

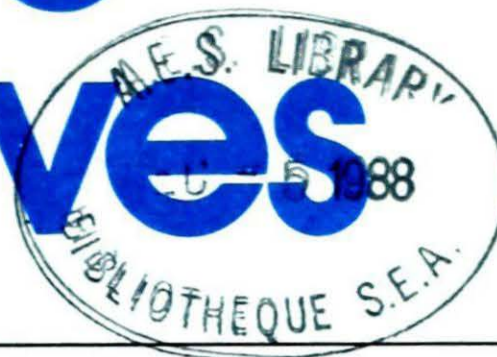


Environment
Canada

Environnement
Canada

Climatic Perspectives

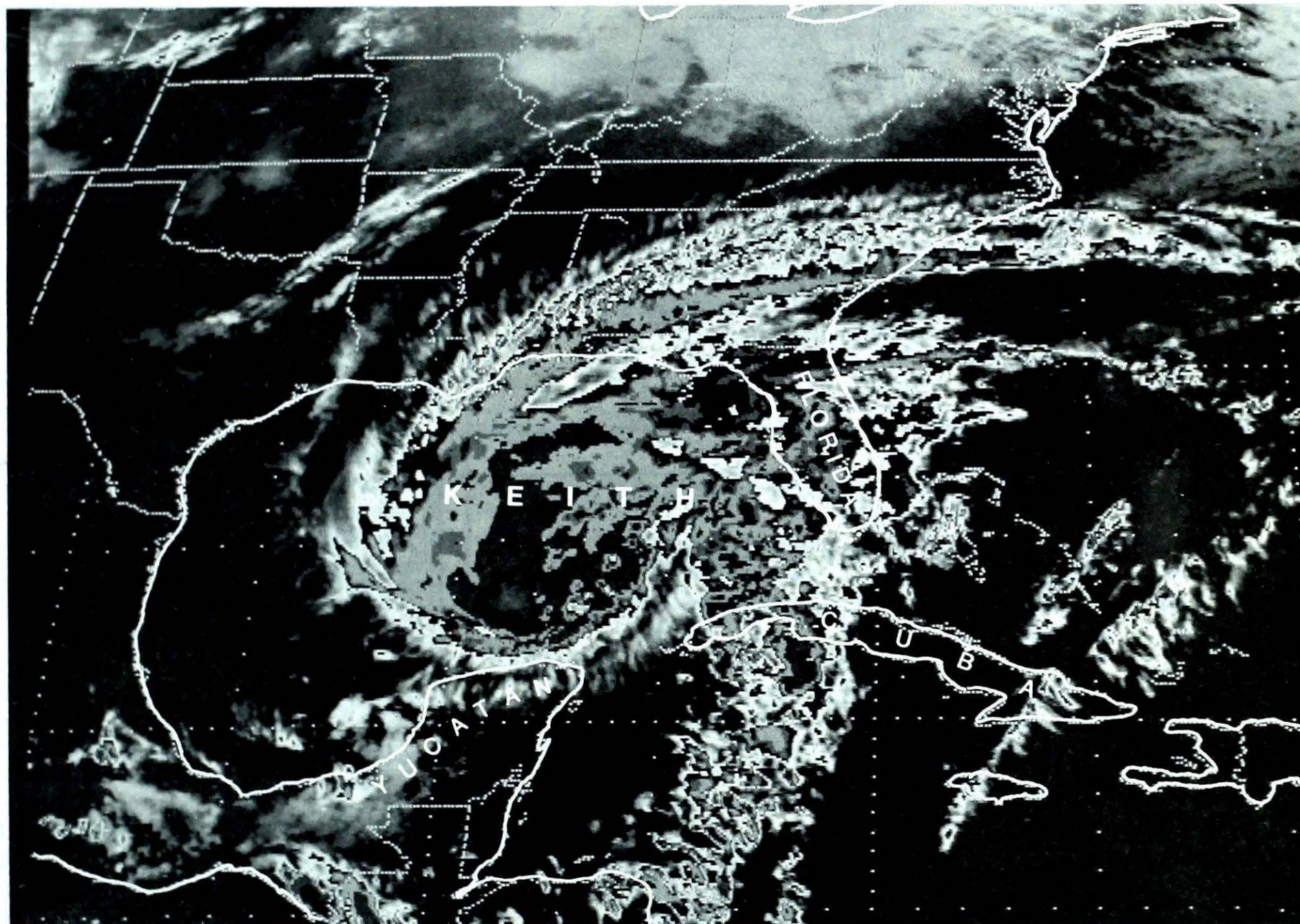
MONTHLY
SUPPLEMENT
INCLUDED



November 15 to 21, 1988

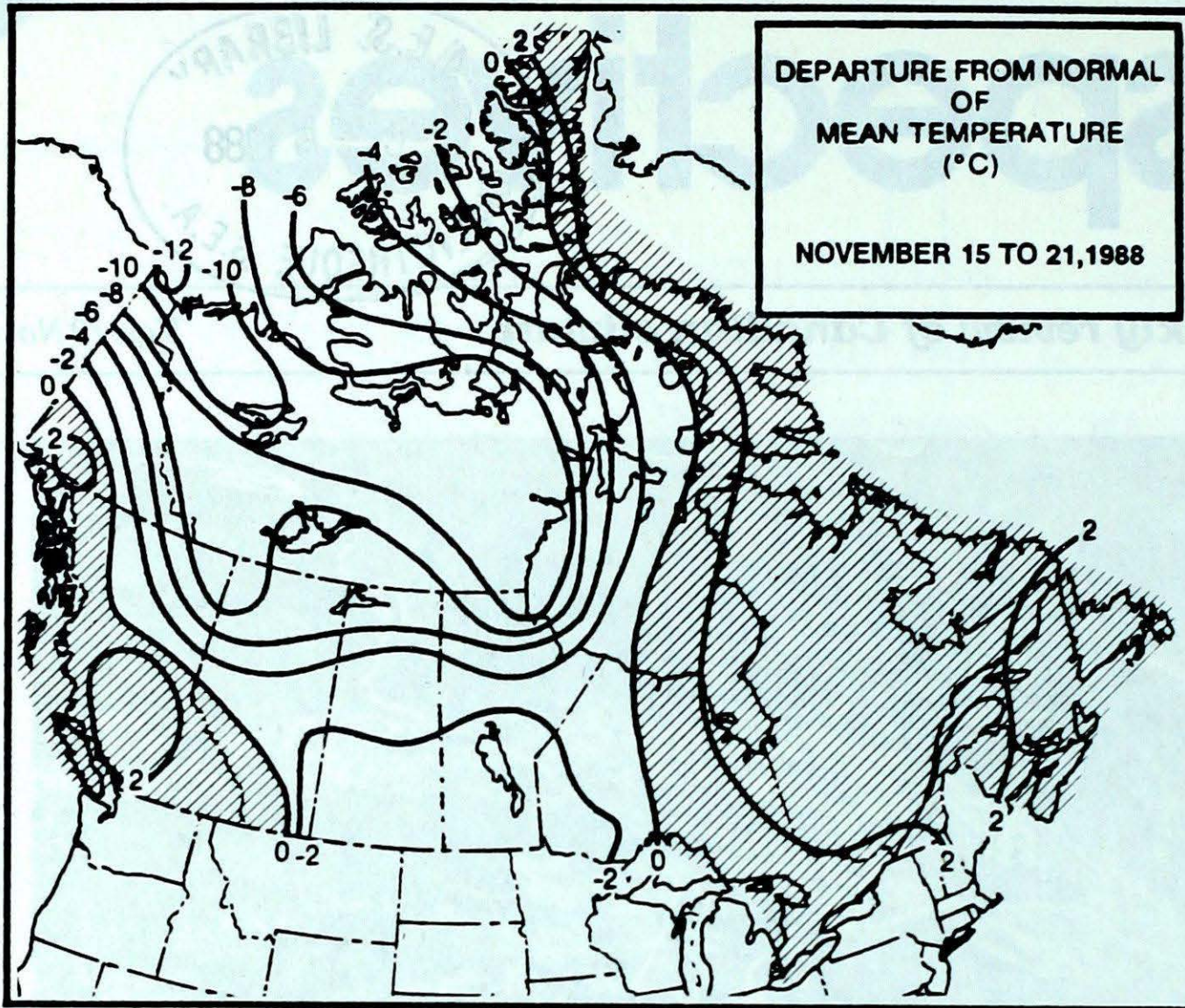
A weekly review of Canadian climate

Vol. 10, No. 47



This infrared GOES satellite photograph of November 21, 1988, shows out of season tropical storm Keith churning across the warm waters of the Gulf Of Mexico. Bands of cloud and heavy rain are pushing into Florida and the Gulf Coast States. For more information see page 3.

