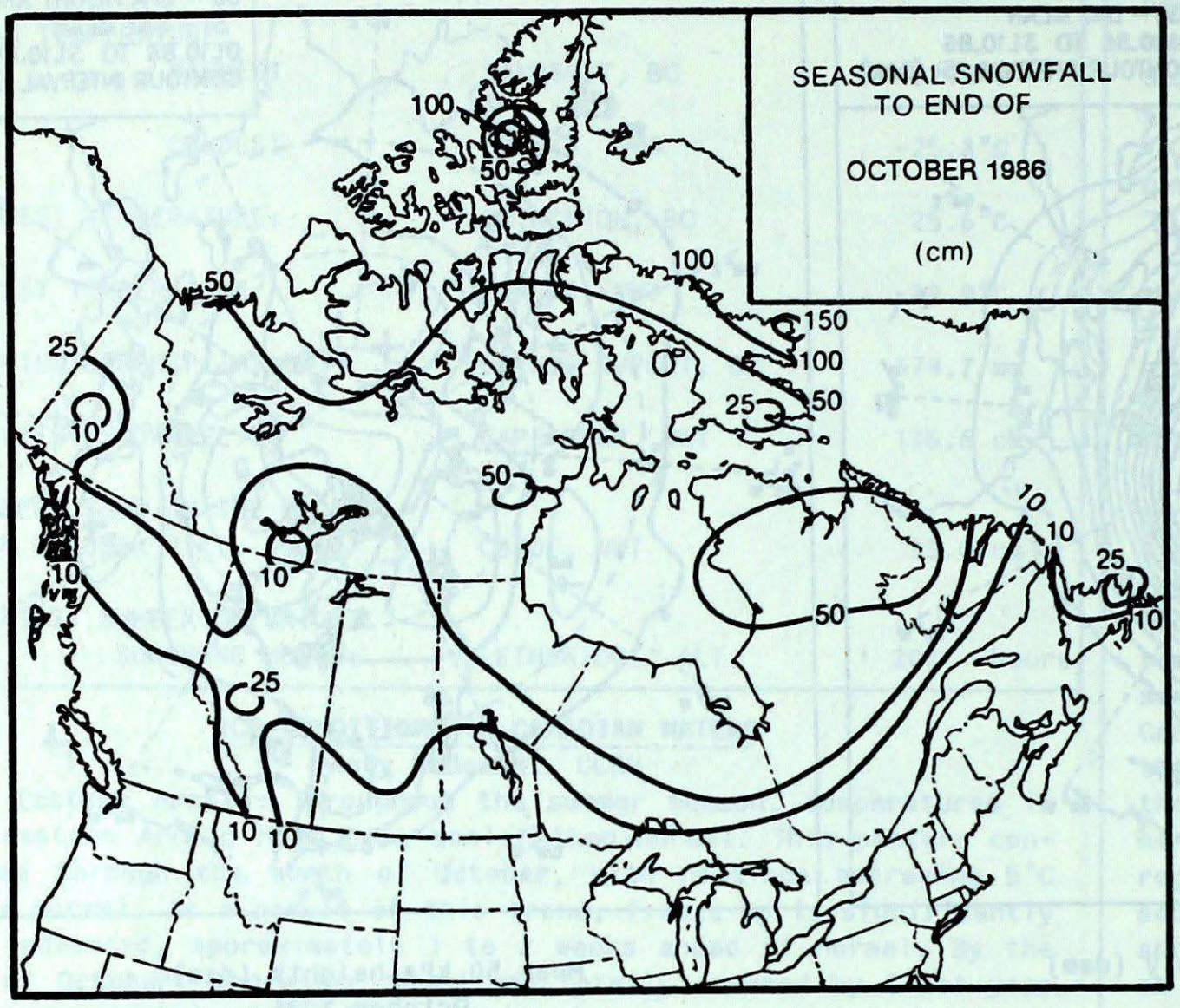
The Pacific coast ridge re-established a more or less normal position with its axis just inland from the B.C. coast. It became a more pronounced feature than usual dominating the maritime flow stream as far south as 40°N. Despite a progressively slow displacement towards the east its position was quite stable throughout the month as indicated by the 10 dam positive height anomaly over the west.

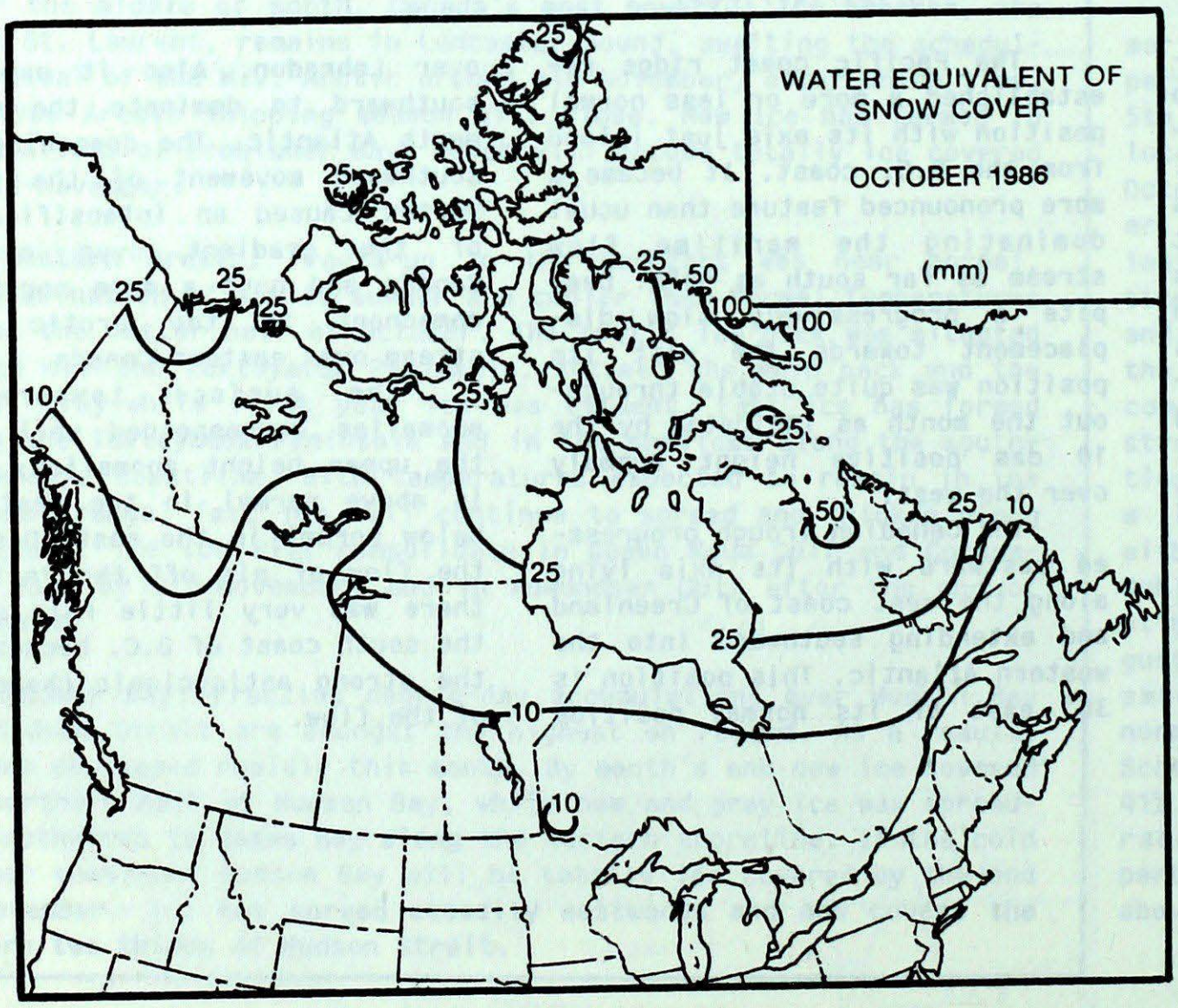
The Canadian trough progressed eastward with its axis lying along the west coast of Greenland and extending southward into the western Atlantic. This position is 30° east of its normal position over Labrador. Also it expanded southward to dominate the whole north Atlantic. The deepening and southward movement of the polar vortex caused an intensification of the gradient over eastern Canada and gave a more northerly component to the arctic flow stream over eastern Canada.

