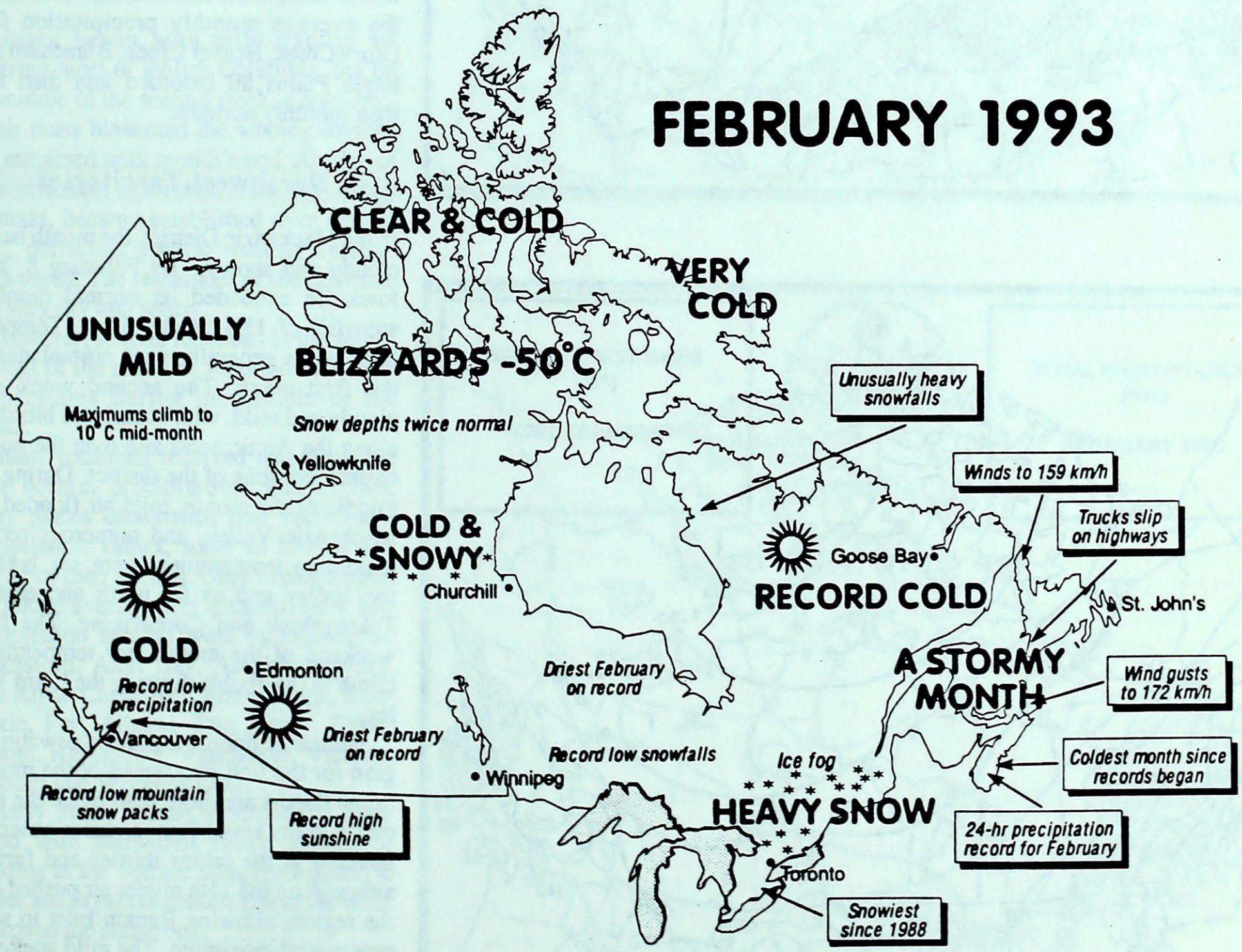
Environment Canada Environnement Canada

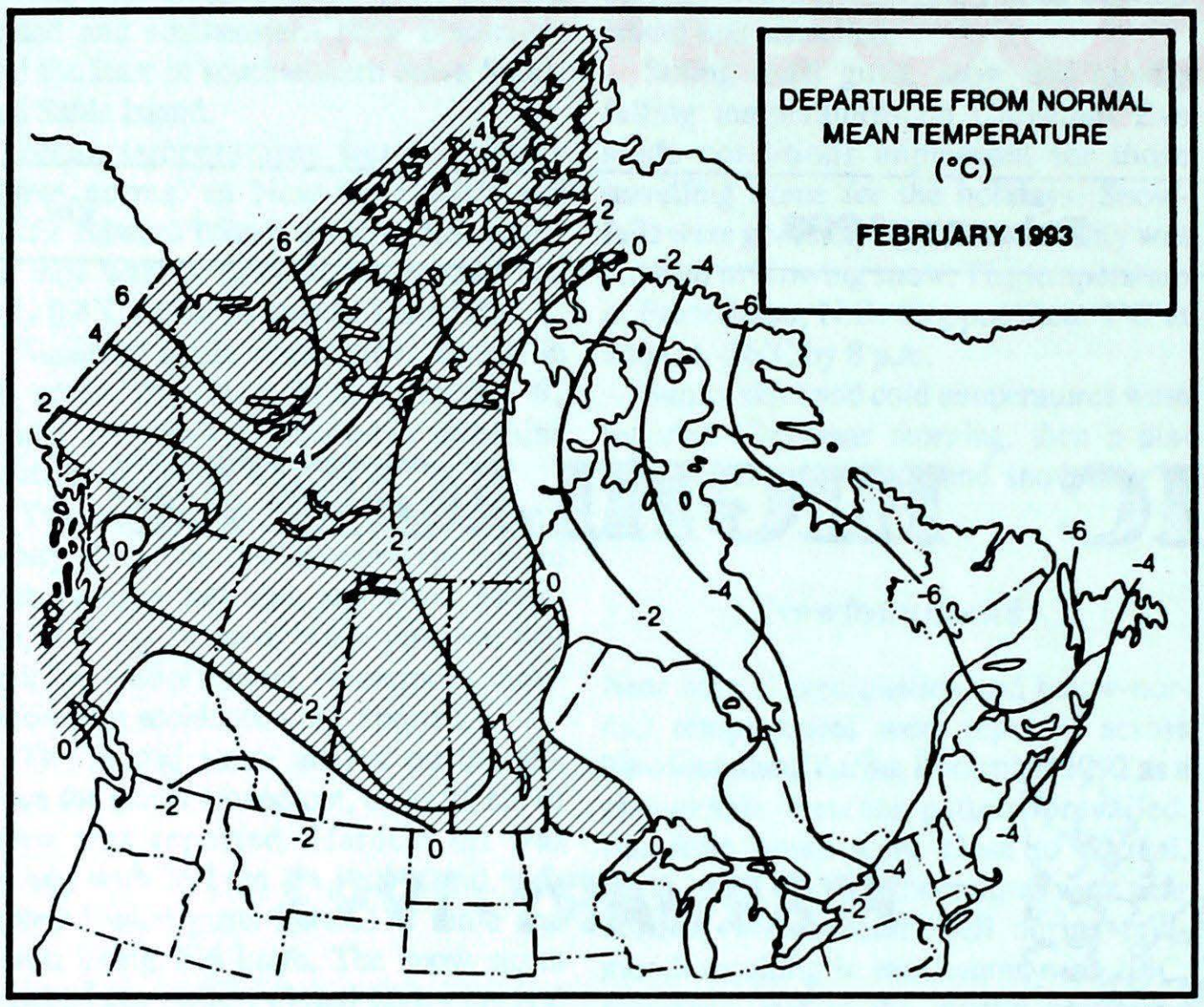
Climatic Perspectives

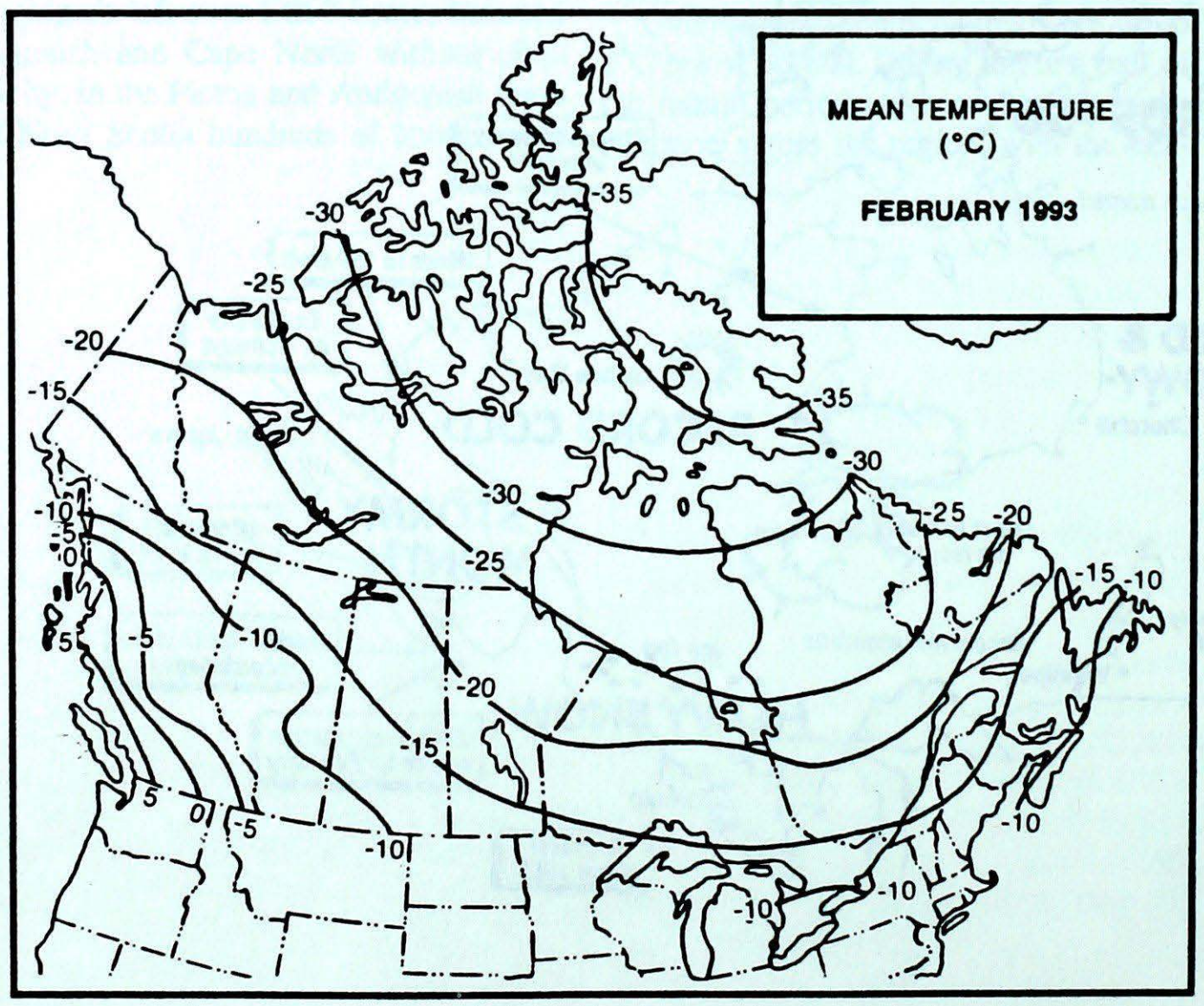
Monthly + Winter 1992/93 Review **February 1993** *Vol. 15*

CLIMATIC HIGHLIGHTS



Canada





Across the country

Yukon

February saw above-average temperatures across much of the Territory. The greatest deviation from normal occurred across the north slope, where temperatures were 5 to 7 degrees above normal. Elsewhere, temperatures averaged closer to normal. The only colder than normal area was a narrow strip along the Yukon, British Columbia border from Blanchard to Swift River, where temperatures were 1 to 3 degrees below normal.

For the most part, precipitation during February was near normal. Exceptions include Haines Junction and Shingle Point, where more than two and one half times the average monthly precipitation fell. Drury Creek, Beaver Creek, Blanchard and Eagle Plains all recorded less than half their monthly normals.

Northwest Territories

In the Mackenzie District, the month began cloudy and snowy. By February 8, Yellowknife exceeded its normal monthly snowfall of 13.1 cm by 3 cm. Temperatures were generally near normal during the first week. The second week was cloudy and mild, with occasional blizzards along the Arctic coast and over the northeastern portions of the district. During the middle of the month, mild air flooded the Mackenzie Valley, and numerous record maximum temperatures were set, both in the Valley and as far north and east as Tuktoyaktuk and Coppermine. The final weekend of the month saw temperatures climb to the double digits in the Liard Valley.

Blizzards dominated. the Keewatin region for the first two weeks of the month. Snow depths are more than twice the normal in many areas. Temperatures generally hovered in the minus thirties and forties, although on the 11th milder air pushed into the region, allowing Rankin Inlet to set a new record maximum. The mild spell was short lived however, putting to an end the dreams of spring. During the latter half of the month, temperatures occasionally dipped down to the minus fifties, with a

number of daily record low temperatures broken.

The Arctic Islands, were for the most part, clear and cold throughout the month. Blizzards raged along the Arctic coast and the central Arctic for the first two weeks of the month, but record-mild air eventually invaded the western Arctic Islands, including Mould Bay, by the third week.

Residents of Resolute Bay and Mould Bay were able to see the first rays of this year's sun on February 4 and 9, respectively. Resolute Bay and Mould Bay recorded 12.3 and 8.9 hours of bright sunshine this month, while Eureka did not receive any sunshine at all.

British Columbia

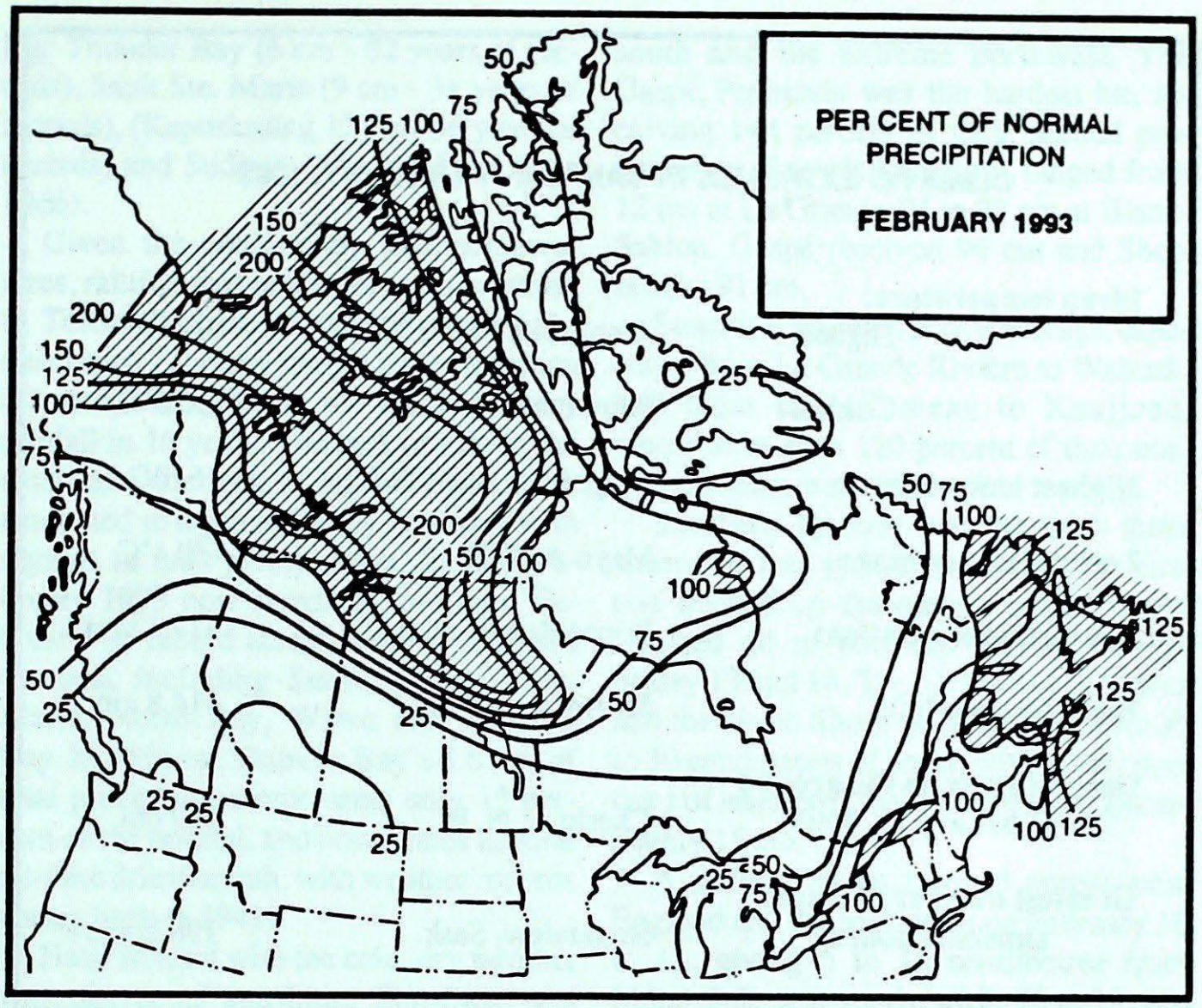
February began with mild Pacific air covering most of British Columbia, but by the middle of the second week, a cold Arctic air mass blanketed the whole province and remained until month's end. A ridge of high pressure, associated with the Arctic air mass, became established over central B.C., deflecting Pacific weather systems northwards. The remainder of the province was very dry and sunny.