- **Major snowstorm strikes
northwestern Ontario**
- **Election Day snowstorm buries
northern New Brunswick**



ACROSS the COUNTRY

Yukon and Northwest Territories

It was bitterly cold in the northern Yukon, Mackenzie Valley and along the Arctic coast, as a Siberian Arctic air mass drifted over the region. Readings down to the record minus thirties and forties were everyday occurrences. The thermometer bottomed out at -44C on the Dempster Highway. South of the Ogilvie Mountains and on Baffin Island it was much milder, with snowfalls of up to 20 cm common. Heavy snowfalls along the east coast of Baffin Island and in the Great Slave Lake region, slowed down the development of ice on lakes and rivers. As a result, snow machines became stuck or broke through thin ice in the Territories.

British Columbia

A persistent on-shore flow affected most of the region, resulting in a mostly cloudy, damp week. Arctic air continued to cover the northeast corner of the province, where snow accumulations on the ground have reached a depth of almost 50 cm. Snowfalls were also plentiful at all higher elevations in the interior. Ski operators in the south are beginning to open the upper slopes to skiers. Alternate freezing and thawing conditions in the central interior have kept roads treacherous, and have resulted in highway traffic accidents.

Prairie Provinces

In Alberta, it was a variably cloudy week, with light snowfalls in most areas. Below freezing daytime temperatures in the south gradually climbed to several degrees above freezing during the weekend.

In Saskatchewan and Manitoba it was cold and gloomy, with light snow reported falling most days. A heavy snowfall, in the order of 30 cm, covered southeastern Manitoba on the 15th, as a major storm moved across the Great Lakes. Colder air gradually encompassed the region, dropping temperatures to the mid-minus thirties in the north.

Ontario

A major snow storm moved across northern Ontario at the beginning of the week, dumping anywhere from 30 to 50 centimetres of snow. The intense storm, which tracked northeastward out of the American mid-west, pumped mild air into the southern

Weekly Temperature Extreme (°C)

| Location | Maximum | Minimum |
|---|---------|--------------------|
| British Columbia Victoria Int'l | 12 | Fort Nelson -28 |
| Yukon Territory Whitehorse | 1 | Ogilvie -44 |
| Northwest Territories Frobisher Bay | 1 | Eureka -42 |
| Alberta Lethbridge | 9 | Fort Chipewyan -33 |
| Saskatchewan Moose Jaw | 2 | Uranium City -32 |
| Manitoba Winnipeg Int'l | -1 | Churchill -35 |
| Ontario Wiarton | 19 | Big Trout Lake -22 |
| Québec Montréal Int'l | 15 | Schefferville -18 |
| New Brunswick Moncton | 15 | Chatham -7 |
| Nova Scotia Greenwood | 17 | Amherst -4 |
| Prince Edward Island Charlottetown | 13 | Summerside -4 |
| Newfoundland St Lawrence | 11 | Wabush Lake -18 |

Across The Country...

| | | |
|-------------------------------------|---------------------|-----|
| Warmest Mean Temperature | Cape St.James (BC) | 7 |
| Coollest Mean Temperature | Cambridge Bay (NWT) | -34 |

sections of the province, and on November 16, temperatures climbed to the record mid-to high teens. The rest of the week continued cloudy and damp. Another system brought more rain and snow over the weekend, and on November 20, snowplows were seen clearing highways north of Toronto.