The surface temperature anomalies corresponded well with the upper height anomalies; that is above normal in the west and below normal in the east. Despite the flow of air off the Pacific, there was very little rain along the south coast of B.C. because of the strong anticyclonic character of the flow.

SNOWFALL

SNOWFALL





SEASONAL SNOWFALL TOTALS (CM)

TO END OF OCTOBER

	1986	1985	NORMAL
YUKON TERRITORY			
Whitehorse	30.8	33.6	21.4
NORTHWEST TERRITORIES			
Cape Dyer	22.7	45.2	54.3
Inuvik	41.0	24.7	53.0
Yellowknife	11.8	46.8	26.7
BRITISH COLUMBIA			
Kamloops	0.0	0.0	0.4
Port Hardy	0.0	0.0	0.2
Prince George	0.0	15.5	10.4
Vancouver	0.0	0.0	0.0
Victoria	0.0	0.0	0.0
ALBERTA			
Calgary	12.3	13.0	19.4
Edmonton Namao	6.2	10.3	9.7
Grande Prairie	8.4	7.7	16.3
SASKATCHEWAN			
Estevan	0.8	16.8	8.2
Regina	5.2	17.2	10.0
Saskatoon	3.0	6.2	10.4
MANITOBA			
Brandon	0.5	29.3	6.
Churchill	40.2	36.1	35.7
The Pas	5.2	23.9	11.7
Winnipeg	0.0	14.2	5.4
ONTARIO			
Kapuskasing	37.4	12.2	23.5
London	0.0	0.0	1.9
Ottawa	0.2	0.0	2.7
Sudbury	1.6	0.0	6.5
Thunder Bay	10.0	11.6	3.3
Toronto	0.0	0.0	0.9
Windsor	0.0	0.0	0.1
QUEBEC			
Baie Comeau	3.0	0.0	6.1
Montréal	0.0	0.0	1.7
Quebec	0.0	0.0	4.4
Sept-Iles	1.0	15.9	10.6
Sherbrooke	0.0	0.0	5.6
Val-d'Or	9.0	4.4	15.7
NEW BRUNSWICK			
Charlo	1.0	0.2	5.8
Fredericton	0.0	0.0	2.3
Moncton	0.0	0.0	3.1
NOVA SCOTIA			
Shearwater	0.0	0.0	1.7
Sydney	0.0	7.2	2.6
Yarmouth	0.0	0.0	1.9
PRINCE EDWARD ISLAND			
Charlottetown	1.0	8.8	2.6
NEWFOUNDLAND			
Gander	25.8	28.0	12.3
St. John's	2.2	11.0	4.4