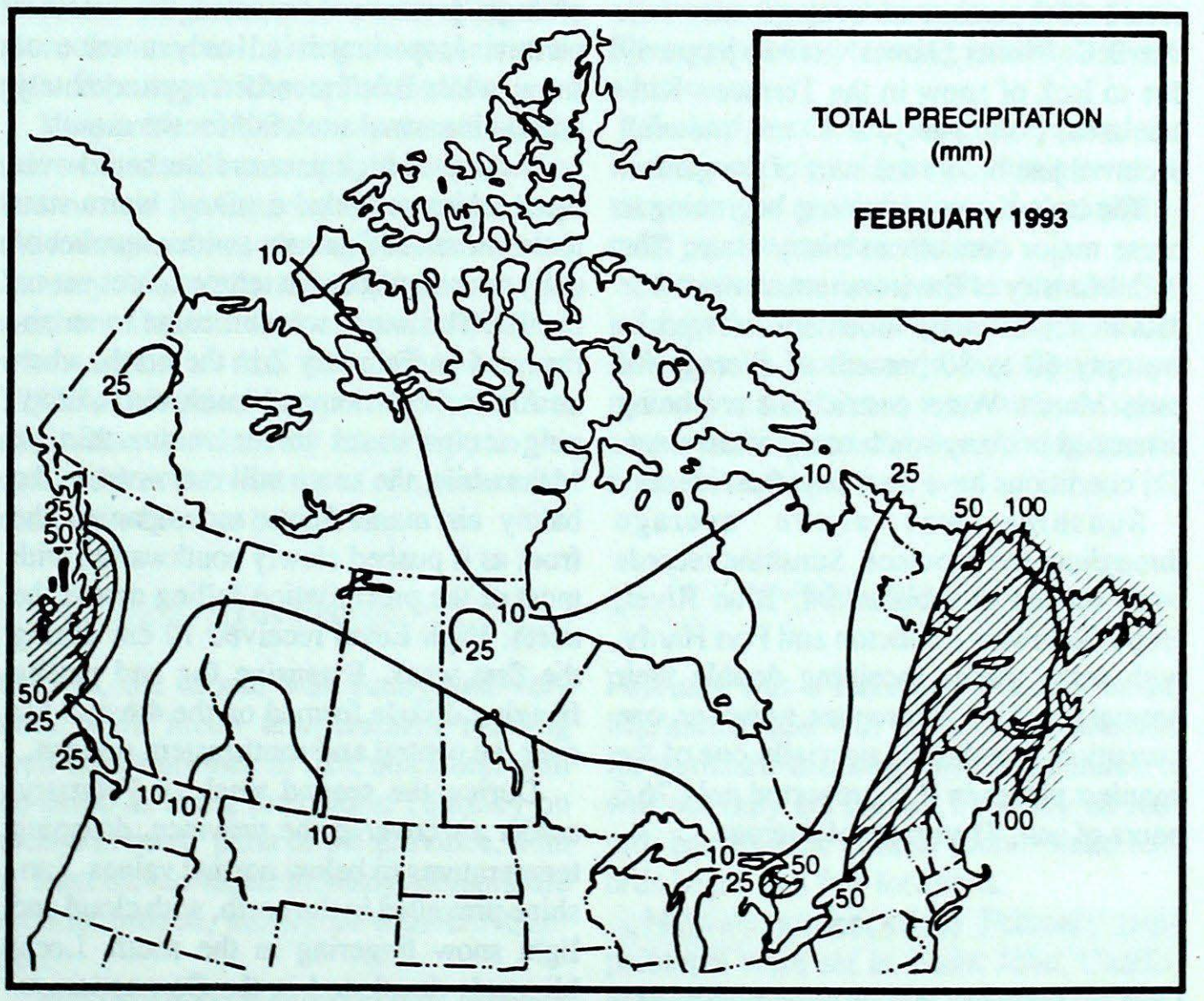
However, several locations in the southern half of the province reported daily-low temperatures during the middle of the month.

Many locations received less than half their normal precipitation, and in fact, many places established new record-low precipitation values, some as low as one quarter of their normal. Only Prince Rupert had above average precipitation. New low precipitation records were established at: Abbotsford, Alert Bay, Amphitrite Point, Blue River, Castlegar, Comox, Hope, Mackenzie, Port Alberni, Port Hardy, Prince George, Revelstoke, Vancouver, Victoria, Whistler and Williams Lake.

Early in the month, precipitation combined with snowmelt raised threats of flooding in the Terrace area, but a return to colder and dryer conditions late in the week improved the situation.

Needless to say snowfall was also well below average in most areas. The exceptions were the extreme southeast and northeast corners of the province and the extreme southern Okanagan, which re-





CLIMATIC EXTREMES IN CANADA - FEBRUARY, 1993

Mean temperature:		
Highest	Amphitrite Point, B.C.	6.6°C
Coldest	Point Inlet, N.W.T.	-36.2°C
Highest temperature:	Amphitrite Point, B.C.	16.8°C
Lowest temperature:	Mayo A, Y.T.	-50.4°C
Heaviest precipitation:	Prince Rupert A, B.C.	317.1 mm
Heaviest snowfall:	St. Anthony, Nfld.	114.8 cm
Deepest snow on the ground on February 28, 1993	Charlo A, N. B.	149 cm
Greatest number of bright sunshine hours:	Broadview, Sask.	198 hours

ported 136 percent of average snowfall. The B.C. Winter Games were in jeopardy due to lack of snow in the Terrace - Kitimat area. Fortunately, a 17 cm snowfall occurred just before the start of the games.

The lack of precipitation is beginning to cause major concern in many areas. The B.C. Ministry of Environment snow course data indicates many mountain snowpacks are only 60 to 80 percent of average for early March. Water restrictions are being discussed in many south coast urban areas. Ski conditions have been less than ideal.

Sunshine was above average throughout the province. Sunshine records were broken at Abbotsford, Blue River, Hope, Kelowna, Penticton and Port Hardy, with some places receiving double their normal sunshine. There was, however, one exception, Cranbrook, normally one of the sunniest places in B.C., reported only 76.6 hours of sun, 71 percent of average.

Alberta

Overall, February will be remembered as a sunny month, with sunshine values well above normal by 25 to 40 percent, as areas of high pressure dominated the weather picture. Jasper received only a trace of snow, while Banff recorded approximately half their normal snowfall for the month.

A ridge of high pressure anchored over the Rockies provided a sunny, warm start to the month of February, with a number of daily record maximum temperatures set on the 1st. The warm weather came to an abrupt end on February 2 in the north, when an Arctic front slumped southwards, dropping temperatures to the minus thirties. Meanwhile, the south still remained in the balmy air mass. Snow accompanied the front as it pushed slowly southwards, with most of the precipitation falling across the north. High Level received 12 cm during the first week. Extensive fog and patchy freezing drizzle formed on the 4th and 5th over the central and southeastern regions.

During the second week of February, colder air covered the province, dropping temperatures to below normal values. Sunshine prevailed in the north, with cloud and light snow lingering in the south. Local blizzards developed in the Coronation region on Valentine's Day, as strong winds combined with falling temperatures and snow. Arctic air covered the province during the third week, keeping temperatures 5 to 10 degrees below normal. A Pacific weather system, moving inland over southern Alberta, produced 5 to 10 centimetres of snow across the southern half of the province and up to 30 cm in the foothills.

On the 21st, record lows were set at Fort Chipewyan (-41.6°C) and High Level (-36.5°C), while Edmonton recorded a record minimum of -31.4°C on the 22nd. Sunshine prevailed during the final week of February, as an Arctic ridge dominated over the province. Overnight temperatures fell to the minus thirties, but daytime readings managed to climb to near freezing, with the help of the strengthening late-winter sunshine.

Chinook conditions developed over the entire province towards the end of the month, causing the snow cover to disappear across southern Alberta. Temperatures climbed to the teens, but no records were set.

Saskatchewan and Manitoba

An Arctic frontal zone stretched from northwestern Saskatchewan to southeastern Manitoba for a good portion of the period. Southwest of the front temperatures were generally above normal and there was very little precipitation. To the northeast it was cold and snowy.

For most of the month, temperatures averaged near or below normal. However, the beginning and latter part of February was mild, with maximum temperatures several degrees above freezing. The warmest reading was 11.6°C at Dauphin, while the coldest was -43.6°C at Thompson.

This was the driest February on record throughout much of this region. Precipitation amounts were minimal in the south, while the northern third of Saskatchewan and the northern half of Manitoba tallied above average precipitation. Almost all of the agricultural areas and the southern fringe of the boreal district received less than 5 mm. In fact, in southern Manitoba, many locations received only a trace of precipitation. In contrast, the area from Island Lake to Thompson to Lynn Lake to Stony Rapids received more than one and a

half times their monthly average, with most of that total falling during a six-day period from the 4th to the 9th. One disturbance, dumped 15 to 25 centimetres of snow across central Manitoba on the 8th.

Sunshine amounts were within a few hours of normal in the north, but as much as 59 hours above normal in the south.

Ontario

Just when Ontario was ready to record yet another gentle winter, along came February. Monthly mean temperatures ranged from 2 to 4 degrees colder than normal everywhere in the province east of Thunder Bay. As a result, most of Ontario experienced their coldest February since 1979. In addition, several days of strong blustery winds made those frigid temperatures seem even colder, thanks to the wind chill effect. In contrast, in northwestern Ontario, February's temperatures were actually a few tenths of a degree milder than usual, although this still made it the coldest February since 1990.

February snowfall totals provided an interesting study in contrasts between southern Ontario and the rest of the province. While folks south of a line from the Bruce Peninsula through Orillia to Ottawa were struggling with hefty snowfalls, locales north of this divide recorded unusually light and even record light February snowfall totals. In the surprisingly snowy south, totals ranged from 35 to 95 centimetres, whereas 25 to 70 centimetres is the more common February amount. Wiarton's 95 cm (normal 71) was the snowiest location in Ontario. The high snowfall totals generally meant that this February was the snowiest since 1988; however in the Kingston area, a 72 cm total made it their greatest February snowfall since 1972. In the more northerly areas however, February snowfall was most notable by its absence. Whereas, central and northeastern regions usually measure 40 to 60 centimetres, only 10 to 20 centimetres fell. Even less fell in the Northwest, with February 1993 totals of only 5 to 10 centimetres, compared to a normal of 20 to 30 centimetres. As a result, new record low snowfall totals for February were set at numerous sites including: Thunder Bay (6 cm - 52 years of records), Sault Ste. Marie (9 cm - 31 years of records), (Kapuskasing 12 cm - 56 years of records) and Sudbury (16 cm - least since 1966).

Given the consistently cold temperatures, rainfall was practically non-existent. In Toronto, where 25 mm of rain are the norm each February, only a trace (less than 0.2 mm) fell. This is the least February rainfall in 16 years. The lack of rain in the south and the lack of snow in the north amounted to a generally dry February with regards to total precipitation. In fact, February 1993 now stands as the driest February on record across most of northern Ontario, including Sudbury, Sault Ste. Marie, North Bay, Wawa and Thunder Bay. In addition, Thunder Bay's 3.6 mm of total precipitation represents only 15 percent of the normal, and now stands as their all-time driest month, with weather records dating back to 1941!

Hand in hand with the cold, dry weather was plenty of sunshine. Sunshine was above normal in all areas except the extreme southwest. Sault Ste. Marie's 150 hours of bright sunshine was 40 hours more than normal, giving them their sunniest February in 32 years of records.

Despite the cold February temperatures, this winter still remains slightly milder than normal for Ontario, thanks to the very mild temperatures during December and January. As well, although portions of southern Ontario have endured their snowiest season to date since the winter of 1983/84, historical perspective shows that this winter is relatively harsh only in the context that the winters of the recent decade have been so benevolent.

Quebec

Overall, the month was sunny and very cold, with mean temperatures running well-below normal. In fact, this month will be noted as being the coldest February on record in many parts of the province, with at least eleven mean monthly temperature records broken, mostly in southern Quebec.

Precipitation, mostly in the form of snow, was near or above average in the south and the extreme northwest. The Gaspé Peninsula was the hardest hit, receiving 144 percent of their normal precipitation. Snowfall amounts ranged from 12 cm at La Grande IV to 97 cm at Blanc-Sablon. Gaspé received 96 cm and Sherbrooke 91 cm.

Sunshine was well above average, especially from La Grande Rivière to Wabush, and from Baie-Comeau to Kuujjuaq, where more than 120 percent of their normal sunshine was observed.

Southern Quebec was hit with three storms in less than two weeks. The first one tracked up the eastern seaboard and affected all of southern Quebec on February 13 and 14. The St. Lawrence Valley and the North Shore were buried under 20 to 30 centimetres of snow, while other portions of southern Quebec received approximately 15 cm.

A second storm tracked across new England and the Maritimes on February 16 to 18, giving 5 to 15 centimetres from Mount Joli, westwards, while 20 to 35 centimetres fell further to the east. The storm also generated winds of 95 to 105 km/h across the Gaspé Peninsula and the North Shore, producing blowing snow and severe whiteouts.

A third, less severe weather system later in the month left 10 to 20 centimetres of snow on the ground across the southernmost portions of the province.

A rather unusual weather phenomena, ice fog, during the early morning hours of February 12, made roads very slippery and reduced visibilities to near zero in some areas, causing treacherous driving conditions on the highways.

Maritimes

February was a record-cold month in the Maritimes, and will be long remembered for its record-breaking low temperatures. It was not only the coldest February on record, but also the coldest month since records began at a few locations.

New record-low mean February temperatures were set at: Saint John, Charlo, Fredericton, Moncton, Charlottetown, Greenwood and Halifax.