Quebec

Two weather systems affected the province. The first moved across central and northern Quebec during the middle of the week, leaving in its wake 10 to 20 centimetres of fresh snow. A brief surge of warm air associated with this system broke a number of daily high temperature records in the western parts of the province. Readings in the south nudged the double digits. The second storm, over the weekend, affected the southern regions. This system produced snowfalls of 10 to 15 centimetres in southwestern Quebec, with greater amounts to the east. The crash of a light plane at Saint-François Xavier, northwest of Sherbrooke, was attributed to the poor weather conditions at the time.

Atlantic Provinces

In the Maritimes, it was a mainly cloudy period, with precipitation falling on the 17th, and during the final two days of the period. On Thursday, temperatures soared to the mid-teens, with colder air flooding the region shortly after. A major snowstorm hit northern New Brunswick on the 21st. By the morning of the 22nd, Chatham had received 38 cm of the white stuff mixed with freezing rain. Most schools and businesses were closed election day Monday. There were power outages throughout the Maritimes, with winds gusting up to 100 km/h. The storm dumped 51 mm of rain in Shearwater in a 12-hour period.

Strong northwesterly winds affected the island of Newfoundland for a good part of the period, with periods of rain or showers occurring each day. There was a brief respite on the 17th, as a ridge of high pressure crossed over the Island. The storm, which hit the Maritimes, brought heavy snow to the southeastern portions of the Island the final day of the period. By the end of the day Gander had already received 29 cm of new snow on the ground.

It was a wintry week in Labrador, with a mixture of snow, freezing rain and rain. Daytime temperatures remained near freezing until the weekend, when it became much colder.



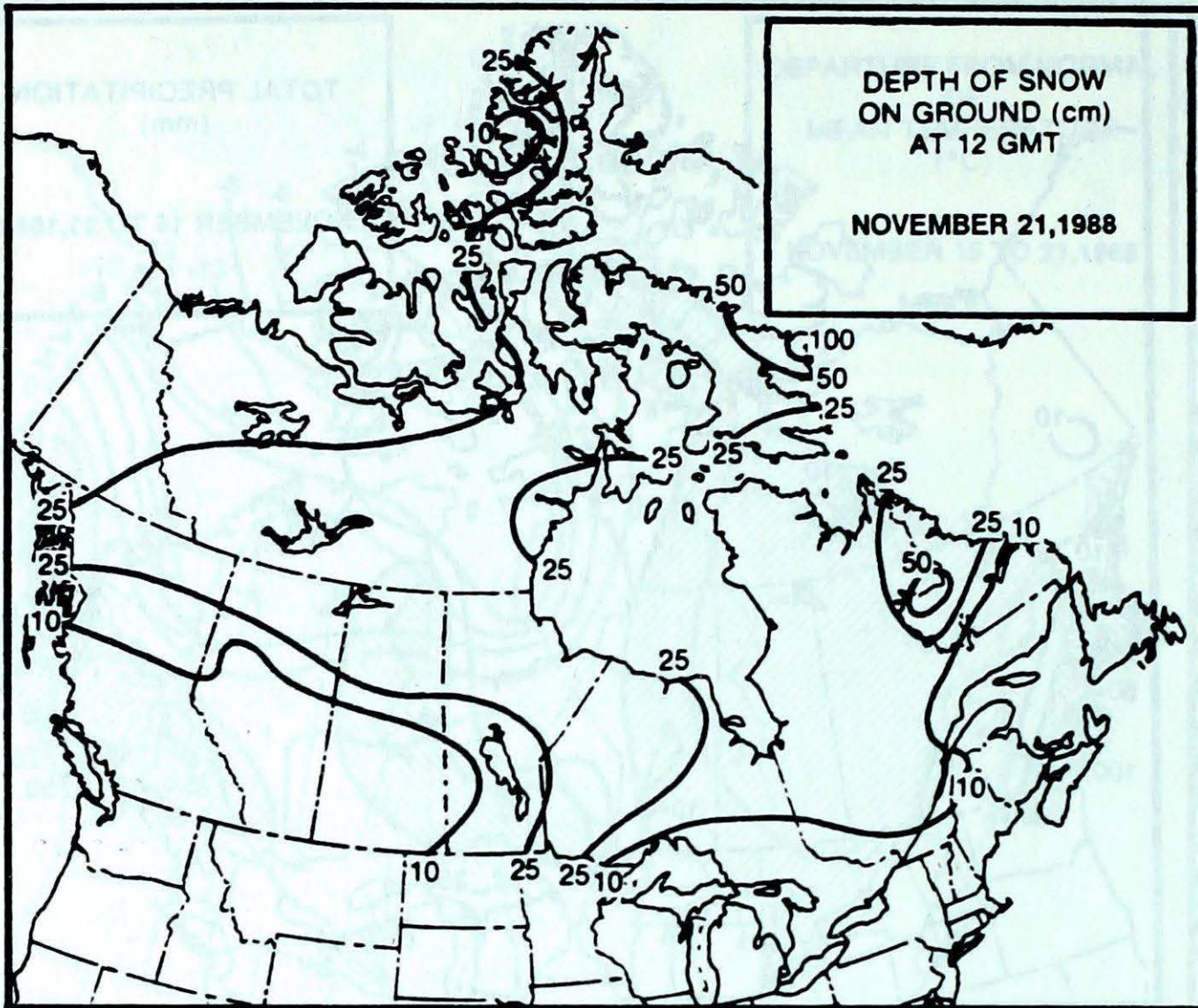
Heaviest Weekly Precipitation (mm)