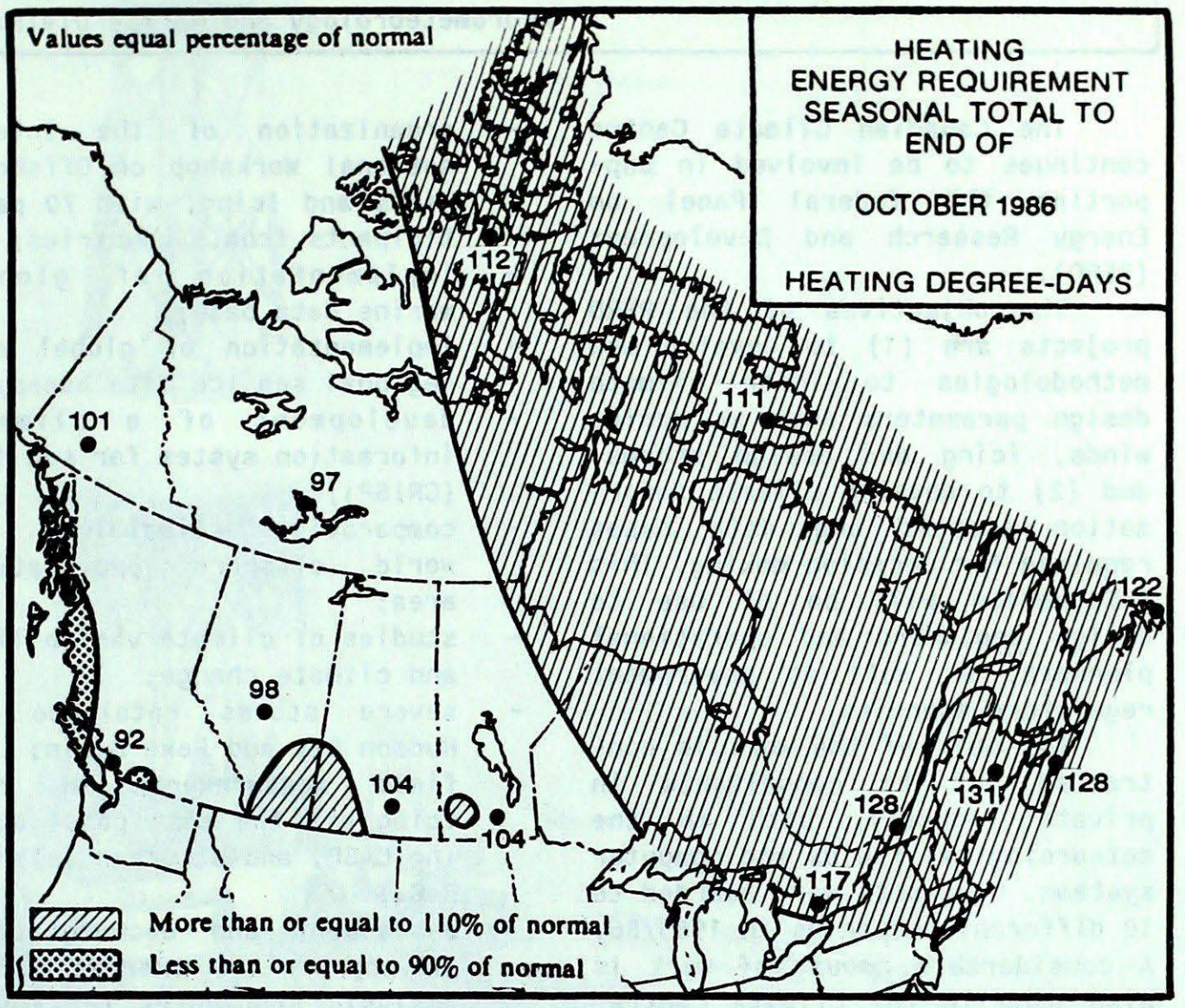
ENERGY

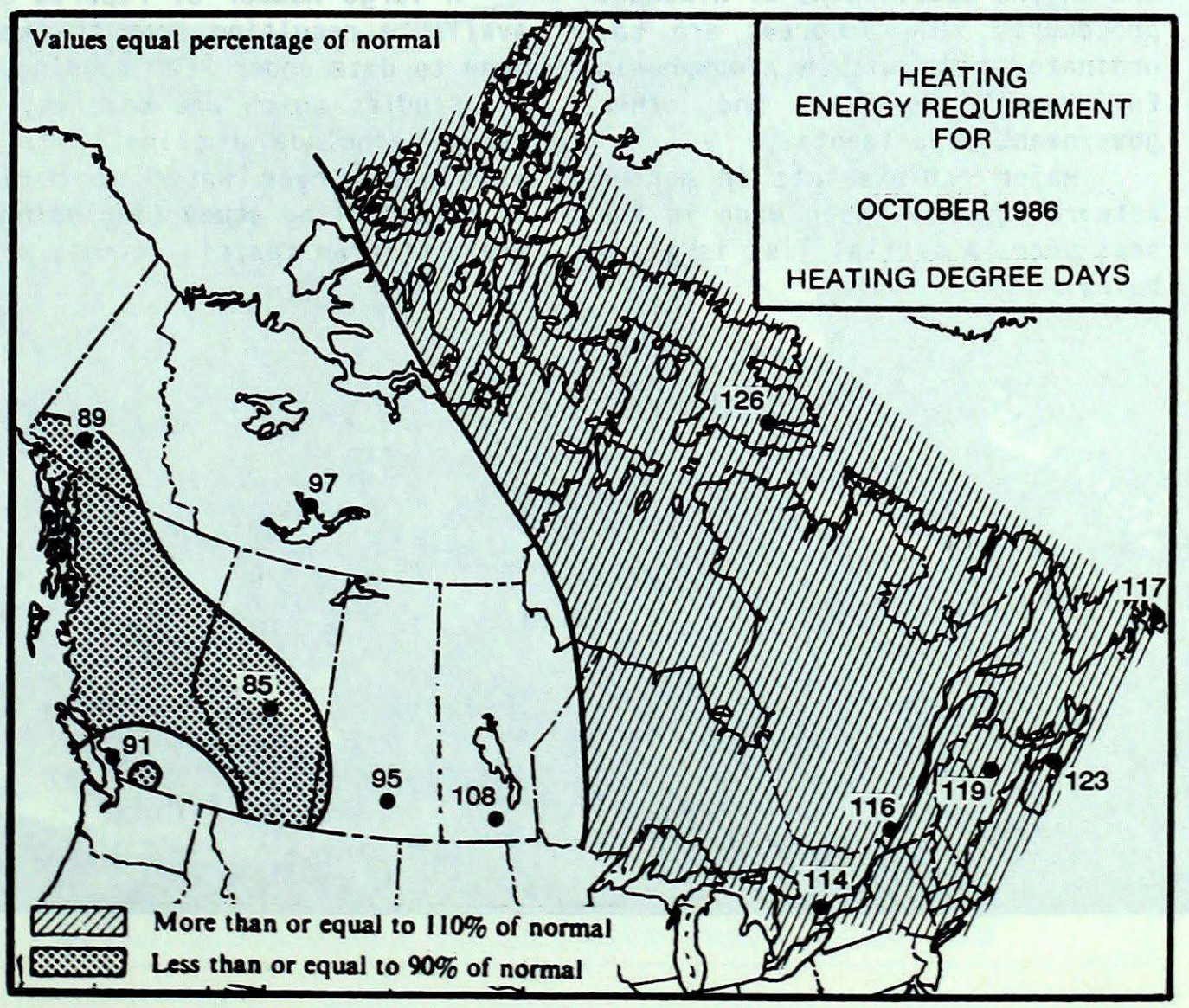
SEASONAL TOTAL OF HEATING

DEGREE-DAYS TO END OF OCTOBER

	1986	1985	NORMAL
BRITISH COLUMBIA			
Kamloops	440	473	436
Penticton	453	495	427
Prince George	836	966	897
Vancouver	401	455	436
Victoria	484	485	501
YUKON TERRITORY			
Whitehorse	1150	1333	1142
NORTHWEST TERRITORIES			
Frobisher Bay	2020	1744	1827
Inuvik	1565	1853	1637
Yellowknife	1095	1384	1124
ALBERTA			
Calgary	793	928	769
Edmonton Mun	716	869	732
Grande Prairie	840	997	843
SASKATCHEWAN			
Estevan	616	722	588
Regina	692	812	669
Saskatoon	720	813	691
MANITOBA			
Brandon	746	851	650
Churchill	1498	1415	1351
The Pas	827	934	790
Winnipeg	614	714	590
ONTARIO			
Kapuskasing	978	745	821
London	405	346	383
Ottawa	520	401	451
Sudbury	697	566	614
Thunder Bay	768	712	700
Toronto	445	367	381
Windsor	265	250	282
QUÉBEC			
Baie Comeau	1015	801	872
Montréal	512	383	401
Quebec	685	502	554
Sept-Iles	1035	852	926
Sherbrooke	702	561	664
Val-d'Or	945	409	795
NEW BRUNSWICK			
Charlo	848	621	615
Fredericton	684	512	524
Moncton	700	510	535
NOVA SCOTIA			
Halifax	551	427	431
Sydney	699	506	502
Yarmouth	600	502	505
PRINCE EDWARD ISLAND			
Charlottetown	656	474	495
NEWFOUNDLAND			
Gander	901	782	728
St. John's	894	755	731

ENERGY REQUIREMENTS





FEATURE

OFFSHORE ENERGY

V.R. Swail
Hydrometeorology and Marine Division

The Canadian Climate Centre continues to be involved in supporting the federal Panel on Energy Research and Development (PERD).

The objectives of the PERD projects are (1) to develop new methodologies to infer climate design parameters such as marine winds, icing and design storms, and (2) to develop climate information systems and data bases required for decision making. This information will be of use to design engineers and operational planners, as well as government regulatory agencies.

The bulk of the work is contracted out to consultants in private industry, both in the meteorological fields and computer systems. Contracts were awarded to 10 different companies in 1985/86. A considerable amount of work is also done in the Climate Centre, including work on the east and west coast marine atlases, organization of the International Workshop on Offshore Winds and Icing, and in the development of hindcast procedures. The programs are coordinated both within Atmospheric Environment Service, and other government departments.

Major achievements in marine meteorology have been made in the past year. A partial list is given below.