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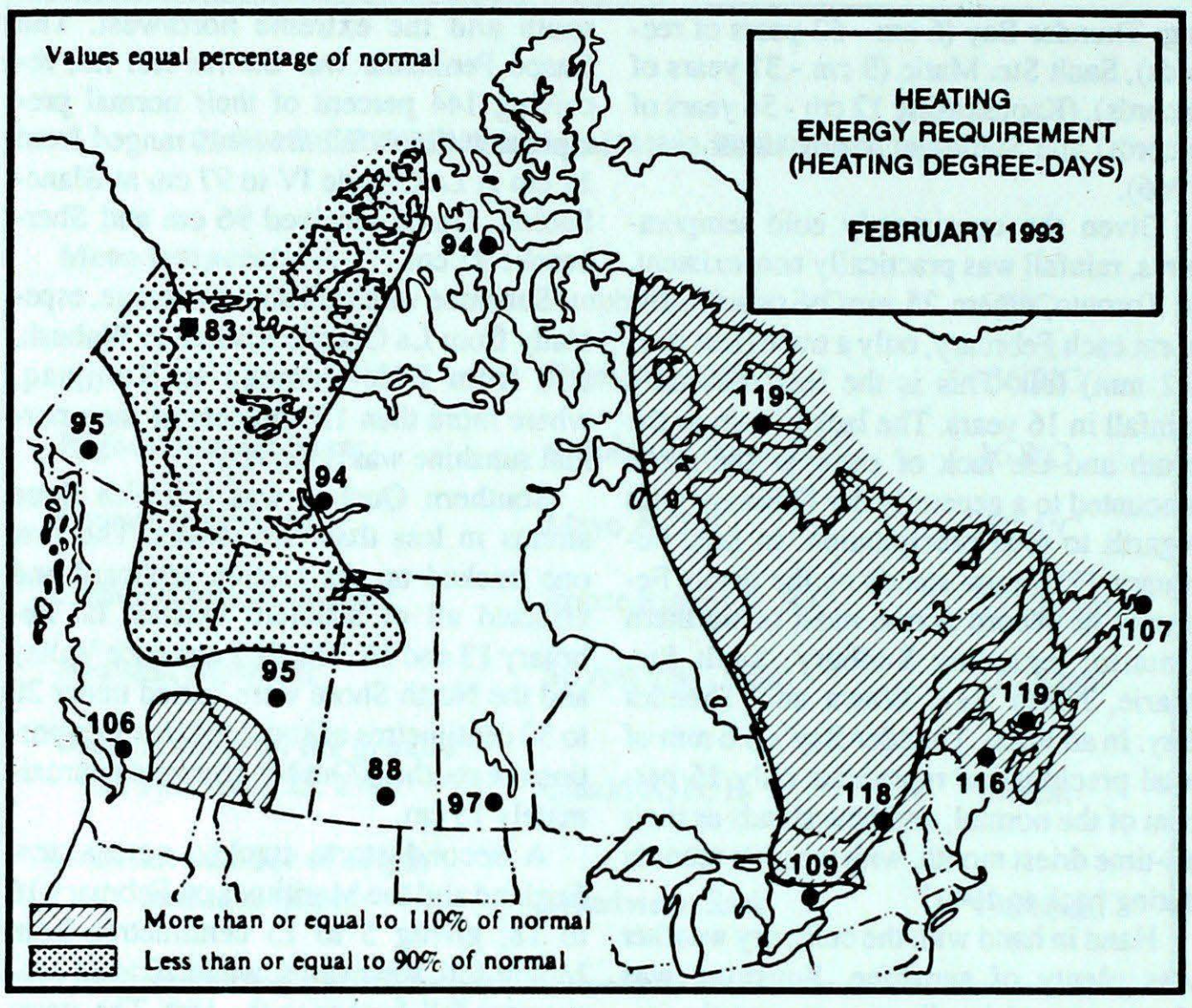
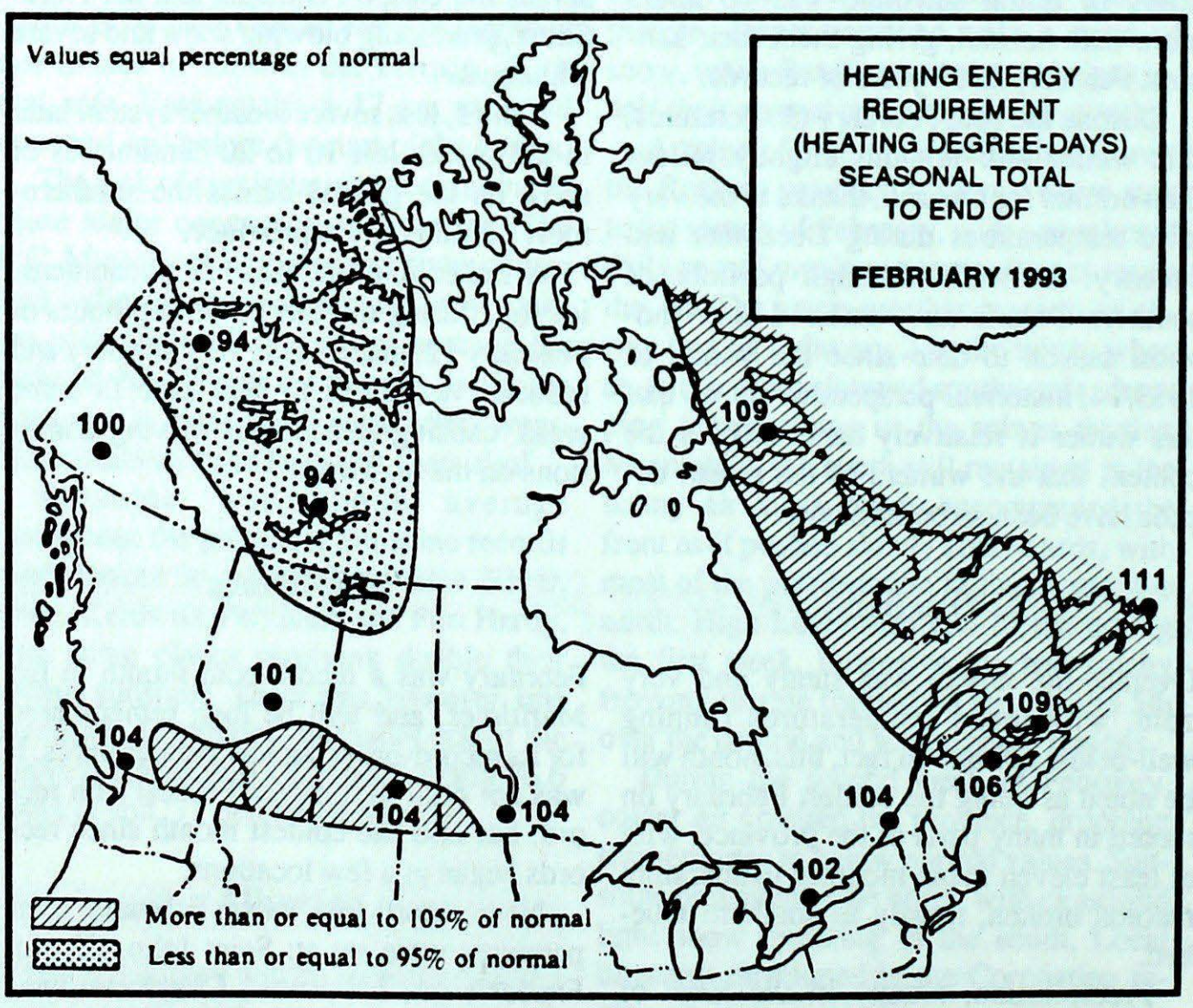


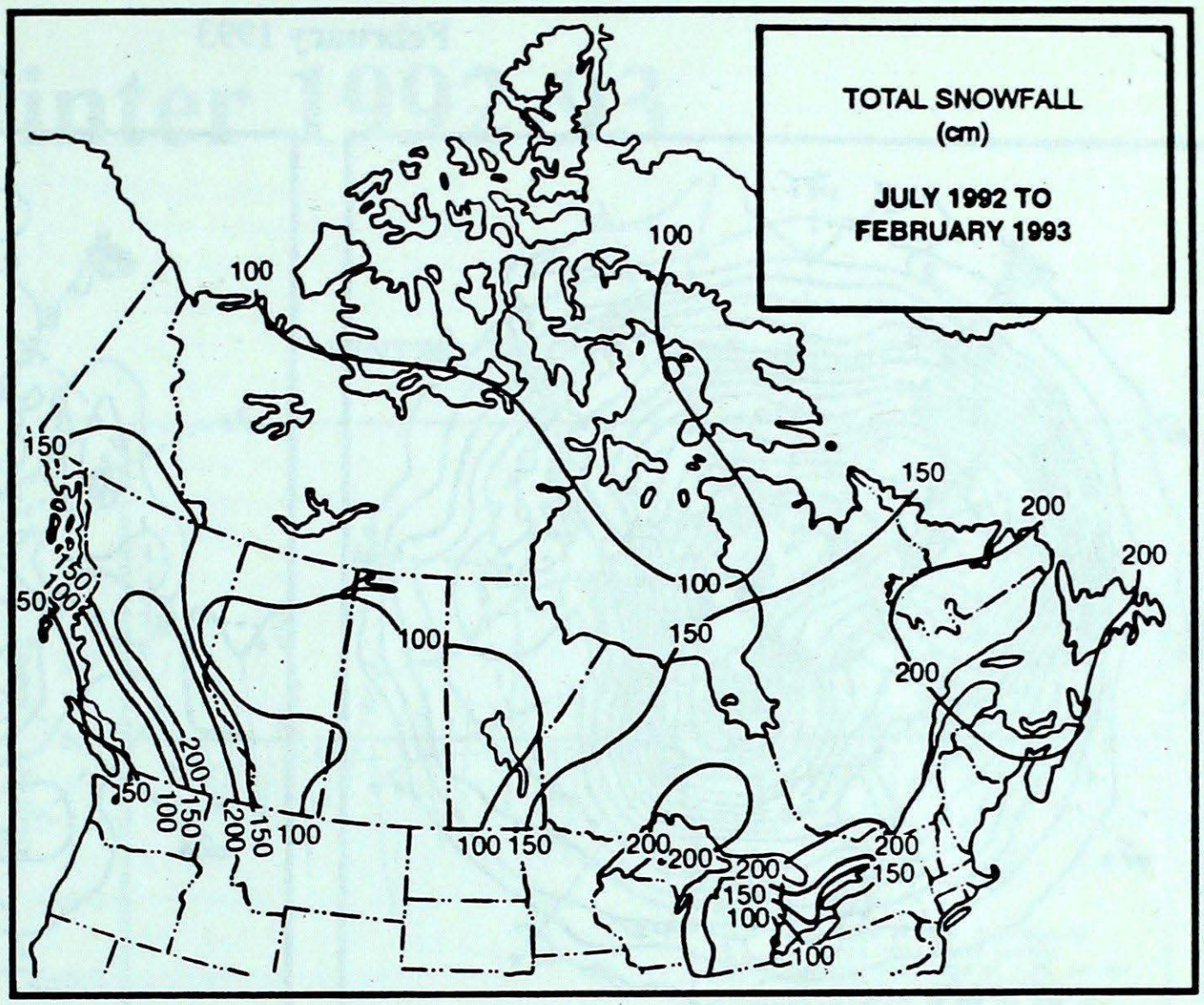


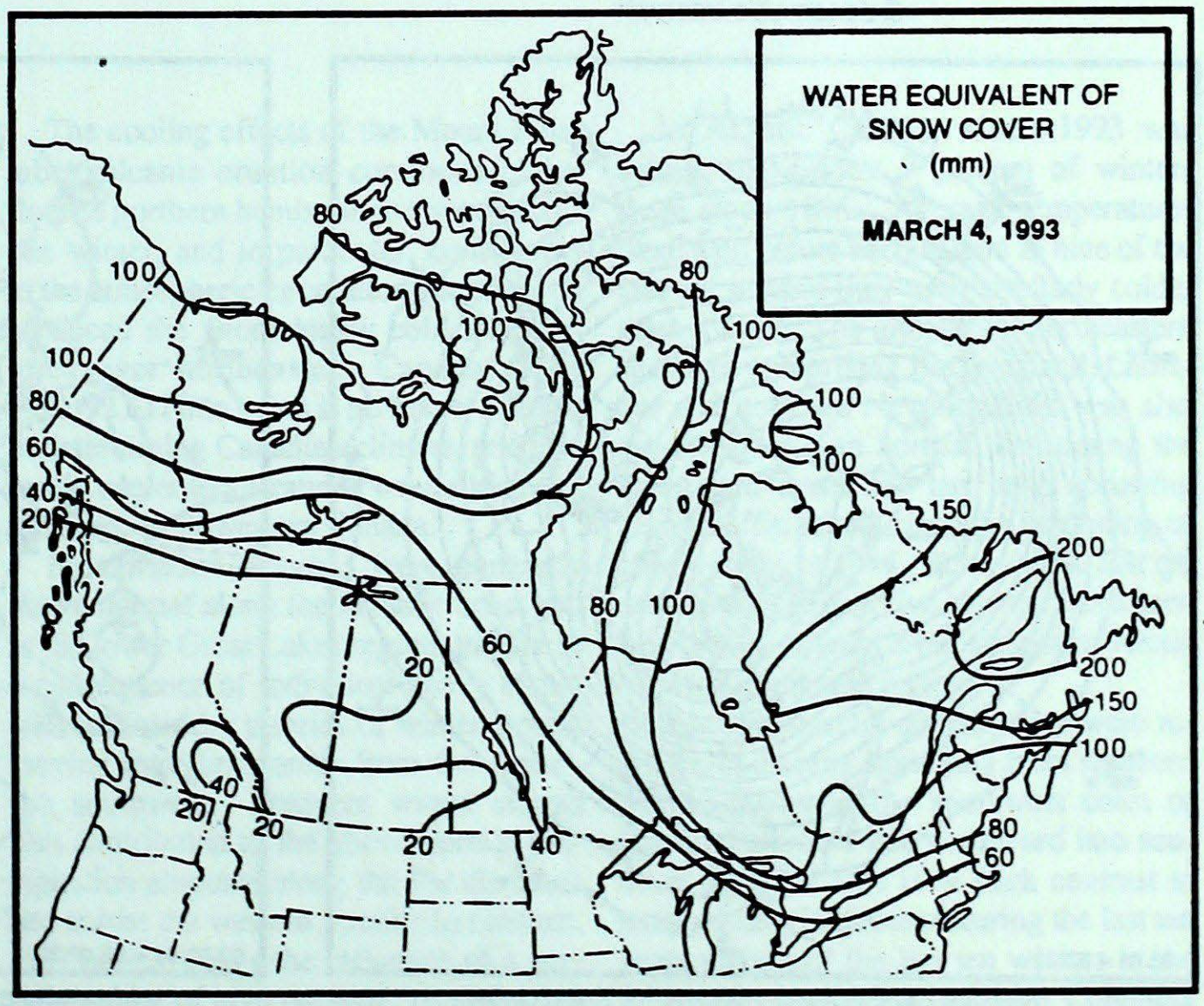
SEASONAL TOTAL OF HEATING DEGREE-DAYS TO END OF FEBRUARY

	1993	1992	NORMAL
BRITISH COLUMBIA			
Kamloops	3173	2359	2820
Penticton	2769	2234	2545
Prince George	4005	3201	3910
Vancouver	2151	1846	2974
Victoria	2178	1919	2117
YUKON TERRITORY			
Whitehorse	5077	4648	5099
NORTHWEST TERRITORIES			
Iqaluit	7217	6681	6591
Inuvik	6563	7168	6975
Yellowknife	5696	6187	6040
ALBERTA			
Calgary	3979	3214	3797
Edmonton Mun.	4027	3654	3990
Grande Prairie	4667	4138	4487
SASKATCHEWAN			
Estevan	4350	3761	3987
Regina	4410	3963	4254
Saskatoon	4653	4176	4417
MANITOBA			
Brandon	4714	4439	4447
Churchill	6211	6352	6170
The Pas	4820	4814	4904
Winnipeg	4468	4135	4306
ONTARIO			
Kapuskasing	4675	4622	4558
London	2964	2831	2898
Ottawa	3494	3448	3387
Sudbury	3988	3875	3845
Thunder Bay	4167	4103	4078
Toronto	2961	2791	2899
Windsor	2568	2484	2593
QUEBEC			
Baie Comeau	4446	4332	4175
Montréal	3417	3377	3270
Québec	3826	3856	3663
Sept-Îles	4671	4582	4273
Sherbrooke	3779	3724	3726
Val d'Or	4656	4494	4361
NEW BRUNSWICK			
Fredericton	3519	3455	3317
Moncton	3516	3400	3236
NOVA SCOTIA			
Sydney	3184	3400	2880
Yarmouth	2956	2726	2686
PRINCE EDWARD ISLAND			
Charlottetown	3366	3200	3093
NEWFOUNDLAND			
Gander	3783	3670	3296
St. John's	3381	3326	3053