| | | |
|---------------------------------|-------------------|-----|
| British Columbia | Port Alberni | 104 |
| Yukon Territory | Carcross | 15 |
| Northwest Territories | Cape Dyer | 84 |
| Alberta | High Level | 6 |
| Saskatchewan | Broadview | 6 |
| Manitoba | Winnipeg Int'l | 17 |
| Ontario | Thunder Bay | 47 |
| Québec | La Grande Rivière | 28 |
| New Brunswick | Saint John | 66 |
| Nova Scotia | Shearwater | 86 |
| Prince Edward Island | Charlottetown | 27 |
| Newfoundland | Burgeo | 52 |

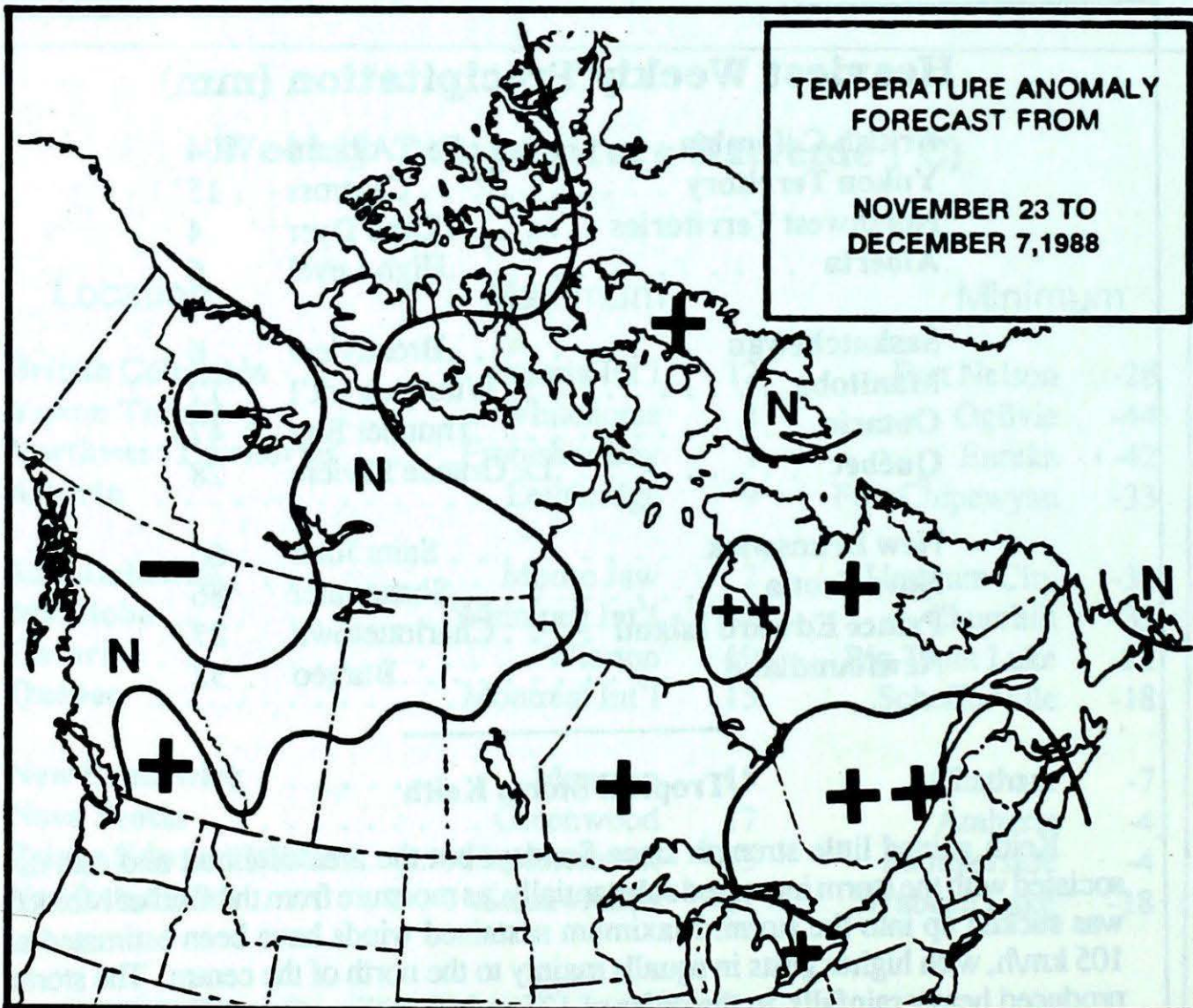
Tropical Storm Keith

Keith gained little strength since Sunday, but the area of cloud and rain associated with the storm increased substantially, as moisture from the Gulf of Mexico was sucked up into the storm. Maximum sustained winds have been estimated at 105 km/h, with higher gusts in squalls mainly to the north of the centre. The storm produced heavy rainfalls, in the order of 125 to 250 millimetres, over the Mexican Yucatan Peninsula and western Cuba. At this time, it was evident the storm would hit Florida, as the trajectory changed to the northeast and the speed increased to 20 km/h. On the 23rd, Cape Canaveral received more than 125 mm of rain.

Note that the different shades of grey in this photograph differentiate temperatures, and hence the height of the cloud tops, with colder readings occurring at the higher elevations. The thickest cloud associated with this storm is in the area of darker grey - the zone more than likely producing the heaviest rainfalls.