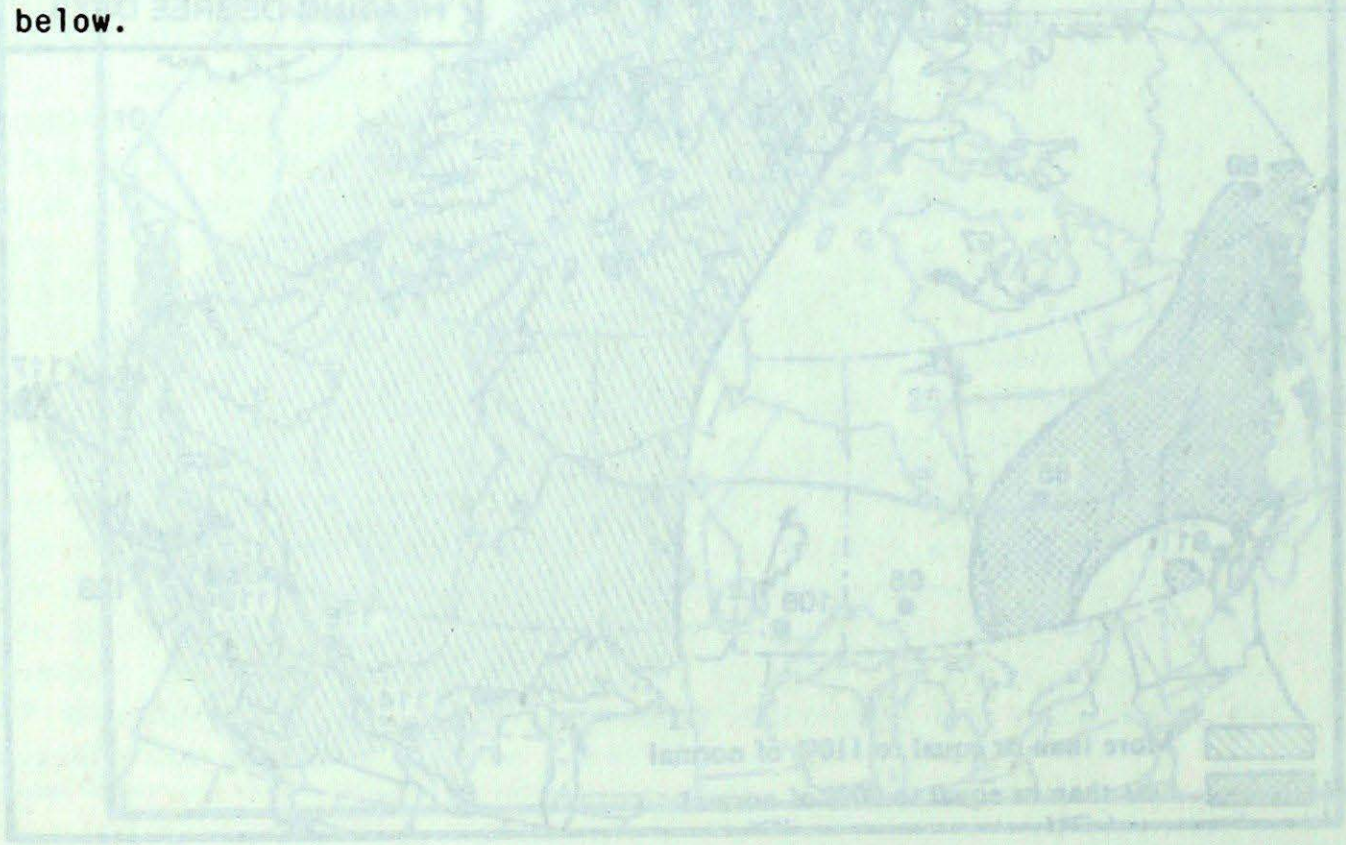
- organization of the International Workshop on Offshore Winds and Icing, with 70 participants from 6 countries;
- implementation of global marine data base;
- implementation of global and regional sea ice data bases;
- development of a climate information system for sea ice (CRISP);
- comparative climatology of world offshore exploration area;
- studies of climate variability and climate change;
- severe storms catalogue of Hudson Bay and Foxe Basin;
- field measurements of rig icing off the east coast during CASP, and at Green Island, B.C.;
- assessment and documentation of appropriate extreme value analysis procedures for environmental parameters;
- east and west coast coast marine environmental atlases.

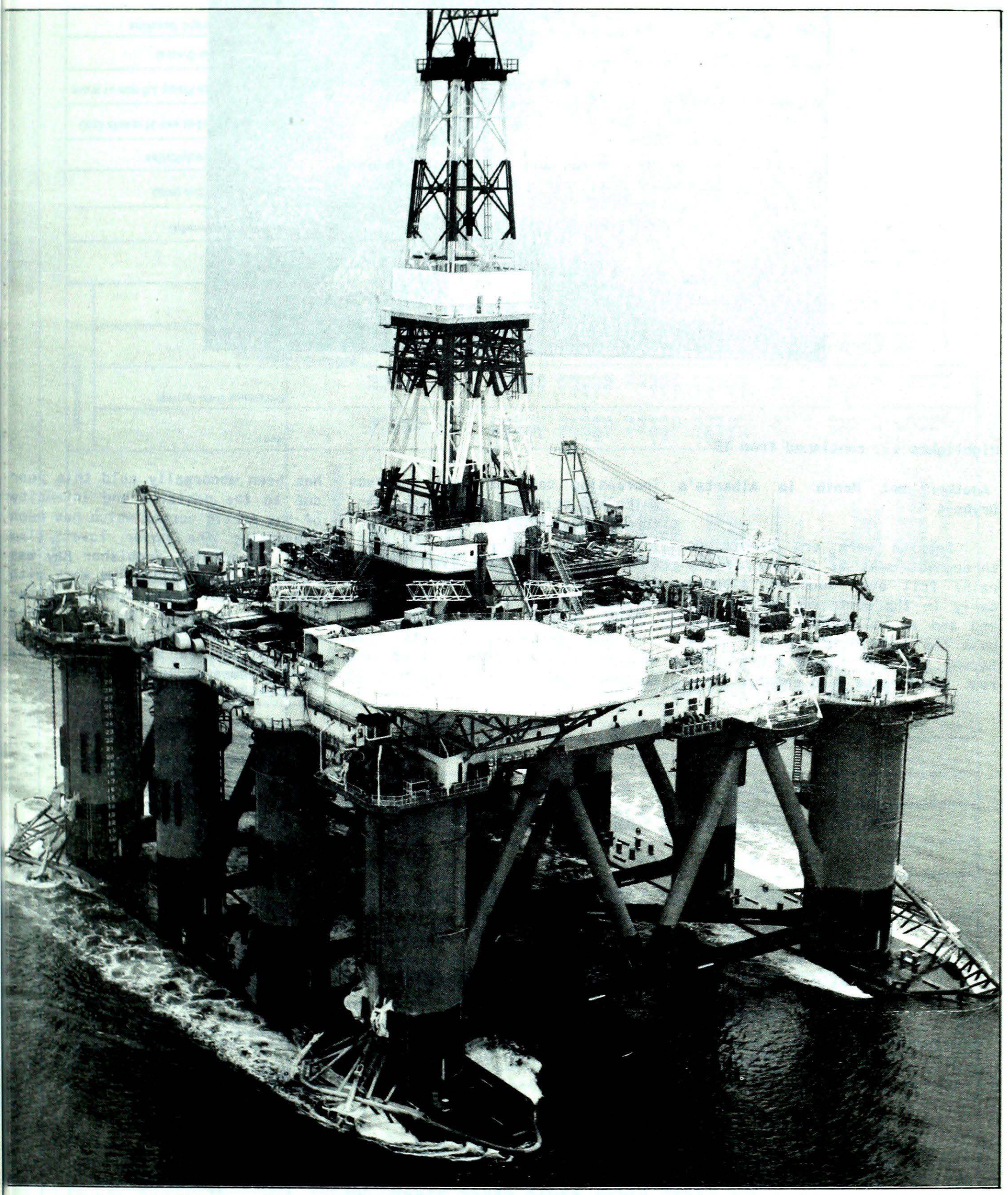
A large number of reports are available resulting from the work done to date under PERD funding.

Studies which are underway in 1986/87 include a climatology of wind gusts over water, a marine icing modelling study (including a field program for rig icing), wind hindcast improvements, establishment of an operational version of the CRISP system, in consultation with Ice Branch, and a storm catalogue for the western high Arctic.

Work planned for future years includes further development of the CRISP system, production of sea ice statistics, work on spray and icing modelling, temperature and windchill design values, study of Arctic instability lows, studies of combined environmental loads, incorporation of microcomputer and satellite technology into climate analysis systems, field programs for icing and wind measurement, and improved physics and application of hindcast models.