SEASONAL SNOWFALL TOTALS (cm)
TO END OF FEBRUARY

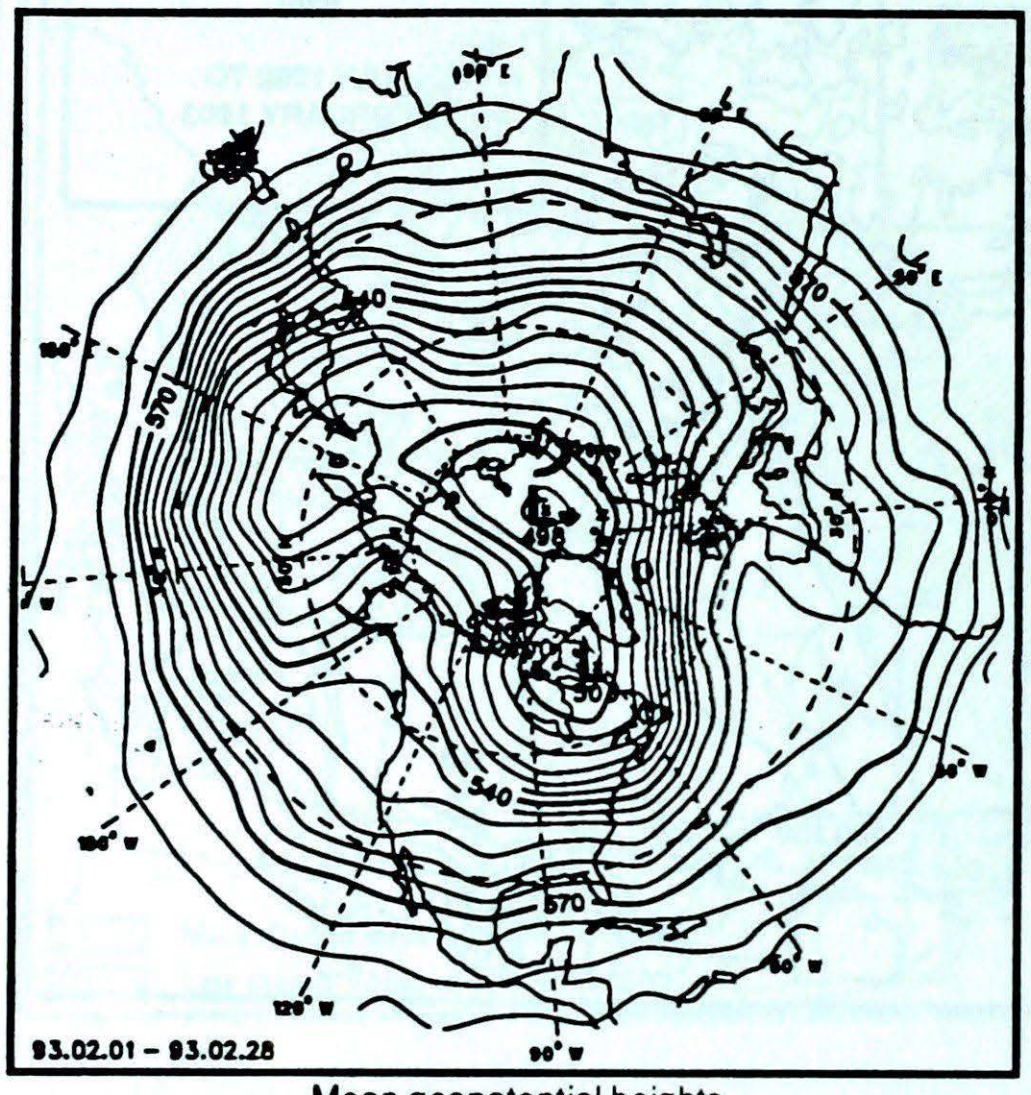
	1993	1992	NORMAL
BRITISH COLUMBIA			
Kamloops	90	32	87
Port Hardy	37	1	60
Prince George	223	203	200
Vancouver	68	2	54
Victoria	46	5	44
YUKON TERRITORY			
Whitehorse	179	194	106
NORTHWEST TERRITORIES			
Iqaluit	133	132	168
Inuvik	178	122	130
Yellowknife	105	144	107
ALBERTA			
Calgary	109	52	96
Edmonton Mun.	81	123	100
Grande Prairie	88	146	141
SASKATCHEWAN			
Estevan	78	61	81
Regina	70	75	83
Saskatoon	62	95	83
MANITOBA			
Brandon	72	131	84
Churchill	112	181	132
The Pas	83	162	117
Winnipeg	101	82	90
ONTARIO			
Kapuskasing	235	230	237
London	174	182	172
Ottawa	210	185	182
Sudbury	168	196	194
Thunder Bay	150	208	158
Toronto	108	84	101
Windsor	88	88	93
QUEBEC			
Baie Comeau	223	265	277
Montréal	132	235	188
Québec	158	209	272
Sept-Îles	249	263	318
Sherbrooke	202	235	236
Val d'or	167	207	237
NEW BRUNSWICK			
Fredericton	134	184	219
Moncton	215	407	243
NOVA SCOTIA			
Sydney	244	185	223
Yarmouth	165	297	168
PRINCE EDWARD ISLAND			
Charlottetown	250	305	240
NEWFOUNDLAND			
Gander	256	282	270
St. John's	193	272	247



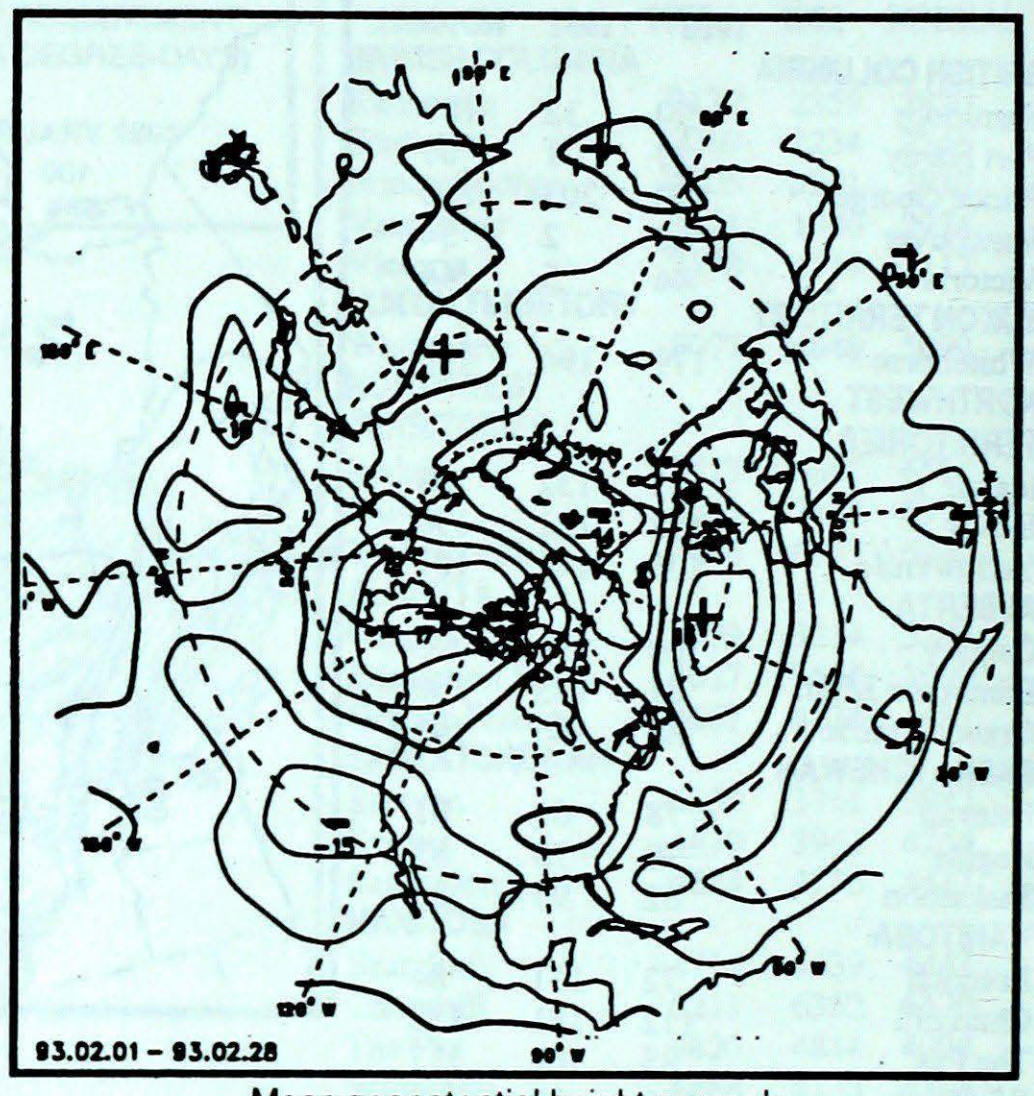


50-kPa ATMOSPHERIC CIRCULATION

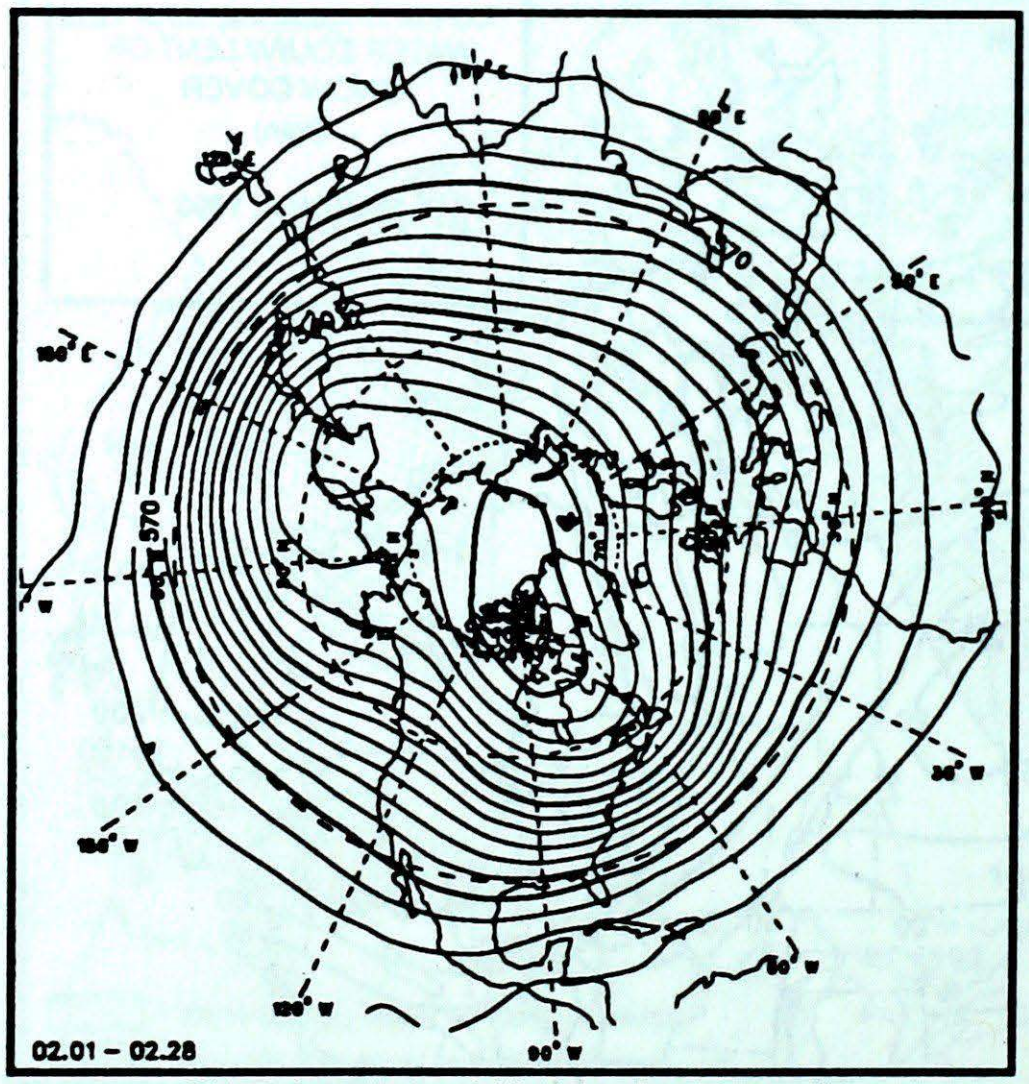
February 1993



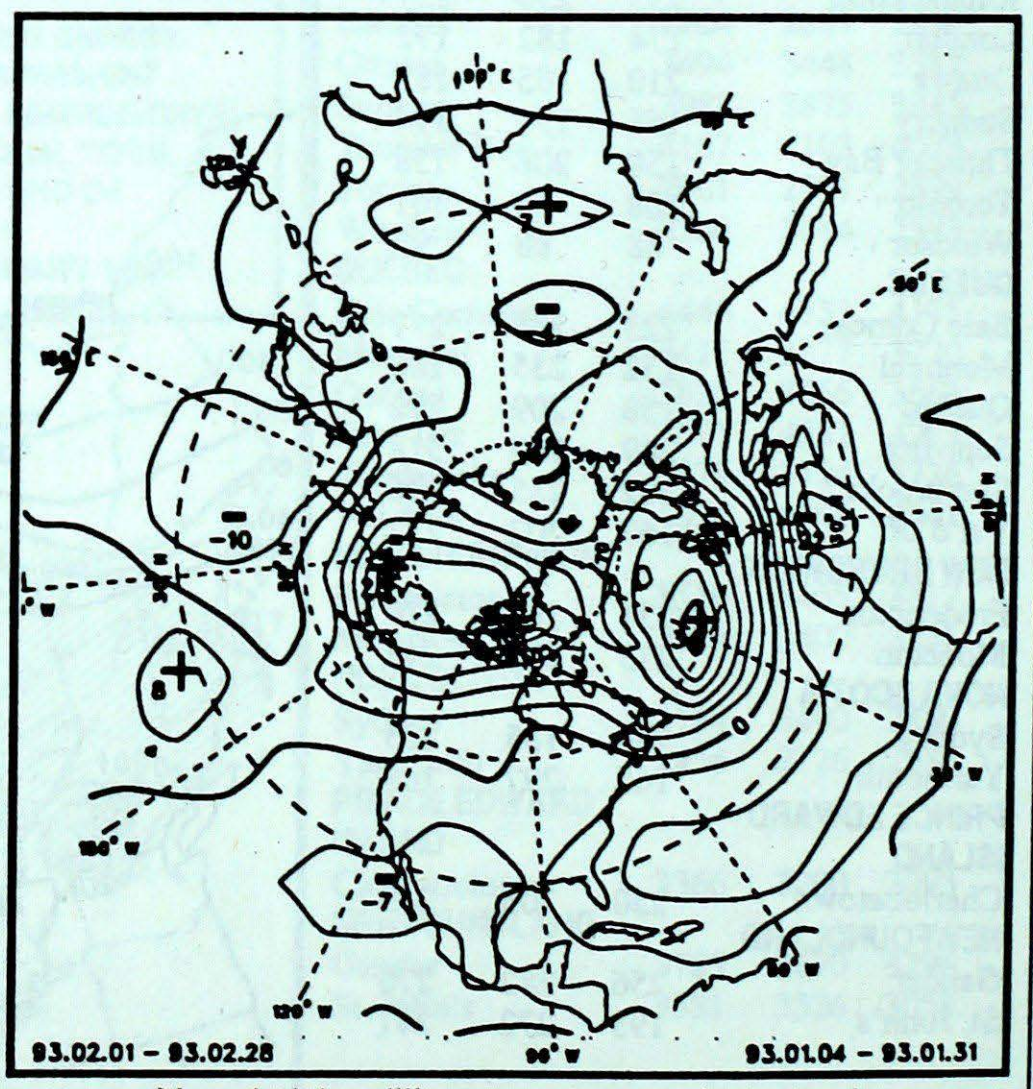
Mean geopotential heights
- 5 decametre interval -



Mean geopotential height anomaly
- 5 decametre interval -



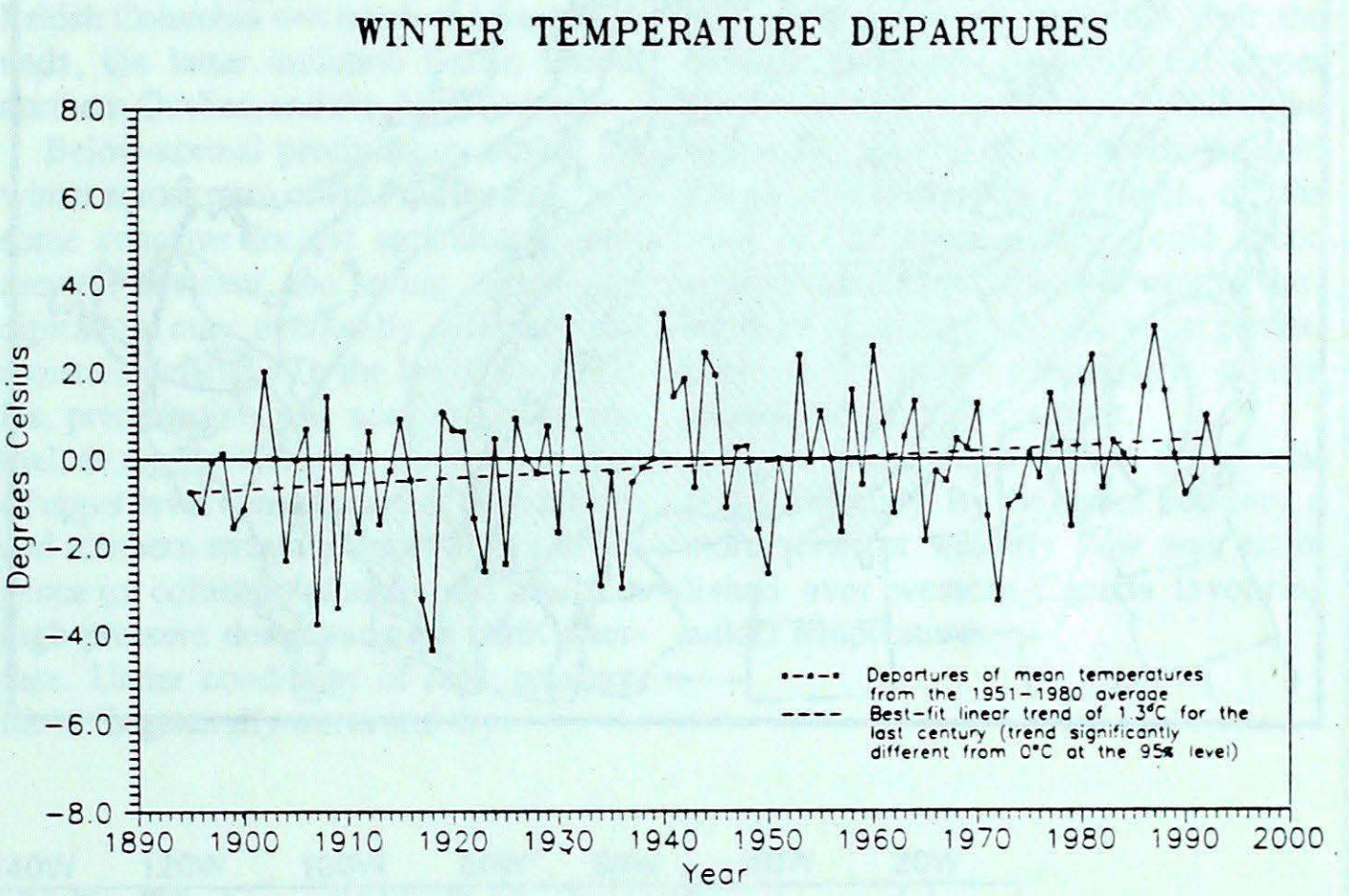
Normal geopotential heights for the month
- 5 decametre interval -



Mean heights difference w/r to previous month
- 5 decametre interval -

Winter 1992-93

Although much of central Canada experienced above normal temperatures during winter 1993, the national average temperature for the December, January and February period was slightly below the long-term mean. Winter 1993 ranked as only the 54th warmest winter in the nearly 100 year period of observations. Nationally, Canada has experienced a warming trend in winter of 1.3 ℃ since 1895. Six of the last ten winters have been warmer than normal but three of the last four have been colder.