DEPTH OF SNOW
ON GROUND (cm)
AT 12 GMT
NOVEMBER 21, 1988



TEMPERATURE ANOMALY
FORECAST FROM
NOVEMBER 23 TO
DECEMBER 7, 1988

- ++ much above normal
- + above normal
- N normal
- below normal
- much below normal

Temperature Anomaly Forecast

This forecast is prepared by searching historical weather maps to find cases similar to the present. The historical outcome during the 15 days subsequent to the chosen analogues is assumed to be a forecast for the next 15 days from now.

CLIMATIC PERSPECTIVES VOLUME 10

Managing Editor . . . P.R. Scholefield
 Editors-in-charge
 English A.K. Radomski
 French A.A. Caillet
 monthly A. Gerge
 Data Manager M. Skarpathiotakis
 Art Layout K. Czaja
 Word Processing . . . P. Burke/U. Ellis
 Translation D. Pokorn
 Cartography B. Taylor/G. Young
 T. Chivers

Regional Correspondents

Atlantic: *F. Amirault*; Quebec: *J. Miron*;
 Ontario: *B. Smith*; Central: *J.F. Bendell*;
 Western: *W. Prusak*; Pacific: *E. Coatta*;
 Yukon Weather Centre: *J. Steele*; Frobisher
 Bay and Yellowknife Weather Offices;
 Newfoundland Weather Centre:
G. MacMillan; Ice Central Ottawa

Climatic Perspectives is a weekly bilingual publication of the Canadian Climate Centre, Atmospheric Environment Service, 4905 Dufferin St., Downsview, Ontario, Canada M3H 5T4
 ☎ (416) 739-4438/4436

ISBN 0225-5707 UDC 551.506.1(71)

The purpose of the publication is to make topical information available to the public concerning the Canadian Climate and its socio-economic impact.