There are two main issues relating to work on offshore energy programs. Funding through PERD will likely decrease over the next few years despite our attempts to the contrary. Should this funding be terminated, the impacts on the development of marine meteorology and climatology would be catastrophic. Second, there has been no real effort (other than one contract for preliminary work) aimed at quantifying the magnitude and effects of climate change on offshore activities as there has been for land applications.





Highlights ... continued from 1B

Another Wet Month in Alberta's Drybelt

Despite warm dry conditions throughout most of October, heavy rains fell over southern Alberta early in the month of the 1st and 2nd and again on the last day to push the monthly totals well above normal for the second month in a row. These rains were beneficial in increasing soil moisture reserves which are critical to the agricultural industry.

Cold Spell Continues over Eastern Canada and Intensifies over the Northeast

One naturally expects cold weather over Baffin Island and northern Québec in October but it has been abnormally cold this year due to the position and intensity of the Arctic vortex which has been dominating the upper level flow over the region. Frobisher Bay was into its 6th consecutive week with below normal temperatures. Elsewhere in the east, most of Québec and the Maritimes recorded their 5th consecutive month with below normal temperatures.

OCTOBER 1986

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	11.2	1.1	21.3	0.3	0.0		102.5	66	0	5	156	114	213.2
ALERT BAY	11.4	2.1	18.3	3.2	0.0		198.8	94	0	13	X		204.2
AMPHITRITE POINT	11.6	1.0	16.9	6.3	0.0		161.4	44	0	8	X		196.2
BLUE RIVER	5.9	0.4	18.5	-6.2	0.0		39.1	48	0	6	114	125	
BULL HARBOUR	10.4	1.0	19.7	1.4	0.0		137.9	51	0	16	X		219.3
CAPE SCOTT			15.7		0.0		194.0	55	0	16	X		
CAPE ST.JAMES	11.7	1.8	15.4	8.2	0.0		189.8	96	0	22			195.8
CASTLEGAR	8.8	0.7	21.3	-1.3	0.0		25.8	47	0	5	156	124	284.2
COMOX	10.4	1.2	19.0	2.0	0.0		27.0	21	0	5	X		235.1
CRANBROOK	6.2	0.3	19.1	-4.9	0.0		28.6	156	0	6	207	*	373.1
DEASE LAKE	2.8	1.5	16.3	-19.5	18.5	105	84.4	239	12	14	59	67	470.3
ETHELDA BAY	10.9	2.1	17.3	1.3	0.0		410.7	101	0	21	X		210.2
FORT NELSON	1.0	-0.1	19.5	-24.3	53.2	281	68.2	280	24	11	92	*	528.6
FORT ST.JOHN	6.3	2.0	21.9	-18.6	15.6	86	28.4	102	15	7	X		364.1
HOPE	11.8	1.4	20.9	2.1	0.0		121.8	70	0	5	135	129	192.0
KAMLOOPS	8.5	0.1	21.0	-1.6	0.0		3.1	20	0	1	163	120	294.7
KELOWNA	7.8	0.9	21.6	-2.8	0.0		19.2	101	0	5	166	110	317.4
LANGARA	11.0	2.0	16.0	6.1	0.0		418.0	157	0	26	X		216.9
LYTTON	10.3	0.2	22.5	0.3	0.0		28.1	75	0	2	154	113	237.6
MACKENZIE	4.6	1.0	16.9	-16.0	13.4	76	66.0	111	8	8	110	94	415.2
MCINNES ISLAND	11.1	1.6	15.6	6.0	0.0		284.4	84	0	18	X		213.6
PENTICTON	8.5	-0.2	22.1	-2.3	0.0		13.2	86	0	3	189	120	293.5
PORT ALBERNI	11.4	*	22.0	-2.6	0.0	*	68.0	*	0	7	120	*	205.1
PORT HARDY	10.6	1.9	18.5	1.1	0.0		109.9	44	0	11	112	114	231.7
PRINCE GEORGE	6.7	1.9	18.9	-12.5	0.0		26.0	43	0	8	145	132	352.0
PRINCE RUPERT	10.8	2.9	16.1	-0.2	0.0		674.7	184	0	27	66	101	220.7
PRINCETON	7.4	0.8	25.6	-5.2	0.0		9.2	40	0	3	208	*	
QUESNEL	7.0	1.3	22.3	-9.4	1.2	19	26.3	54	0	6	X		340.9
REVELSTOKE	8.3	1.4	17.1	-0.9	0.0		36.4	43	0	4	84	93	339.8
SANDSPIT	12.0	3.0	20.6	3.7	0.0		181.1	93	0	21	75	82	185.7
SMITHERS	7.6	2.9	18.5	-3.4	0.0		56.7	89	0	13	84	92	325.9
TERRACE	9.6	3.2	15.0	0.6	0.4	10	163.2	75	0	22	67	107	260.0
VANCOUVER HARBOUR	11.6	0.9	17.1	5.7	0.0		53.7	33	0	5	X		199.4
VANCOUVER INT'L	10.8	0.8	19.5	2.3	0.0		49.2	43	0	5	136	112	223.8
VICTORIA GONZ. HTS	11.5	0.7	18.7	5.4	0.0		35.9	56	0	3	136	93	202.4
VICTORIA INT'L	10.5	0.6	20.2	1.3	0.0		35.2	44	0	4	148	102	233.7
VICTORIA MARINE	10.1	0.2	20.1	3.0	0.0		57.1	43	0	6	X		244.2
WILLIAMS LAKE	7.7	2.6	22.4	-9.2	4.6	61	19.4	64	0	4	186	137	318.1