Trends

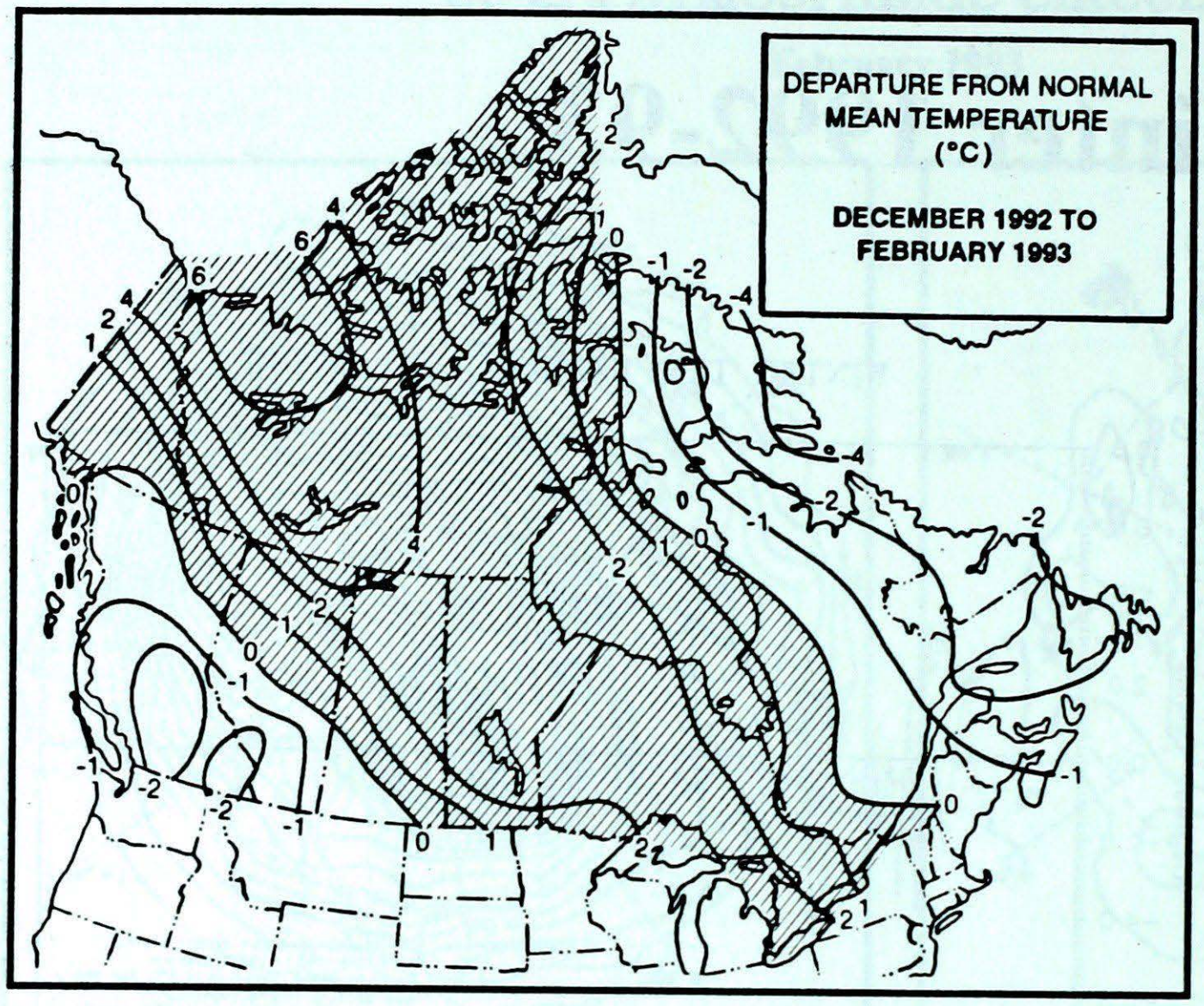
The national temperature departure map for winter 1993 shows a pattern that is markedly different from that of one year ago. The northeastern seaboard, Atlantic Canada and all of Québec were again much colder than normal, however, the area of above normal temperatures that had existed throughout most of western Canada last winter, has shrunk somewhat, and this winter has been limited to an area stretching from the Beaufort Sea and high Arctic Islands southeastward to northern Ontario. Temperatures varied from 1 to 2 degrees above normal in northern Ontario to as much as 5 to 6 Celsius degrees above along the northwestern Arctic coast. In sharp contrast to winter 1992, temperatures in southern Yukon, most of British Columbia and across the southern prairies have been colder than normal, especially in parts of southern British Columbia and Alberta, where values were as much as 2 to 5 degrees colder than the long-term mean.

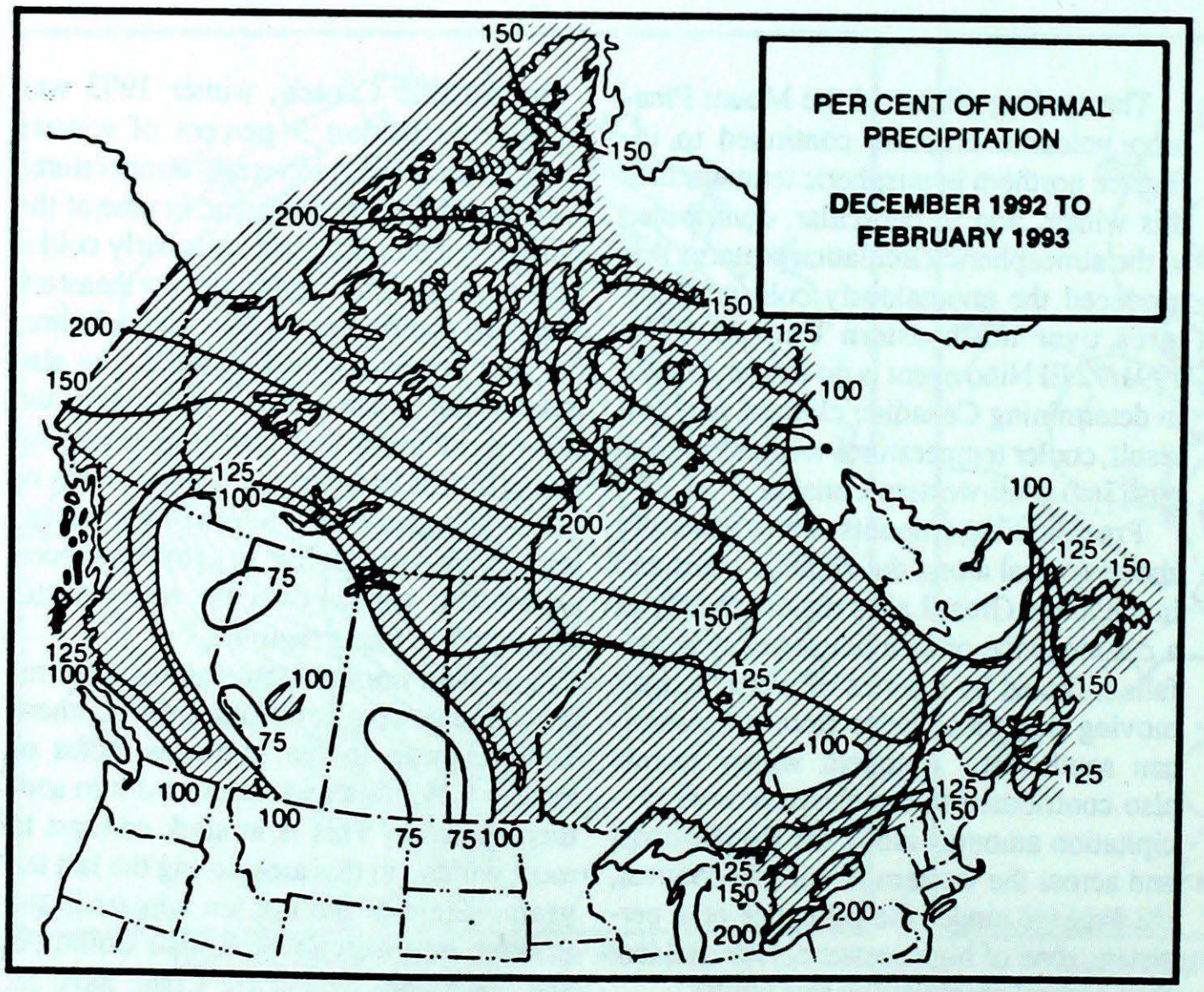
The cooling effects of the Mount Pinatubo volcanic eruption continued to influence northern hemispheric temperatures this winter, and in particular, contributed to the atmospheric circulation patterns that produced the anomalously cold temperatures over northeastern Canada. The 1991/92 El Niño event is no longer a factor in determining Canadian climate, and as a result, cooler temperatures were allowed to push into southwestern Canada.

Precipitation amounts were generally above normal along the Atlantic coast and in the lower Great Lakes region, mostly as a consequence of individual heavy snowfalls inflicted by a series of winter storms moving into those areas from the American southwest. Frequent winter storms also contributed to the above normal precipitation amounts along the Pacific coast and across the western Arctic. In contrast, the Prairies, under the influence of a persistent zone of high pressure, received less than normal precipitation this winter.

In Atlantic Canada, winter 1993 was among the coldest 9 percent of winters there since 1895. Average temperatures were well below normal, and in nine of the last ten winters they were similarly colder than normal. The area of the northeastern seaboard comprising Baffin Island, Labrador and northern Newfoundland was also much colder than normal, continuing the downward trend that has been occurring along Baffin Island since the beginning of observations in 1946. Seven of the last ten winters and the last five in a row have been well below normal over the entire Arctic Mountains climate region.

Colder than normal temperatures were recorded in an area stretching from southern Saskatchewan to the southwest coast of British Columbia and northward into southern Yukon. This is in stark contrast to most winters in this area during the last ten years. Eight of the last ten winters in the Prairies, seven in south British Columbia and six along the Pacific Coast have all





been warmer than the long-term means. In southern British Columbia, winter 1993 was among the coldest 12 percent of winters there since 1895, while just one short year ago, the average winter temperature, was among the warmest on record.

Central Canada including most of Yukon, the Mackenzie River basin, and the northern Prairie Provinces, northward to the high Arctic Islands, experienced winter temperatures that were considerably above normal. The largest warming above seasonal norms was again concentrated over the Mackenzie Region where eight of the last ten winters have been above normal, and where winter 1993 was among the warmest 8 percent of winters there since 1895.

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Atmospheric Circulation

The domination of a west-southwesterly flow across the southern half of the U.S. - a pattern associated with El-Nino type events, and the cold upper atmospheric trough extending from southern British Columbia to lower California, allowed storms originating off the coast of California to move rapidly northeastward into southern Ontario and Quebec. Storms, which originated off the coast of California this winter, were more intense than what is normally observed. This was due to the unusually warm sea surface temperatures extending from lower California to the equatorial Pacific dateline. The chart on page 11 shows the anomalies or differences from normal or mean ocean surface temperatures for January. The water temperature gradient along the northern edge of this zone had intensified as most of the North Pacific was colder than normal. There, minor sub-tropical disturbances grew rapidly and moved northeastward towards California, due to the enhanced air-sea thermal gradient on the northern edge of this warm water. Further east, above normal water temperatures along the Gulf Stream contributed to more intense storms and well above-normal precipitation across the Atlantic region.

The storms, moving through southern Ontario and Quebec, resulted in above-

normal precipitation, and large fluctuations in temperatures. In the process of storm development, warm air was forced up from the south, giving above-normal temperatures for the winter period.

Once these storms whisked through these regions, they intensified over the Maritimes. It is not unusual for intensification to occur over the Atlantic provinces, as colder air passes over the warmer Atlantic waters, resulting in unstable atmospheric conditions. Cold weather across eastern Canada was due to a more westerly extension of the Icelandic low pressure area this winter, as compared to its normal position. This, in turn, was probably the result of the eruption of Mount Pinatubo during July, 1991. A study of 8 major volcanic eruptions during the last 100 years showed that in all eight cases, northeastern Canada experienced below-normal temperatures during the second winter following the eruptions. This year was no exception.

Globally, the cooling after Pinatubo is now self-evident, and has provided some verification of Global Circulation models otherwise used to project global warming due to increasing amounts of greenhouse gases. Residual stratospheric aerosols from the eruption are nearly gone now, and any lingering effects from the eruption to follow would now depend on the land-ocean-atmosphere systems "memory" of the Pinatubo event.

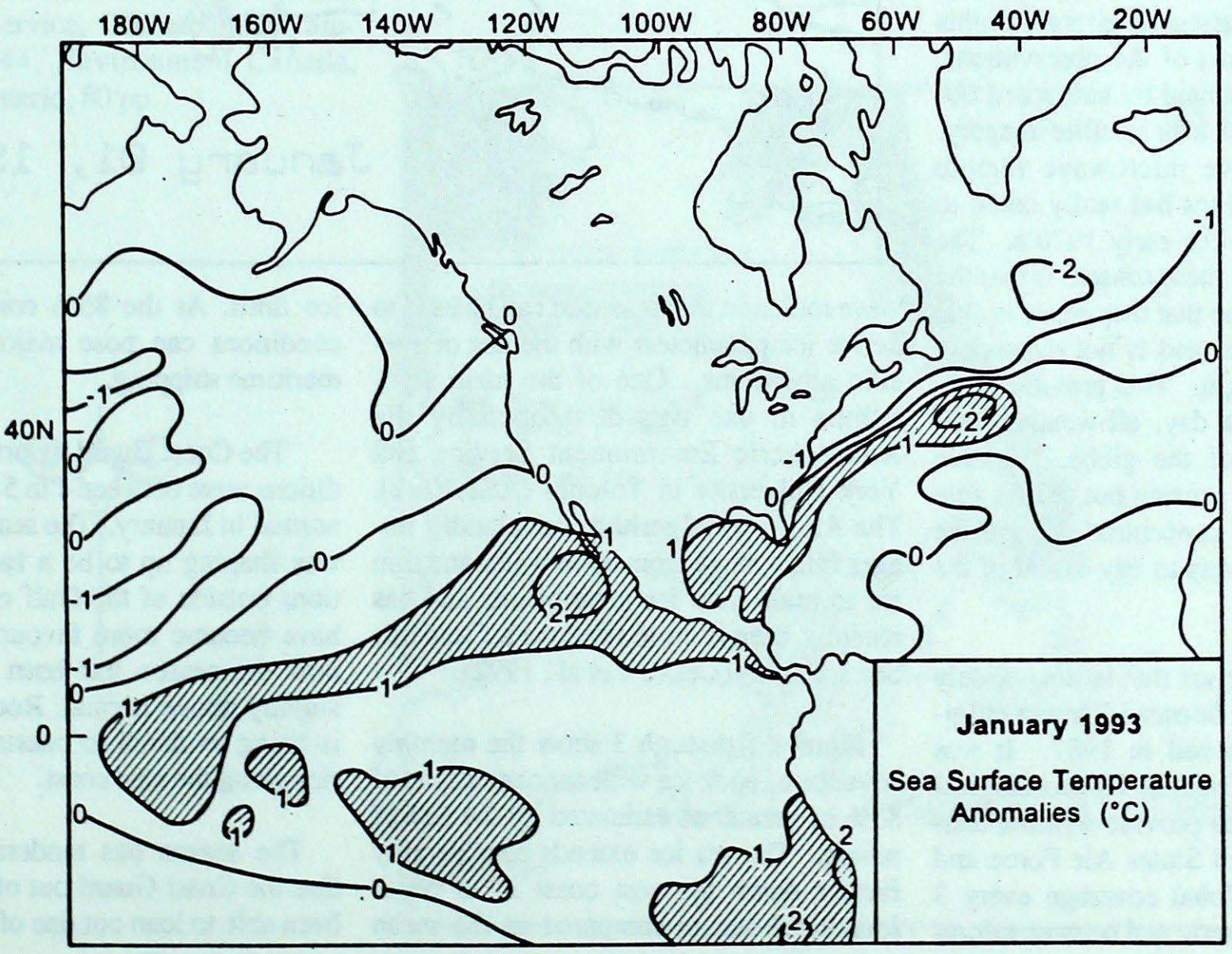
Most of the country experienced above-normal temperatures and precipitation this winter. Unusually cold weather dominated British Columbia and much of eastern Canada, the latter included Baffin Island, northern Quebec, and the Atlantic region.

Below-normal precipitation during the winter across most of the Prairies may raise some concerns for the agricultural community, however, the spring season precipitation may eventually alleviate soil moisture deficits. To the lee of the Rockies, precipitation was near to below normal, as the Prairies were caught in a zone of upper level convergence of the northern and southern streams. Upper level convergence (or collision) of air masses results in high pressure dominating the earth's surface. Under conditions of high pressure, the air is generally warm and dry.

During the winter, numerous storms from the Gulf of Alaska swept across the Mackenzie and Keewatin Districts of the Northwest Territories, resulting in much above normal precipitation. Milder temperatures this winter were due to the warmer maritime air masses which originated in the Gulf.

By mid-December, a cold trough of low pressure established itself across southern B.C. yielding heavy snowfalls over the Greater Vancouver area and the Upper Fraser Valley during the second half of the month. By the end of the month, the cold trough sank further to the south, off the coast of California, allowing cold Arctic air to penetrate B.C. The cold weather during most of January was due to the persistence of the upper atmospheric pattern established during December.

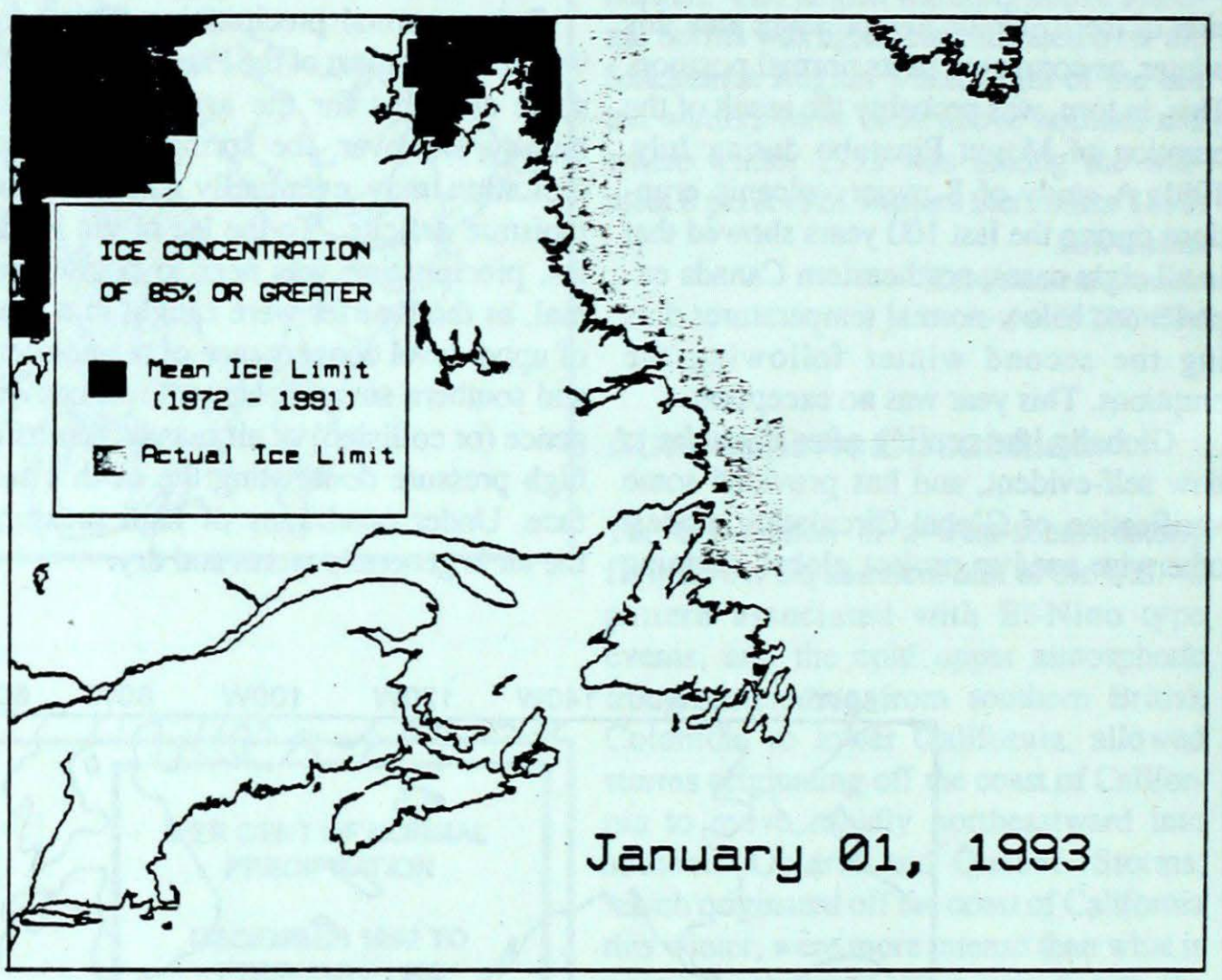
There was a major shift in the circulation in February. By the end of February, a more zonal or westerly flow was established over western Canada favouring milder temperatures.



East coast sea ice extent

□ *By Arvids Silis CCAD*

Persistently colder than normal temperatures this winter are once again disrupting marine traffic in Atlantic Canada. Since the beginning of November air temperatures have been consistently 2 to 5 degrees colder than normal not only off the east coast of Newfoundland but also in the Gulf of St. Lawrence. The departure from normal mean temperature map for February which is included in this months monthly summary shows that the colder than normal air temperatures have continued to persist.



Ice conditions off the eastern Canadian seaboard are monitored in several different ways. Ice reconnaissance aircraft flights make up a large part of the observations. These are supplemented by shipboard observations as well as with satellite imagery. The use of passive microwave remote sensing from satellites has really come to the forefront since the early 1970's. The main advantage of these sensors is that the microwave radiation that they sense is able to penetrate clouds, and is not dependent upon visible sunlight. This provides continuous, 24-hour a day, all-weather, all-season coverage of the globe. Passive microwave remote sensing not only is able to provide sea ice concentrations and ice types, but also the day to day extent of the ice edge.

The satellite sensor that is now widely used is the Special Sensor Microwave/Imager (SSM/I) launched in 1987. It was launched by the Defense Meteorological Satellite Program to provide weather analysis for the United States Air Force and offers complete global coverage every 3 days. The atmospheric and oceanic microwave radiation that is sensed can be used to derive ice parameters with the use of specific algorithms. One of the main algorithms in use was developed by the Atmospheric Environment Service and York University in Toronto (AES/York). The AES/York algorithm can classify images into a range from open water and thin ice to multi-year ice components and has recently been used to produce a Canadian Sea Ice Atlas (LeDrew et al., 1992).

Figures 1 through 3 show the monthly advance of pack ice with concentrations of 85% or greater as estimated by the SSM/I sensor. The sea ice extends considerably further down the east coast in to Newfoundland waters compared to the mean ice limit. At the 85% concentration, ice conditions can pose major problems for maritime shipping.

The Coast Guard reported that ice conditions were between 4 to 5 weeks ahead of normal in January. The season at that time was shaping up to be a bad one. Conditions outside of the Gulf of St. Lawrence have become more favourable lately and now the season has been ranked as just slightly above normal. Routine assistance is being rendered to coastal shipping ferries along the east coast.

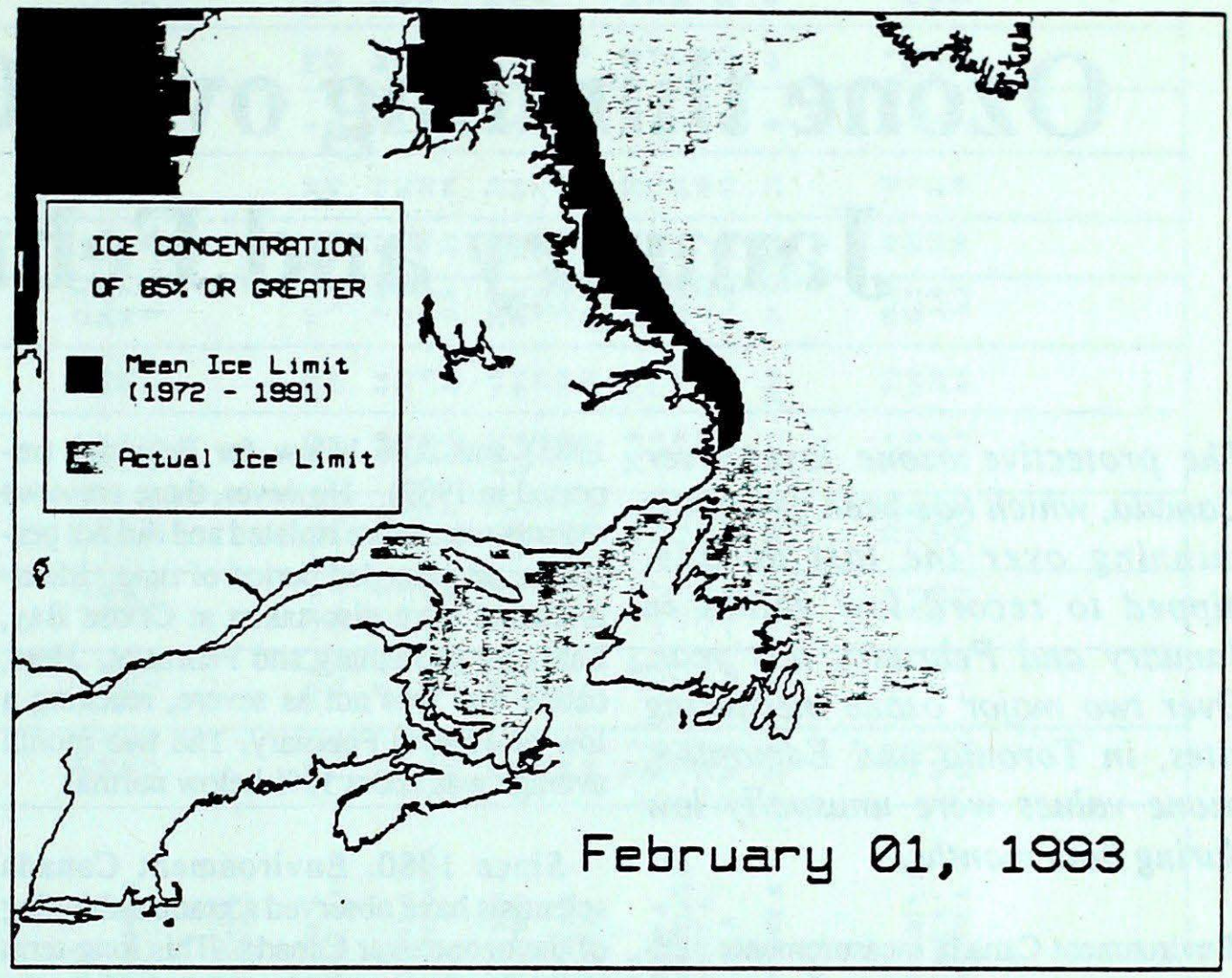
The season has moderated to a point that the Coast Guard out of St. John's has been able to loan out one of their heavy ice

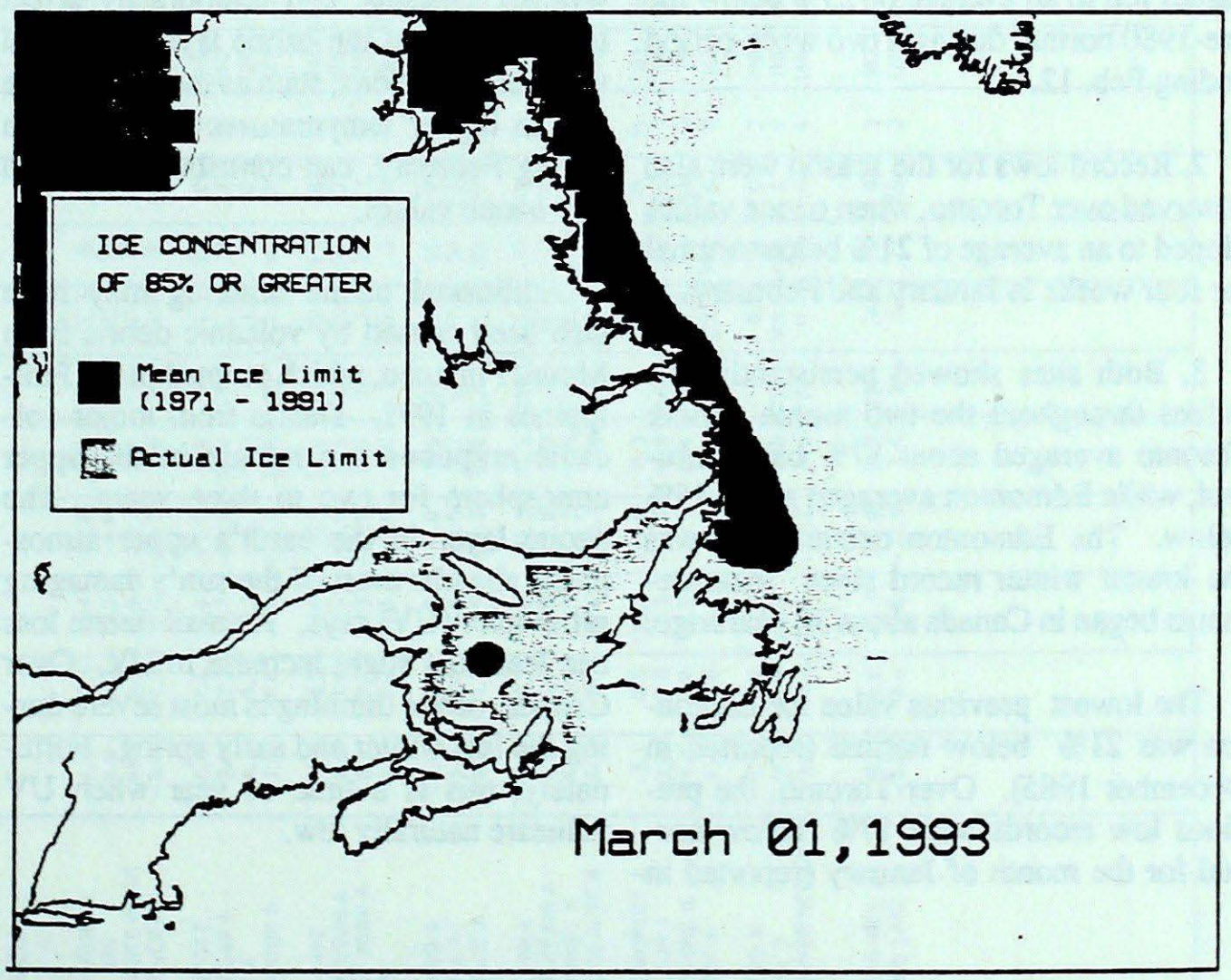
breakers to the Gulf of St. Lawrence region, where they are more urgently needed.

Since the beginning of the year, the abnormally cold weather has promoted rapid ice growth in the Gulf, and has consequently produced some of the most difficult ice conditions in recent memory. Not only have they had to borrow the C.J.D.T. Franklin from the east coast but also a medium ice breaker from the Quebec region. Conditions are at a point that only the heaviest of icebreakers are making headway in the Gulf. There are approximately 7 or 8 ships stuck in the ice every day and most must wait several days to be cleared. The only bright spot for the Gulf region is that the spring outlook forecasts near normal temperatures and therefore the ice conditions may not worsen anymore.

REFERENCES

LeDrew, E.F., D.G. Barber, T.A. Agnew, and D. Dunlop, 1992. Canadian Sea Ice Atlas From Microwave Remotely Sensed Imagery: July 1987 to June 1990. Atmospheric Environment Service, Climatological Studies Number 44, Environment Canada, Downsview, Ontario, 80 pp.





Ozone thinning over Canada in January and February

The protective ozone layer over Canada, which has been gradually thinning over the last decade, dipped to record low values in January and February this year. Over two major ozone measuring sites, in Toronto and Edmonton, ozone values were unusually low during both months.