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
YUKON TERRITORY													
BURWASH	-1.0	2.2	13.9	-22.8	1.0	6	2.6	14		1	X		586.2
DAWSON	-4.8	0.6	13.0	-29.4	6.2	25	16.2	58	3	5	X		676.0
MAYO	-1.1	1.2	14.8	-21.1	3.0	14	19.4	68	0	8	X		590.1
WATSON LAKE	2.6	2.7	16.4	-21.3	0.2	0	50.3	143		12	81	84	478.1
WHITEHORSE	2.5	1.9	14.5	-18.0	1.0	6	29.9	139		10	88	94	481.4
NORTHWEST TERRITORIES													
ALERT	-21.7	-2.0	-13.2	-33.6	30.4	194	16.1	119	25	5	12	141	1230.8
BAKER LAKE	-11.4	-3.7	2.6	-28.8	39.8	171	30.9	100	16	10	65	89	910.7
CAMBRIDGE BAY	-15.7	-4.0	0.4	-29.9	11.6	75	10.6	71	10	4	64	109	1044.8
CAPE DYER	-12.2	-4.5	-2.5	-27.9	136.6	137	87.1	86	26	12	X		936.8
CAPE PARRY	-7.3	-0.5	3.0	-20.0	34.2	126	31.3	155	17	7	X		784.5
CLYDE	-13.9	-7.0	-1.1	-28.7	57.2	153	44.4	129	33	12	66	138	989.1
COPPERMINE	-7.4	-0.8	5.3	-21.5	37.6	179	27.0	116	14	12	46	99	786.8
CORAL HARBOUR	-13.0	-5.2	0.5	-27.4	19.8	74	19.8	53	7	6	150	173	930.7
EUREKA	-25.8	-3.7	-17.0	-39.9	6.4	85	6.2	88	13	2	0		1377.0
FORT RELIANCE	-1.6	0.2	6.4	-17.1	18.9	93	17.7	63	3	5	X		606.7
FORT SIMPSON	-0.8	1.1	20.2	-19.5	12.2	65	17.4	72	5	5	85	99	583.0
FORT SMITH	0.4	0.1	18.7	-18.5	13.8	86	15.2	57	7	5			545.9
FROBISHER BAY	-10.8	-5.8	1.0	-23.4	17.0	42	14.6	33	5	4	100	173	891.9
HALL BEACH	-15.5	-5.0	-0.4	-30.5	12.1	56	9.6	45	9	3	X		1038.5
HAY RIVER	1.5	0.6	20.0	-16.8	9.0	47	21.7	71	3	9	X		508.8
INUVIK	-7.7	0.4	8.7	-23.7	23.6	63	22.2	66	7	8	0		796.1
MOULD BAY	-20.2	-2.6	-8.2	-37.9	27.8	253	21.8	232	26	9	2	18	1182.9
NORMAN WELLS	-4.1	0.5	9.2	-19.7	22.2	88	21.1	78	8	4	64	108	682.2
POND INLET	-18.0	-6.0	-2.4	-29.7	13.4	40	9.6	37	10	5	X		1115.4
RESOLUTE	-20.7	-5.6	-11.1	-37.3	16.3	110	12.6	91	13	3	24	101	1198.4
YELLOWKNIFE	-1.0	0.6	10.8	-18.1	11.0	47	24.2	70	1	5	77	137	587.0
ALBERTA													
BANFF	6.9	2.5	19.0	-10.0	9.4	52	17.8	56	4	4	X		
BROOKS	7.5	1.2	24.5	-7.5	9.5	139	25.3	147	0		189	*	
CALGARY INT'L	7.8	2.3	23.0	-11.7	4.2	31	10.6	60	4	3	206	117	315.2
COLD LAKE	5.4	0.9	23.2	-10.5	9.3	132	12.3	72	7	3	166	107	391.2
CORONATION	6.3	1.5	22.0	-11.4	0.4	4	14.8	98		4	195	109	362.7
EDMONTON INT'L	6.6	1.9	22.2	-9.5	4.0	59	20.8	135		5	177	108	353.2
EDMONTON MUNI.	7.3	1.5	22.2	-9.0	3.6	48	20.9	125		5	186	114	331.2
EDMONTON NAMAO	6.9	1.8	22.3	-9.1	6.0	77	19.3	106		5	X		346.3
EDSON	6.2	3.1	23.5	-15.4	6.4	31	12.0	41	1	4	166	110	297.4
FORT CHIPEWYAN	1.5	0.5	18.5	-17.0	11.8	65	18.0	58	8		X		

OCTOBER 1986

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	3.8	0.5	24.6	-14.0	12.2	96	27.6	98	3	5	137	110	441.1
GRANDE PRAIRIE	5.8	1.6	23.1	-19.0	6.4	54	12.7	47	3	5	140	*	379.7
HIGH LEVEL	1.0	-0.3	19.8	-23.4	17.0	111	34.4	234	10	5	119	83	526.7
JASPER	6.9	2.2	20.5	-11.4			10.2	34	0	4	161	*	343.7
LETHBRIDGE	8.6	1.1	24.4	-13.0	20.6	176	37.8	212	3	8	208	118	294.0
MEDICINE HAT	8.7	1.3	24.2	-12.1	8.8	110	25.1	154	4	4	205	118	289.2
PEACE RIVER	4.5	0.8	22.9	-21.0	25.9	269	32.4	162	13	8	X		417.3
RED DEER	6.4	1.8	24.2	-10.2	0.6	5	21.5	104		5	X		356.9
ROCKY MTN HOUSE	6.3	1.4	23.8	-11.7	1.0	6	12.4	54		3	X		363.1
SLAVE LAKE	4.7	0.6	20.1	-11.2	17.4	110	33.6	132	9	6	164	110	412.7
SUFFIELD	8.4	1.4	24.0	-11.0	9.3	136	18.9	124	5	2	198	106	293.9
WHITECOURT	6.4	3.0	22.8	-12.0	6.1	39	44.3	160	2	7	X		361.0
SASKATCHEWAN													
BROADVIEW	5.9	1.3	23.2	-9.8	9.0	105	26.2	118	4	6	195	122	375.8
COLLINS BAY	-1.0	-0.1	15.4	-18.1	36.5	120	42.9	113	11	9	100	*	235.5
CREE LAKE	1.5	-0.1	18.7	-14.2	16.6	112	38.5	127	4	4	118	121	511.4
ESTEVAN	6.7	0.3	23.9	-7.6	0.8	11	20.4	92	0	3	183	97	348.4
HUDSON BAY	4.7	0.8	22.0	-11.0	9.4	93	14.0	52	8	3	163	*	410.7
KINDERSLEY	6.7	1.4	22.7	-10.6	0.4	5	16.0	115		5	X		322.5
LA RONGE	3.3	-0.2	22.2	-12.3	12.4	126	33.2	111	4	5	X		458.7
MEADOW LAKE	4.4	-0.2	23.4	-14.9	2.0	22	7.2	40	0	4	175	*	420.8
MOOSE JAW	7.3	0.9	23.0	-9.6	6.7	88	17.1	93	3	5	200	115	333.1
NIPAWIN	4.4	*	22.3	-11.1	6.9	*	15.5	*		6	157	*	420.2
NORTH BATTLEFORD	5.7	0.8	23.5	-10.5	5.2	73	10.1	64	TR	3	X		315.1
PRINCE ALBERT	4.7	1.0	23.2	-9.2	0.2	2	3.0	13		2	151	103	412.0
REGINA	5.9	0.7	23.2	-10.9	5.2	63	11.8	62	2	4	201	119	374.1
SASKATOON	5.9	1.0	22.6	-10.0	3.0	32	6.8	39		3	X		375.2
SWIFT CURRENT	7.3	1.5	22.8	-13.1	4.5	49	27.5	151	1	6	186	110	330.1
WYNYARD	5.5	0.7	22.9	-11.1	9.6	84	13.9	56	7	2	X 153	102	387.5
YORKTON	5.3	0.5	23.5	-11.3	6.8	90	11.8	51	6	3	193	122	459.2
MANITOBA													
BRANDON	4.9	-0.3	22.3	-9.7	0.5	7	23.2	107	0	5	X		403.9
CHURCHILL	-2.2	-0.7	9.7	-15.1	37.8	129	41.7	96	5	10	61	98	625.6
DAUPHIN	6.2	0.7	24.8	-10.7	3.6	43	21.1	73	2	6	165	107	350.6
GILLAM	-1.0	-0.6	13.1	-16.9	31.9	151	24.9	76	9	4	X		588.2
GIMLI	4.8	-0.8	22.6	-9.3			12.8	33		3	165	114	409.5
ISLAND LAKE	2.4	-0.8	17.9	-11.0	14.8	90	44.2	101	8	8	X		484.3
LYNN LAKE	-0.2	-0.2	19.9	-15.5	23.0	82	30.3	73	11	10	81	113	565.4
NORWAY HOUSE	2.3	*	15.1	-11.4	21.6	*	52.2	*	16	7	8 X	*	487.4
PORTAGE LA PRAIRIE	6.3	-0.2	24.0	-6.7	7.1	112	14.7	47	0	6	X		363.7