Environment Canada measurements indicate:

1. The lowest ozone value recorded in Canada for the winter season occurred over Edmonton in February, when ozone values fell to an average of 25% below the pre-1980 normal during a two week period ending Feb. 12.

2. Record lows for the season were also observed over Toronto, when ozone values dipped to an average of 21% below normal for four weeks in January and February.

3. Both sites showed persistently low values throughout the two month period: Toronto averaged about 17% below normal, while Edmonton averaged about 15% below. The Edmonton ozone value was the lowest winter record since measurements began in Canada about 30 years ago.

The lowest previous value for Edmonton was 21% below normal (reported in December 1985). Over Toronto, the previous low records were 17% below normal for the month of January (reported in 1985) and 20% below for February (reported in 1989). However, these previous records were more isolated and did not persist for an extended period of time. Measurements were also taken at Goose Bay, Labrador in January and February. Here, ozone loss was not as severe, reaching a low of 16% in February. The two month average was about 10% below normal.

Since 1980, Environment Canada scientists have observed a gradual thinning of the ozone over Canada. This long-term loss of ozone can be attributed to the build-up of industrial chemicals in the atmosphere, most notably CFCs (chlorofluorocarbons). However, natural phenomena such as volcanic eruptions and especially weather patterns, can temporarily affect the thickness of the ozone layer. Unusual weather conditions, such as those that gave rise to higher temperatures in Edmonton during February, can contribute to record low ozone values.

Additional ozone thinning may have also been caused by volcanic debris from Mount Pinatubo, which erupted in the Philippines in 1991. Debris from major volcanic eruptions can remain in the upper atmosphere for two to three years. The ozone layer in the earth's upper atmosphere absorbs most of the sun's damaging ultraviolet (UV) rays. A small ozone loss can lead to a slight increase in UV. Over Canada, ozone thinning is most severe during the late winter and early spring. Fortunately, this is a time of year when UV valueare naturally low.

The greatest concern for UV in Southern Canada is the period from May to August, when the sun's rays are most intense and UV values are naturally high. During the summer months, ozone depletion over Canada is usually much less than the winter - only about 2 to 4%.

In the high Arctic, where ozone depletion is slightly greater, UV values remain low throughout the year, as the sun's rays are naturally weaker.

Excessive exposure to UV can cause health problems, such as skin cancer and eye cataracts, as well as damage to crops and ecosystems.

Canada is working to reduce chlorofluorocarbons (CFCs) and other ozone depleting substances. Our nation played an active role at the 1992 international conference in Copenhagen, where the Montreal Protocol - a global agreement to protect the ozone layer - was significantly strengthened. The agreement reached at Copenhagen calls for the production and consumption of CFCs to be phased out by January 1, 1996.

More details on ozone and the UV-index will appear in the next month's issue of Climatic Perspectives.

For further information on ozone and the UV index please contact:

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FEBRUARY 1993

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 A	4.3	-0.1	16.1	-7.6	4.0	34	13.3	8	0	4	163	212	384.3
ALERT BAY	4.9	0.3	13.2	-4.4	0.2	2	16.9	13	0	3	*	*	348.2
AMPHITRITE POINT	6.6	0.5	16.8	-2.1	0.0	0	42.0	12	0	6	*	*	372.9
BLUE RIVER A	-6.0	-1.3	6.0	-28.7	6.0	10	4.8	8	49	1	91	157	*
CAPE SCOTT	6.5	1.4	15.5	-0.6	0.0	0	74.2	30	0	9	*	*	324.5
CASTLEGAR A	-2.8	-2.2	5.7	-16.7	22.4	51	12.6	21	28	2	100	147	581.4
COMOX A	3.3	-0.7	11.1	-6.1	0.0	0	3.6	3	0	1	127	*	412.4
CRANBROOK A	-7.8	-4.0	4.4	-26.7	23.6	92	14.3	66	36	3	77	74	723.5
DEASE LAKE	-13.1	-0.2	6.4	-32.1	24.4	79	15.2	62	49	2	111	105	870.1
FORT NELSON A	-13.3	3.6	12.5	-28.9	22.5	97	10.6	54	32	5	108	*	875.2
FORT ST JOHN A	-8.7	2.7	9.3	-22.9	10.7	35	7.2	26	1	3	116	*	745.7
HOPE A	3.6	0.2	15.5	-7.4	0.0	0	5.4	3	0	1	99	206	404.9
KAMLOOPS A	-3.6	-2.3	6.0	-17.0	2.6	20	2.2	14	0	1	140	149	603.1
KELOWNA A	-3.9	-1.9	7.0	-19.8	7.2	48	7.6	31	5	2	121	175	611.8
MACKENZIE A	-9.0	1.3	6.9	-28.3	13.6	26	14.0	25	47	3	102	141	733.3
PENTICTON A	-2.1	-2.7	8.0	-17.3	15.5	136	14.0	71	3	4	118	157	562.9
PORT ALBERNI A	2.8	-0.6	11.8	-9.8	0.0	0	28.8	12	0	5	99	*	427.0
PORT HARDY A	4.0	0.1	13.1	-7.3	0.0	0	14.4	9	0	3	119	159	390.5
PRINCE GEORGE A	-6.2	-0.1	8.4	-25.1	1.8	5	1.6	4	1	1	126	145	676.6
PRINCE RUPERT A	3.1	0.5	13.1	-12.4	0.3	1	317.1	138	0	10	101	160	418.1
PRINCETON A	-5.0	-2.0	6.2	-23.2	9.8	40	6.8	23	25	3	130	*	*
REVELSTOKE A	-4.2	-1.4	5.5	-20.7	12.4	16	7.8	9	66	2	79	141	621.9
SANDSPIT A	4.3	0.8	10.7	-5.0	0.0	0	123.3	109	0	8	112	137	382.9
SMITHERS A	-2.9	2.4	10.6	-20.3	0.8	3	9.4	30	0	2	110	131	585.9
TERRACE A	0.2	1.6	9.6	-11.4	17.0	24	165.6	135	0	9	118	164	499.1
VANCOUVER INT'L A	3.5	-1.1	14.4	-7.2	6.0	80	11.4	10	0	4	146	167	405.3
VICTORIA INT'L A	3.2	-1.6	13.1	-7.9	19.2	237	24.1	24	6	3	147	173	413.7
WILLIAMS LAKE A	-6.8	-2.6	7.6	-27.9	5.4	21	4.2	17	40	2	126	116	693.6

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													
DAWSON A	-21.1	*	5.2	-50.2	23.0	*	12.3	*	*	*	*	*	*
MAYO A	-18.1	1.8	5.0	-50.4	30.7	172	24.9	152	*	*	*	*	*
WATSON LAKE A	-18.0	0.7	6.4	-36.4	23.6	73	19.3	76	51	3	85	100	1062.3
WHITEHORSE A	-12.0	1.2	7.0	-37.6	14.2	93	9.5	71	10	3	112	123	838.4
NORTHWEST TERRITORIES													
BAKER LAKE A	-33.0	-0.4	-14.4	-44.9	10.2	189	10.2	208	20	*	110	103	1429.8
CAMBRIDGE BAY A	-33.5	0.9	-15.3	-47.6	5.4	117	5.1	127	45	3	65	125	1441.3
CLYDE A	-33.1	-5.4	-21.0	-44.2	2.8	44	2.6	42	49	1	40	101	1424.6
COPPERMINE A	-26.5	4.6	-6.3	-43.7	16.2	253	13.3	215	92	4	51	67	1245.6
CORAL HARBOUR A	-34.0	-4.6	-16.8	-43.3	0.8	9	0.8	9	18	0	121	106	1457.0
EUREKA	-34.2	3.8	-15.0	-46.4	0.6	23	0.6	25	14	0	0	*	1460.3
FORT SIMPSON A	-18.8	3.7	0.6	-31.5	28.0	148	20.2	125	39	7	83	86	1031.6
FORT SMITH A	-18.2	3.6	8.9	-40.3	34.8	189	18.6	117	44	7	94	82	1013.3
IQALUIT	-34.6	-8.7	-20.3	-42.3	6.2	25	5.6	24	19	2	126	131	1471.9
HALL BEACH A	-34.9	-2.8	-19.5	-43.1	3.2	38	3.0	36	45	*	*	*	1482.7
HAY RIVER A	-18.2	3.5	8.2	-40.5	21.7	112	14.8	82	31	5	*	*	1015.6
INUVIK A	-21.3	7.6	-2.0	-43.6	26.8	213	23.2	221	72	9	42	64	1099.7
MOULD BAY A	-30.5	4.7	-15.1	-45.0	5.8	176	3.8	127	15	1	9	178	1358.4
NORMAN WELLS A	-19.1	7.1	-0.3	-43.4	19.8	114	13.9	86	34	6	72	95	1037.4
POND INLET A	-36.2	*	-27.9	-42.3	0.2	*	0.2	*	14	0	30	*	1517.4
RESOLUTE A	-30.6	2.6	-21.4	-40.0	1.8	58	1.8	60	15	1	12	68	1360.5
YELLOWKNIFE A	-22.6	2.5	-3.0	-38.4	27.2	208	21.2	189	29	6	94	92	1136.7
ALBERTA													
BANFF	-9.4	-3.1	9.0	-32.0	17.4	53	10.8	39	12	4	*	*	766.8
CALGARY INT'L A	-7.2	0.1	14.5	-25.8	21.0	110	12.5	81	0	3	170	133	703.5
COLD LAKE A	-10.8	2.8	10.0	-31.2	3.6	20	2.0	13	22	0	137	110	824.7
CORONATION A	-13.3	-1.6	4.7	-30.3	13.9	69	6.2	36	19	3	157	118	876.0

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	Mean	Difference from Normal	Maximum	Minimum									
EDMONTON INT'L A	-10.2	1.2	10.7	-31.4	12.8	60	7.2	41	6	4	154	130	789.3
EDMONTON MUNICIPAL	-8.3	1.3	12.3	-26.3	18.6	*	16.2	86	14	5	146	126	737.9
EDMONTON NAMAO A	-8.8	2.1	12.8	-26.6	10.2	48	4.6	22	14	3	*	*	748.9
EDSON A	-8.1	2.2	12.5	-30.0	15.8	53	7.8	48	8	4	101	87	729.3
FORT CHIPEWYAN A	-16.7	3.4	10.0	-40.5	20.5	113	13.4	98	*	*	*	*	*
FORT MCMURRAY A	-11.9	3.5	12.7	-33.0	8.8	40	4.4	23	7	1	115	89	836.2
GRANDE PRAIRIE A	-10.8	1.3	8.8	-29.5	8.6	32	6.0	25	17	3	108	*	805.2
HIGH LEVEL A	-15.4	2.9	13.8	-36.5	20.5	100	19.3	120	13	5	110	87	934.6
JASPER	-6.9	-0.4	9.2	-25.1	0.0	0	0.0	0	4	0	115	*	696.5
LETHBRIDGE A	-7.3	-1.9	14.8	-28.8	17.0	79	13.1	69	6	3	184	150	706.6
MEDICINE HAT A	-8.6	-0.9	9.6	-29.9	9.1	50	8.2	49	3	3	168	138	743.3
PEACE RIVER A	-11.2	2.3	8.7	-29.0	6.6	26	5.2	25	8	2	*	*	811.9
RED DEER A	-11.7	-1.0	8.4	-32.5	12.9	66	10.6	60	7	4	*	*	832.2
ROCKY MTN HOUSE A	-9.7	-2.3	12.8	-31.9	21.2	91	13.8	70	30	6	*	*	777.1
SLAVE LAKE A	-9.5	3.0	12.0	-29.0	7.6	35	2.8	14	1	2	119	105	770.3
SUFFIELD A	-8.6	*	8.9	-28.3	12.5	*	10.8	*	4	2	182	*	771.1
WHITECOURT A	-8.0	2.2	12.7	-30.2	24.0	91	12.3	51	3	4	*	*	738.1
SASKATCHEWAN													
BROADVIEW	-12.0	2.9	8.5	-29.5	7.0	47	3.2	26	3	2	198	146	841.7
CREE LAKE	-16.9	3.2	8.5	-43.1	16.8	93	14.4	106	28	4	115	86	978.2
ESTEVAN A	-13.5	-1.5	5.6	-32.0	5.8	33	2.4	14	5	1	158	117	881.7
KINDERSLEY	-14.5	-2.0	2.5	-33.0	4.3	28	4.3	27	18	1	118	*	909.6
LA RONGE A	-13.4	4.2	12.5	-32.7	1.8	8	1.8	12	11	0	*	*	880.3
MEADOW LAKE A	-12.0	*	9.5	-31.5	1.8	*	1.4	*	6	1	137	*	840.7
MOOSE JAW A	-10.6	-0.9	8.6	-28.2	7.3	39	5.9	38	5	2	159	127	801.0
NIPAWIN A	-15.5	*	6.2	-35.3	4.2	*	1.4	*	31	0	141	*	938.1
NORTH BATTLEFORD A	-13.4	0.7	8.4	-31.3	3.7	24	2.6	18	7	1	*	*	880.9
PRINCE ALBERT A	-14.1	2.4	9.7	-32.5	4.5	27	3.5	23	10	2	139	114	899.7
REGINA A	-13.2	0.4	5.5	-29.7	5.4	30	3.0	19	10	1	156	129	873.0
SASKATOON A	-14.6	0.0	2.8	-32.6	4.2	23	3.0	18	7	2	*	*	913.3
SWIFT CURRENT A	-10.7	-0.4	7.7	-29.0	7.2	40	6.8	40	3	2	141	124	803.0
YORKTON A	-12.6	2.9	10.3	-28.3	2.4	13	2.4	13	4	1	169	131	857.1
MANITOBA													
BRANDON A	-14.9	0.8	3.3	-31.2	2.4	12	1.0	5	9	0	160	*	922.1
CHURCHILL A	-25.7	0.2	-2.2	-36.7	11.8	81	7.4	56	14	4	112	85	1226.7
DAUPHIN A	-11.5	4.1	11.6	-28.3	1.6	9	1.4	8	0	0	167	124	827.0
GILLAM A	-23.2	0.1	2.5	-38.3	27.2	122	14.2	78	36	4	*	*	1152.4

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	Mean	Difference from Normal	Maximum	Minimum									
ISLAND LAKE	-20.6	-0.7	5.7	-40.5	27.4	130	24.4	154	38	3	*	*	1092.3
LYNN LAKE A	-21.0	0.7	7.5	-42.6	34.6	229	25.4	169	25	5	125	95	1092.7
NORWAY HOUSE A	-19.3	*	5.9	-38.1	31.8	*	20.6	*	20	3	*	*	1043.3
THE PAS A	-15.3	2.7	8.8	-34.7	11.2	54	7.2	47	5	1	139	104	931.6
THOMPSON A	-21.5	0.3	8.2	-43.6	26.4	236	21.8	195	28	4	147	102	1107.0
WINNIPEG INT'L A	-14.8	0.8	3.1	-29.6	0.2	1	0.2	1	30	0	182	127	919.7
ONTARIO													
EARLTON A	-18.3	-4.2	1.6	-37.4	9.8	21	7.4	16	25	1	*	*	1015.1
GERALDTON A	-18.8	*	5.8	-39.7	10.2	*	5.2	*	43	2	*	*	1029.6
GORE BAY A	-11.5	-1.8	3.9	-25.6	23.2	62	11.0	26	32	4	*	*	825.0
HAMILTON RBG	-7.0	*	5.0	-20.5	48.0	*	50.8	*	37	7	123	*	*
HAMILTON A	-8.1	-1.8	3.2	-21.3	55.0	183	49.7	103	29	4	*	*	729.7
KAPUSKASING A	-19.1	-2.9	4.4	-39.7	12.4	28	10.6	25	60	3	*	*	1003.2
KENORA A	-13.7	0.7	5.1	-30.9	4.6	18	3.4	15	34	2	*	*	887.8
KINGSTON A	-11.2	-3.3	2.3	-26.6	72.0	202	66.6	117	50	7	130	101	817.1
LONDON A	-7.8	-1.7	3.6	-22.0	43.0	111	40.9	68	20	7	104	107	724.0
MOOSONEE	-19.6	-1.1	3.7	-40.1	16.4	55	14.8	49	47	4	144	118	1164.6
MUSKOKA A	-13.2	-3.6	1.8	-29.5	30.1	59	25.3	41	32	5	*	*	873.6
NORTH BAY A	-14.5	-3.2	1.0	-31.2	21.8	43	13.4	24	28	5	129	103	911.0
OTTAWA INT'L A	-13.6	-4.1	3.0	-30.0	78.6	157	60.5	100	92	6	141	117	885.9
PETAWAWA A	-16.4	-4.3	4.7	-34.6	35.9	79	23.8	46	24	6	*	*	961.9
PETERBOROUGH A	-12.0	-3.2	3.0	-34.0	56.4	179	46.6	98	45	7	*	*	840.0
PICKLE LAKE	-17.7	1.0	7.1	-34.9	12.0	44	9.2	36	23	4	*	*	999.0
RED LAKE A	-16.5	0.3	6.6	-34.5	5.9	26	3.8	19	39	1	179	*	967.1
ST CATHARINES A	-6.3	-1.3	5.9	-18.9	48.8	216	43.6	96	16	8	112	*	663.1
SARNIA A	-7.2	-1.3	6.9	-23.3	35.8	151	36.0	82	29	8	96	91	705.0
SAULT STE MARIE A	-12.6	-1.1	4.9	-28.2	9.2	14	5.8	11	15	2	150	132	855.1
SIOUX LOOKOUT A	-15.2	0.5	6.2	-32.4	4.9	17	4.9	18	38	2	*	*	931.2
SUDBURY A	-14.9	-2.4	1.6	-30.9	15.8	35	12.0	26	46	5	133	101	922.3
THUNDER BAY A	-12.5	0.5	8.2	-28.6	6.4	21	3.6	13	15	1	166	113	856.9
TIMMINS A	-18.0	-2.4	2.8	-38.1	13.7	26	12.3	27	72	3	*	*	1008.6
TORONTO	-6.2	*	5.2	-19.9	51.2	*	48.2	*	21	6	*	*	677.7
TORONTO INT'L A	-8.4	-2.3	3.6	-21.8	31.8	120	26.6	58	19	5	*	*	737.9
TORONTO ISLAND A	-6.3	*	4.8	-19.6	45.5	183	41.6	*	22	4	*	*	678.6
TRENTON A	-10.6	-4.1	3.5	-26.3	61.3	173	51.5	90	29	7	*	*	802.0
WATERLOO WELLINGTON	-9.4	-1.5	2.1	-24.4	41.4	134	31.6	61	23	7	*	*	766.7
WAWA A	-15.3	*	2.0	-31.4	16.4	*	6.4	*	76	2	*	*	935.9
WIARTON A	-10.2	-2.7	2.8	-25.0	95.7	158	68.0	106	42	13	100	97	790.2
WINDSOR A	-5.2	-1.4	10.2	-17.5	42.4	186	43.3	86	13	7	*	*	647.7

FEBRUARY 1993

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 A	-19.0	-5.2	-2.6	-37.2	47.1	77	38.9	70	40	12	*	*	1036.5
BAIE COMEAU A	-18.3	-5.2	-4.0	-34.5	75.2	103	70.8	99	56	10	158	132	1015.9
BLANC SABLON A	-16.6	-6.2	3.8	-32.3	96.6	95	100.4	92	40	15	101	*	967.6
GASPE A	-16.2	*	-1.0	-31.5	95.5	*	90.6	*	59	9	131	*	959.2
INUKJUAK A	-29.2	-4.2	-9.0	-39.5	15.2	175	13.8	160	27	3	133	125	1319.7
KUUJJUAQ A	-27.8	-5.4	-8.8	-42.0	13.4	40	13.4	40	26	5	127	117	1281.3
KUUJJUARAPIK A	-26.7	-4.1	-3.0	-43.7	12.6	52	10.0	43	18	3	135	109	1250.8
LA GRANDE IV A	-27.7	*	-3.2	-45.0	11.8	*	11.2	*	40	3	155	*	1280.2
LA GRANDE RIVIERE A	-25.6	*	-3.6	-37.8	17.6	*	17.6	*	65	3	133	*	1274.2
MANIWAKI	-16.6	-4.4	2.9	-34.2	60.0	131	45.6	91	60	9	129	101	969.9
MONT JOLI A	-16.2	-5.7	-4.4	-30.0	56.0	74	44.8	60	35	11	139	122	1010.9
MONTREAL INT'L A	-14.1	-5.1	1.4	-30.3	66.6	124	65.4	100	22	8	133	104	900.0
MONTREAL MIRABEL I/	-15.5	*	0.6	-32.6	58.0	*	54.8	*	38	8	168	*	939.5
QUEBEC A	-15.6	-4.8	-3.5	-32.6	57.8	82	45.6	58	57	10	134	119	939.1
ROBERVAL A	-19.5	-4.8	-2.1	-35.9	47.6	79	46.8	79	64	7	137	*	1050.6
SCHEFFERVILLE A	-26.6	-5.4	-9.0	-40.6	13.4	30	13.0	30	53	4	126	111	1248.8
SEPT-ILES A	-18.6	-6.1	-4.5	-35.0	74.1	100	74.1	93	53	11	149	108	1026.7
SHERBROOKE A	-15.5	-4.0	-1.3	-39.3	91.4	162	76.6	127	52	11	118	*	936.8
ST HUBERT A	-14.7	-5.7	1.2	-32.6	70.4	*	65.2	90	39	8	125	*	915.5
VAL D'OR A	-20.2	-5.3	0.3	-39.0	18.6	37	14.0	28	47	5	138	102	1070.0
NEW BRUNSWICK													
CHARLO A	-16.4	-5.0	-2.7	-31.2	122.8	167	95.6	149	149	9	147	108	964.1
FREDERICTON A	-12.9	-4.5	5.7	-30.8	49.7	79	74.4	83	25	8	144	*	867.2
MONCTON A	-12.4	-4.7	8.2	-31.4	54.9	80	64.4	65	14	8	125	102	850.1
SAINT JOHN A	-11.4	-3.9	6.9	-26.2	59.0	93	82.6	71	28	8	140	112	824.0

STATION	Temperature C				Snowfall (cm)	% of Normal Snowfall	Total Precipitation (mm)	% of Normal Precipitation	Snow on ground at end of month (cm)	No. of days with Precip 1.0 mm or more	Bright Sunshine (hours)	% of Normal Bright Sunshine	Degree Days below 18 C
	Mean	Difference from Normal	Maximum	Minimum									
NOVA SCOTIA													
GREENWOOD A	-9.9	-4.5	11.0	-35.5	82.6	132	83.9	93	20	12	*	*	781.8
HALIFAX INT'L A	-9.9	-3.8	8.7	-27.3	54.2	83	167.1	125	4	8	*	*	782.6
SABLE ISLAND	-2.1	-1.1	10.6	-11.4	27.8	87	145.6	123	0	11	57	78	564.1
SHEARWATER A	-8.1	-3.6	8.4	-25.7	53.6	103	128.2	105	6	9	133	103	729.6
SYDNEY A	-9.7	-3.8	7.4	-24.9	84.0	122	178.4	144	16	13	108	98	776.0
YARMOUTH A	-6.2	-3.0	8.5	-23.6	70.5	131	107.0	94	10	13	115	124	677.9
PRINCE EDWARD ISLAND													
CHARLOTTETOWN A	-12.4	-4.9	7.0	-29.8	56.8	86	83.6	86	15	8	*	*	850.7
NEWFOUNDLAND													
BONAVISTA	-7.5	-2.3	8.0	-20.2	49.4	110	155.8	180	18	18	*	*	715.0
BURGEO	-8.8	-3.1	5.0	-24.1	63.2	124	141.2	109	27	13	*	*	751.7
CARTWRIGHT	-19.0	-6.4	1.8	-31.0	73.0	111	73.4	108	131	10	101	95	1035.8
CHURCHILL FALLS A	-25.2	-5.5	-9.7	*	54.8	93	44.1	80	100	10	152	122	*
COMFORT COVE	-11.9	-4.2	8.5	-27.8	70.8	96	109.2	133	72	16	*	*	835.4
DANIELS HARBOUR	-13.7	-6.0	9.0	-28.0	72.6	97	73.6	90	38	11	76	101	886.2
DEER LAKE A	-14.9	-5.7	9.5	-36.6	66.8	102	68.6	98	86	13	*	*	991.2
GANDER INT'L A	-10.6	-3.8	9.2	-25.9	76.2	100	118.4	119	36	16	99	100	800.2
GOOSE A	-20.6	-6.1	1.3	-33.2	84.9	140	64.4	107	49	8	129	110	1080.1
MARY'S HARBOUR	-17.1	-7.0	5.0	-32.0	80.2	127	104.2	133	128	12	*	*	973.7
PORT AUX BASQUES	-10.1	-4.4	8.3	-23.6	66.4	95	109.7	94	41	15	73	*	749.0
ST ANTHONY	-15.2	-4.8	4.1	-28.3	114.8	189	104.2	127	99	15	*	*	929.4
ST JOHN'S A	-6.2	-1.7	11.3	-22.0	61.8	83	183.1	131	3	20	66	*	676.6
ST LAWRENCE	-6.5	-2.0	9.0	-21.5	42.1	87	117.1	108	4	17	*	*	686.4
STEPHENVILLE A	-12.3	-6.1	8.5	-28.8	108.8	143	111.1	124	92	14	81	*	843.3
WABUSH LAKE A	-25.0	-4.2	-7.3	-40.7	41.6	*	37.7	78	63	8	152	*	1203.8

AGROCLIMATOLOGICAL STATIONS — **FEBRUARY 1993**

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	5.2	0.7	16.0	-3.5	0.0	0.4	0	0	0	147	46.8	55.3
SUMMERLAND	-2.7	-2.8	7.5	-15.0	5.4	7.6	40	0	3	125	0.0	0.0
ALBERTA												
BEAVERLODGE	-8.2	2.0	10.0	-26.5	5.6	5.3	21	0	3	105	2.5	6.0
LACOMBE	-10.7	-0.2	9.0	-32.0	7.1	7.1	39	7	3	134	0.0	0.0
SASKATCHWAN												
INDIAN HEAD	-12.7	1.1	7.0	-29.5	3.0	2.6	15	25	2	**	2.5	3.0
MELFORT	-14.0	2.3	6.0	-31.5	2.7	2.7	17	15	2	120	0.0	0.0
REGINA	-14.6	-0.8	6.0	-33.0	2.0	2.2	15	1	2	**	0.0	0.0
SCOTT	-14.8	-0.4	5.0	-34.0	3.7	2.6	20	18	0	137	0.0	0.0
SWIFT CURRENT	-10.4	0.0	8.0	-28.0	4.4	4.1	27	5	1	138	*.*	0.0
MANITOBA												
BRANDON	-14.4	0.8	5.6	-31.2	2.1	2.1	10	22	1	**	0.0	0.0
MORDEN	-11.8	4.6	7.0	-25.0	2.6	2.6	10	6	2	178	0.0	0.5
GLENLEA	-16.0	-2.6	3.0	-34.0	0.0	0.0	0	70	0	172	0.0	0.0
ONTARIO												
DELHI	-7.3	-1.9	5.0	-23.0	41.5	41.5	73	12	9	**	0.0	3.0
ELORA	-10.3	-3.0	1.1	-23.7	25.4	25.4	52	16	*	**	1.4	1.4
GUELPH	-10.0	-3.5	2.1	-23.5	30.0	30.0	59	20	7	98	0.0	1.9
HARROW	*	*	8.5	-19.5	26.2	36.2	68	9	6	100	0.0	3.5
KAPUSKASING	-20.3	-4.0	4.0	-41.0	19.9	11.4	28	53	3	142	0.0	0.0
OTTAWA	-13.3	-3.8	3.5	-29.0	61.7	56.4	103	38	6	141	0.0	0.0
SMITHFIELD	-9.3	-2.7	4.3	-27.8	77.2	62.0	87	35	6	**	0.0	0.6

Courtesy of Agriculture Canada

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	-15.1	-4.9	-3.0	-32.0	49.3	69.6	98	35	8	146	0.0	0.0
L'ASSOMPTION	-14.8	-4.2	0.0	-33.0	68.7	69.2	113	29	***	135	0.0	0.0
NORMANDIN	-21.8	-5.7	0.5	-40.4	*.*	29.0	54	18	11	162	0.0	0.0
NEW BRUNSWICK												
FREDERICTON	-12.3	-4.0	3.5	-29.0	8.6	60.3	69	22	6	144	*.*	2.0
NOVA SCOTIA												
KENTVILLE	-9.0	-3.8	9.5	-18.0	51.1	102.6	96	15	12	112	0.0	5.8
NAPPAN	-10.5	-3.6	10.5	-36.0	43.0	63.1	71	15	11	113	0.0	3.3
PRINCE EDWARD ISLAND												
CHARLOTTETWN	*.*	*.*	*.*	*.*	*.*	*.*	**	***	***	**	*.*	*.*
NEWFOUNDLAND												
ST.JOHN'S WEST	-5.2	-0.9	11.5	-20.5	54.3	195.8	118	2	21	64	0.0	0.0

Courtesy of Agriculture Canada

...continued from page 5

These temperatures were also the lowest ever recorded for any month at: Greenwood, Charlottetown and Halifax. Charlo, N.B., tied its all-time record low established in February 1991. It was extremely cold during the first weekend of the month, as several locations set new record-low minimums for the month on February 6, only to be broken again on the 7th: Greenwood,-35.5°C; Shearwater, -25.7°C; Halifax, -27.3°C; and Charlottetown, -29.8°C.

The -35.5°C temperature reported at Greenwood is the lowest minimum ever recorded at the station since records began in 1943. Also on the 7th, Charlo, only managed to reach a maximum temperature of -21.7°C; this is the lowest maximum ever recorded at Charlo for the month of February since records began in 1967.

Precipitation was generally above normal in the northern portions of New Brunswick and most of Nova Scotia. Snowfall totals varied either side of normal, with the largest amounts occurring in northeastern New Brunswick, where Charlo reported 122.8 cm.

Hours of bright sunshine were generally above normal in New Brunswick and Prince Edward Island.

Several storms caused havoc in the Maritimes. Two back-to-back storms on the 13th and 17th consisted mainly of heavy rain in Nova Scotia, except for the northern parts of the region, which received snow. Halifax reported 74.1 mm of precipitation on the 17th, almost entirely as rain. This set a new record for the greatest 24-hour precipitation amount during the month of February. Flooded streets and basements, stalled cars, leaking roofs and power outages were evidence of the heavy rains. Large scale temperature changes also occurred, particularly on the 13th, with some locations reporting changes greater than 20°C in 24-hours.

Up to 22 cm of snow fell during a blizzard on the 22nd. In many areas the snow became mixed or changed to freezing precipitation and ice pellets. Transportation was disrupted and schools were closed. A section of the Trans Canada Highway near Moncton, N.B. was closed for several hours after three trucks collided.

Winds gusting up to 107 km/h and snow, ice pellets and freezing rain arrived on Sunday the 28th, as a storm approached from the south. Hardest hit, was Nova Scotia, where up to 17 centimetres of snow fell in Halifax by the end of the day. Seven crewmen were taken from their sinking fishing vessel Sunday night, when it ran aground near Sambro Harbour during the height of the storm.

There were several reports of strong winds from Grand Etang, near Cheticamp, Nova Scotia, this month. These winds, which are locally known as "Suetes", are caused by funnelling and other effects in the highlands of Cape Breton and caused considerable damage. On the 17th, winds gusted to 135 km/h, toppling fuel storage tanks and spilling about 70,000 litres of gasoline into a safety dike. On the 22nd, winds again reached 126 km/h, with gusts to 172 km/h. The strong winds sent tree branches, garbage cans, small stones and even picnic tables flying in the Cheticamp area.

Newfoundland and Labrador

A changeable weather pattern prevailed across Newfoundland. Well-below normal temperatures and light precipitation early in the month gave way to frequent periods of snow, freezing rain or rain. A minimum temperature of -39°C was recorded at Badger, in central Newfoundland. However, milder air moved in later in the month, with St. John's reporting a maximum of 11.3°C. During the latter half of the month, periods of rain or freezing rain were common in eastern locations. St. John's recorded 126 mm of rain, which is nearly 60 mm above normal. At western locations, near normal monthly snowfalls of 70 to 100 centimetres were reported.

A major storm on February 17, brought very strong winds and mixed precipitation to the region. Western Newfoundland received the brunt of the storm, with wind gusts to 159 km/h at Daniel's Harbour. Some buildings were damaged, Marine Atlantic ferry service disrupted and an 18 wheeler flipped on the stretch of highway near the infamous Wreckhouse area.

Hours of bright sunshine were in the 80 to 100 range across most of the Island, which is close to normal. However St. John's reported 65.5 hours, which is nearly 20 hours below normal.

In Labrador, below-normal temperatures and above-normal sunshine highlighted the month's weather. Very cold conditions and light precipitation prevailed during the first half of the month. Minimum temperatures in the minus thirties and forties were common, with strong winds resulting in bitterly cold windchills. Snowfalls were in the 70 to 80 centimetre range in central and eastern locations, which is about 20 cm above normal. In western locations, nearly 50 cm, was recorded, which is close to normal.

Sunshine was frequent throughout the month, with over 150 hours recorded in the western sections, which is about 35 hours above normal. The below-normal temperatures have resulted in a vast area of sea ice off the Newfoundland and Labrador coast.