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	5.7	2.1	23.5	-10.5	5.2	50	10.1	30	5	3	*		375.1
THOMPSON	-0.1	-0.3	18.8	-15.4	30.7	111	35.1	72	10	9	113	143	559.1
WINNIPEG INT'L	5.4	-0.7	23.4	-8.5	TR		11.6	37	0	4	189	124	390.9
ONTARIO													
ATIKOKAN	3.4	-1.6	19.6	-12.6	7.4	61	48.1	77	0	8	93	82	451.7
BIG TROUT LAKE	0.9	-0.9	14.8	-11.7	27.6	*	60.6	108	3	12	99	*	529.3
EARLTON	4.3	-1.1	17.8	-7.2	0.6	8	96.1	137	0	11	X		424.9
GERALDTON	2.3	-1.6	15.1	-12.2	9.4	87	74.6	115	0	10	X		485.9
GORE BAY	7.5	-0.8	18.8	-2.8	0.0		75.0	110	0	12	X		325.8
HAMILTON RBG	10.7	*	21.0	-1.9	0.0		59.6	*	0	10	154	*	
HAMILTON	9.4	0.0	20.0	-0.7	0.0		73.8	120	0	11	X		266.3
KAPUSKASING	2.5	-1.9	16.5	-10.0	32.8	155	90.6	117	0	14	X		583.3
KENORA	5.0	-0.6	18.4	-7.7	1.4	18	18.0	44	0	6	X		403.2
KINGSTON	8.7	-0.7	20.0	-4.0	0.0		81.8	106	0	12	145	95	289.6
LANSDOWNE HOUSE	1.6	-1.2	15.8	-11.8	13.2	42	48.4	74		10	X		508.5
LONDON	9.4	0.0	19.8	-1.2			82.7	112	0	12	121	85	267.3
MOOSONEE	2.0	-2.1	14.4	-11.0	26.8	184	80.1	107	0	12	61	69	495.6
MUSKOKA	6.6	-0.9	20.4	-6.7			103.5	110	0	11	X		344.7
NORTH BAY	5.0	-1.4	18.1	-6.2			86.5	98	0	12	132	111	403.4
OTTAWA INT'L	7.7	-0.4	19.5	-5.6	0.2	7	78.0	114	0	13	142	*	319.9
PETAWAWA	5.7	-1.4	11.7	-0.4			49.6	74	0	9	X		382.5
PETERBOROUGH	7.8	-0.1	20.1	-5.3	0.0		45.8	76	0	11	X		316.9
PICKLE LAKE	2.2	-0.5	16.2	-10.6	8.8	42	39.4	62	1	10	X		489.2
RED LAKE	3.2	-1.3	19.0	-10.9	0.2	1	22.5	44	0	6	130	*	459.9
ST. CATHARINES	10.4	-0.5	20.4	-1.5	0.0		51.8	78	0	13	X		235.3
SARNIA	10.0	-0.5	19.5	-0.3	0.0		69.4	115	0	13	133	91	248.1
SAULT STE. MARIE	6.6	-1.0	19.5	-5.3			85.6	115	0	15	124	105	353.6
SIMCOE	9.6	-0.3	21.0	-2.0	0.0		98.8	116	0	12	X		253.6
SIOUX LOOKOUT											X		
SUDBURY	5.2	-1.1	18.2	-7.0	1.6	25	76.5	102	0	10	121	99	397.5
THUNDER BAY	4.3	-1.4	21.5	-10.7	10.0	303	28.4	51	0	8	134	104	424.9
TIMMINS	3.3	-1.5	18.8	-9.7	8.0	63	104.0	151	0	15	X		459.1
TORONTO	10.6	-0.4	20.5	0.5	0.0		56.2	92	0	9			230.4
TORONTO INT'L	8.7	-0.6	20.4	-4.5	0.0		59.6	96	0	9	X		287.9
TORONTO ISLAND	10.3	0.2	20.5	1.9	0.0		55.7	98	0	11			239.0
TRENTON	8.6	-0.6	20.5	-4.2	0.0		59.3	84	0	11	X		291.4
WATERLOO-WELL	8.2	-0.6	19.3	-4.5			67.0	102	0	11	X		304.2
WAWA	4.0	*	16.1	-8.5	3.9	*	152.0	*	0	12		*	432.7
WIARTON	8.2	-0.8	18.8	-4.2			93.1	113	0	12	143	107	303.2
WINDSOR	11.4	0.3	23.2	1.5			75.4	132	0	11	X		207.0

OCTOBER 1986

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
QUEBEC													
BAGOTVILLE	3.6	-1.7	15.0	-7.9	7.6	64	84.9	118		13	X		447.0
BAIE COMEAU	3.1	-1.2	16.5	-11.0	3.0	49	60.4	67	0	15	116	*	461.8
BLANC SABLON	1.9	-2.0	12.0	-10.4	5.0	55	64.0	69	0	10	140	*	
CHIBOUGAMAU	0.9	-1.7	14.7	-10.8	40.8	176	94.0	109		17	69	97	528.7
GASPE	3.8	-2.0	16.2	-11.8	6.6	132	50.6	55	0	10	113	*	437.9
INUKJUAK	-2.6	-2.2	5.1	-14.6	64.8	294	61.6	134	20	16	32	61	639.7
KUUJJUAQ	-4.9	-4.0	6.2	-18.4	50.4	185	45.6	93	8	15	64	131	708.7
KUUJJUARAPIK	-0.1	-2.1	7.3	-9.5	29.6	108	49.4	87	2	13	34	72	561.4
LA GRANDE RIVIERE	-1.1	*	8.4	-11.1	47.6	*	57.0	*	5	15	46	*	591.7
MANIWAKI	5.2	-1.3	19.5	-9.0			63.0	87	0	7	124	102	396.9
MATAGAMI													
MONT JOLI	4.3	-1.4	15.8	-7.4	5.6	75			66	12	112	96	426.2
MONTREAL INT'L	8.0	-0.7	20.9	-4.5	0.0		57.0	75	0	13	143	104	309.6
MONTREAL M INT'L	6.6	*	20.7	-7.9	0.0	*	59.2	*	0	11	163	*	352.8
NATASHQUAN	2.7	-1.4	-13.5		2.2	56	59.0	54		10	130	100	468.6
QUEBEC	5.7	-0.9	20.1	-5.1	0.0		77.2	85	0	12	124	106	381.1
ROBERVAL	4.3	-0.9	17.3	-8.9	7.2	71	89.8	140	0	13	77	*	435.9
SCHEFFERVILLE	-4.2	-2.8	7.2	-18.6	58.8	130	61.0	80	25	14	63	*	664.7
SEPT-ILES	2.4	-1.2	14.8	-10.6	1.0	9	70.6	73	0	10	126	100	483.1
SHERBROOKE	5.9	-0.7	18.3	-7.4	0.0		72.9	83	0	13	113	*	375.9
STE AGATHE DES MONTS	4.8	-0.6	18.4	-10.2	0.4	5	64.8	73	0	10	137	107	410.5
ST-HUBERT	7.5	-0.9	20.6	-7.4	0.0		61.2	79	0	11	*		326.2
VAL D'OR	3.1	-1.5	14.8	-10.3	9.0	62	105.4	128	0	14	90	101	463.2
NEW BRUNSWICK													
CHARLO	4.3	-1.5	15.8	-7.9	1.0	17	59.7	72	0	11	130	101	421.7
CHATHAM	5.3	-1.8	16.9	-5.6			30.3	31	0	5	*		392.6
FREDERICTON	5.9	-1.6	18.5	-6.9			30.1	30	0	8	138	*	374.4
MONCTON	6.0	-1.6	18.2	-5.7			41.1	41	0	11	138	97	372.2
SAINT JOHN	6.3	-1.3	18.5	-4.4	0.0		49.9	39	0	9	141	100	363.8

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
NOVA SCOTIA													
GREENWOOD	7.3	-1.3	20.4	-5.6			62.1	63	0	12	X		331.2
HALIFAX INT'L	7.3	-1.3	19.0	-2.7			75.3	56	0	9	*		333.3
SABLE ISLAND	10.1	-1.4	16.6	3.0	0.0		175.6	150	0	12	118	98	245.7
SHEARWATER	8.0	-1.5	19.8	-1.5	0.0		70.7	58	0	9	138	87	310.4
SYDNEY	7.0	-1.4	18.7	-4.7			87.3	71	0	16	127	96	343.1
TRURO	6.1	-1.7	19.0	-5.8			62.8	56	0	13	127	98	367.3
YARMOUTH	8.3	-1.2	19.5	-1.1	0.0		98.0	84	0	12	151	101	304.2
PRINCE EDWARD ISLAND													
CHARLOTTETOWN	6.7	-1.4	16.8	-3.4	1.0	38	61.8	58	0	13	X		352.2
SUMMERSIDE	10.6	2.0	16.6	-0.7	0.2	9	38.6	41	0	9	126	94	345.0
NEWFOUNDLAND													
ARGENTIA	6.6	-1.8	14.4	-1.2	0.0		105.0	117	0	13	X		352.8
BATTLE HARBOUR	1.8	-2.4	13.8	-11.4	8.0	216	57.6	74	7	8	X		502.4
BONAVISTA	5.6	-1.6	16.3	-2.8	24.6		119.6	117		14	X		383.4
BURGEO	5.6	-1.5	14.5	-4.5	0.0		133.6	93	0	14	*		383.9
CARTWRIGHT	1.0	-2.1	11.5	-11.3	5.8	48	74.6	103	0	8	128	143	491.9
CHURCHILL FALLS	-2.2	-2.1	10.5	-16.7	41.7	77	67.6	78	8	11	94	141	624.5
COMFORT COVE	3.9	-2.1	17.4	-6.2	13.6	107	100.5	90	3	12	X		435.4
DANIEL'S HARBOUR	3.4	-2.5	10.2	-5.7	1.0	22	88.3	98	0	12	110	131	462.7
DEER LAKE	4.8	-0.5	16.6	-7.5	11.6	158	67.5	64	2	12	X		436.3
GANDER INT'L	3.8	-2.2	17.7	-7.2	24.2	198	13.4	12	1	13	132	119	439.6
GOOSE	0.4	-2.3	14.1	-12.3	21.7	87	88.9	116	0	8	130	138	544.4
PORT-AUX-BASQUES	6.3	-0.7	14.8	-4.0	0.2	6	107.4	81	0	14	133	*	363.0
ST ANTHONY	1.9	*	11.5	-10.7	14.2	*	94.1	*	12	7		*	499.1
ST JOHN'S	5.4	-1.5	17.0	-3.5	2.2	50	157.2	108		17	118	106	391.5
ST LAWRENCE	6.0	*	14.0	-4.9	0.0	*	145.2	*	0	12		*	
STEPHENVILLE	5.6	-1.4	14.4	-5.1	0.6	17	96.6	87	0	15			385.4
WABUSH LAKE	-2.4	*	9.7	-16.3	32.3	*	52.1	*	4	10	90	*	

AGROCLIMATOLOGICAL STATIONS — OCTOBER 1986

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	12.2	1.3	21.0	1.0	0.0	113.0	64	0	5	167	223.5	2223.3
KAMLOOPS												
SIDNEY												
SUMMERLAND	*		20.0	1.0	0.0	12.8	73	0	4	207	122.2	2163.0
ALBERTA												
BEAVERLODGE	6.0	1.6	23.0	-18.0	3.0	19.0	66	2	6	130	102.3	1391.1
ELLERSLIE	6.4	1.8	22.4	-8.9	3.2	20.2	120	0	6	179	78.9	1320.6
FORT VERMILLION												
LACOMBE	5.8	2.1	24.0	-9.0	0.0	16.3	93	0	5	176	90.0	1261.9
LETHBRIDGE												
VAUXHALL												
VEGREVILLE	6.0	1.9	23.0	-9.0	2.0	13.2	52	2	6		77.2	1317.0
SASKATCHEWAN												
INDIAN HEAD	6.1	0.8	23.5	-8.0	4.4	17.4	70	2	5		80.0	1575.0
MELFORT	5.0	0.8	22.5	-9.0	1.1	3.7	14	0	1	150	68.0	1495.5
REGINA	4.7	0.2	23.0	-11.5	3.5	15.3	83	3	3		0.0	1438.0
SASKATOON	5.9	0.7	23.5	-9.5	4.2	6.3	36	TR	2	155	85.0	1588.5
SCOTT	5.5	1.3	22.5	-8.5	0.0	9.8	72		5	183	63.2	1350.9
SWIFT CURRENT SOUTH	7.4	1.5	23.0	-9.5	5.4	26.4	163	5	5	173		1648.3
MANITOBA												
BRANDON	5.8	0.2	23.1	-9.2	0.0	21.0	90	0	6		70.2	1739.0
GLENLEA	4.9	0.9	23.0	-9.0	0.2	14.2	38	0	6	183	42.1	1619.2
MORDEN	6.4	0.6	24.0	-8.5	1.8	13.6	43	0	3	168	86.5	1935.0
ONTARIO												
DELHI	9.2	-0.7	20.5	-3.5	0.0	101.3	135	0	12	136	141.8	2171.1
ELORA	7.8	-0.7	18.9	-3.4	0.0	76.6	116	0	15		106.2	1907.2
GUELPH	8.3	-0.9	19.3	-5.0	0.0	69.4	95	0	12	137	109.4	1990.1
HARROW	11.6	0.3	23.0	1.0	0.0	118.4	213	0	11	129	208.4	2538.4
KAPUSKASING												
MERIVALE												
OTTAWA	7.8	-0.7	20.1	-5.3	0.0	62.9	92	0	12	142	98.5	2029.9
SMITHFIELD	9.5	0.6	20.5	-3.0	0.0	55.4	69	0	9		140.2	2167.7
VINELAND STATION	10.9	-0.1	20.6	-0.5	0.0	65.2	111	0	15	144	104.0	2248.8
WOODSLEE												
QUEBEC												
LA POCATIERE	6.0	-0.9	17.0	-4.5	1.0	52.8	74	0	9	134	65.3	
L'ASSUMPTION	7.4	-0.6	21.5	-7.0	0.0	62.8	79	0	10	143	94.1	1860.8
LENNOXVILLE												
NORMANDIN	2.9	-1.7	16.5	-10.5	5.0	73.0	122	0	13	86	19.7	1165.5
ST. AUGUSTIN												
STE CLOTHILDE	8.0	-0.3	20.5	-6.5	0.0	73.4	88	0	11	129	104.9	2008.4
NEW BRUNSWICK												
FREDERICTON												
NOVA SCOTIA												
KENTVILLE	8.3	-0.8	20.0	-3.0	0.0	53.7	53	0	8	126	106.1	1698.3
NAPPAN	7.1	-1.2	17.5	-8.0	0.0	53.4	53	0	11	124	85.8	1461.0
PRINCE EDWARD ISLAND												
CHARLOTTETOWN												
NEWFOUNDLAND												
ST. JOHN'S WEST	5.3	-1.8	16.0	-4.0	0.0	172.2	119	0	20	108	46.7	1154.5