Unsolicited articles are welcome but should be at maximum about 1500 words in length. They will be subject to editorial change without notice due to publishing time constraints. The contents may be reprinted freely with proper credit.

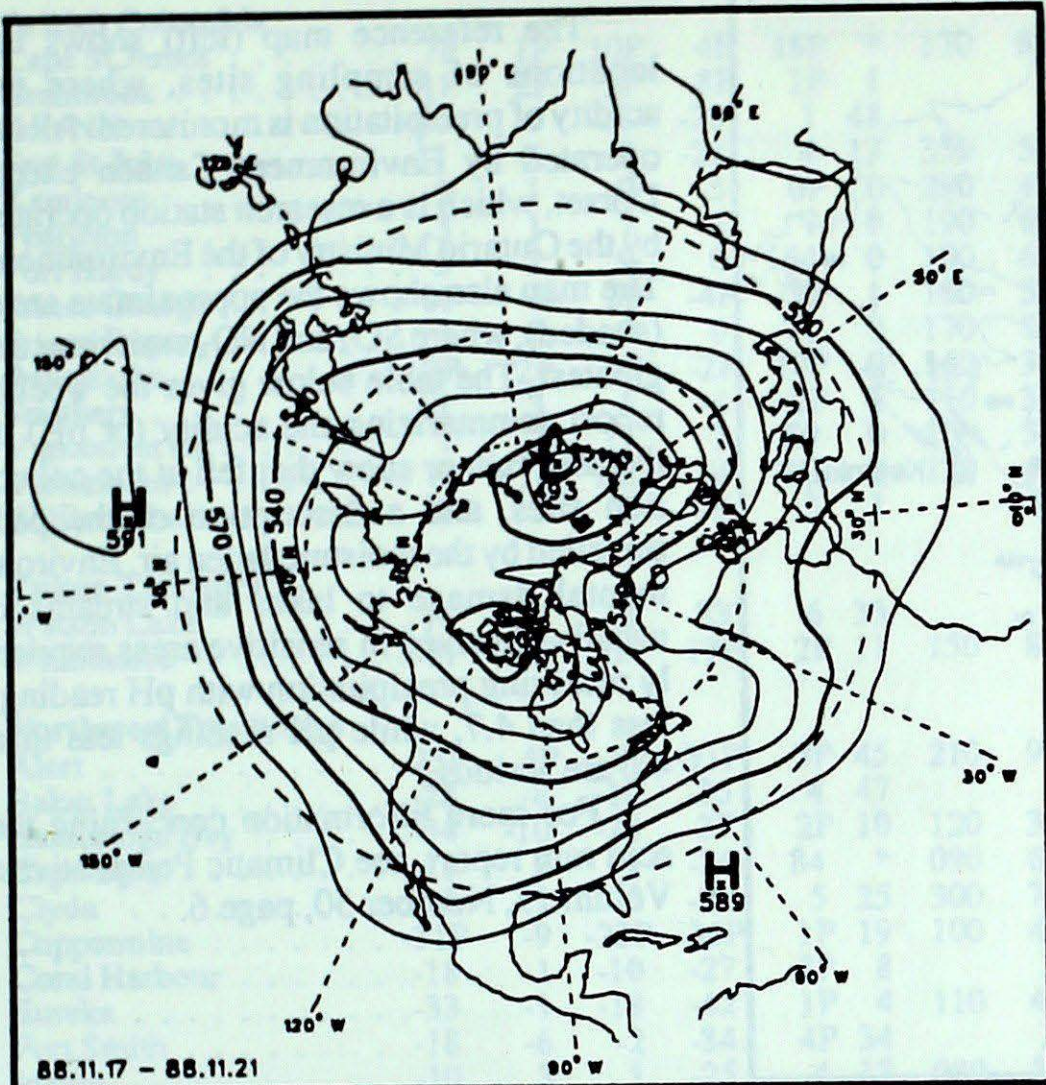
The data in this publication are based on unverified reports from approximately 225 Canadian synoptic weather stations. Information concerning climatic impacts is gathered from AES contacts with the public and from the media. Articles do not necessarily reflect the views of the Atmospheric Environment Service.

Annual Subscriptions

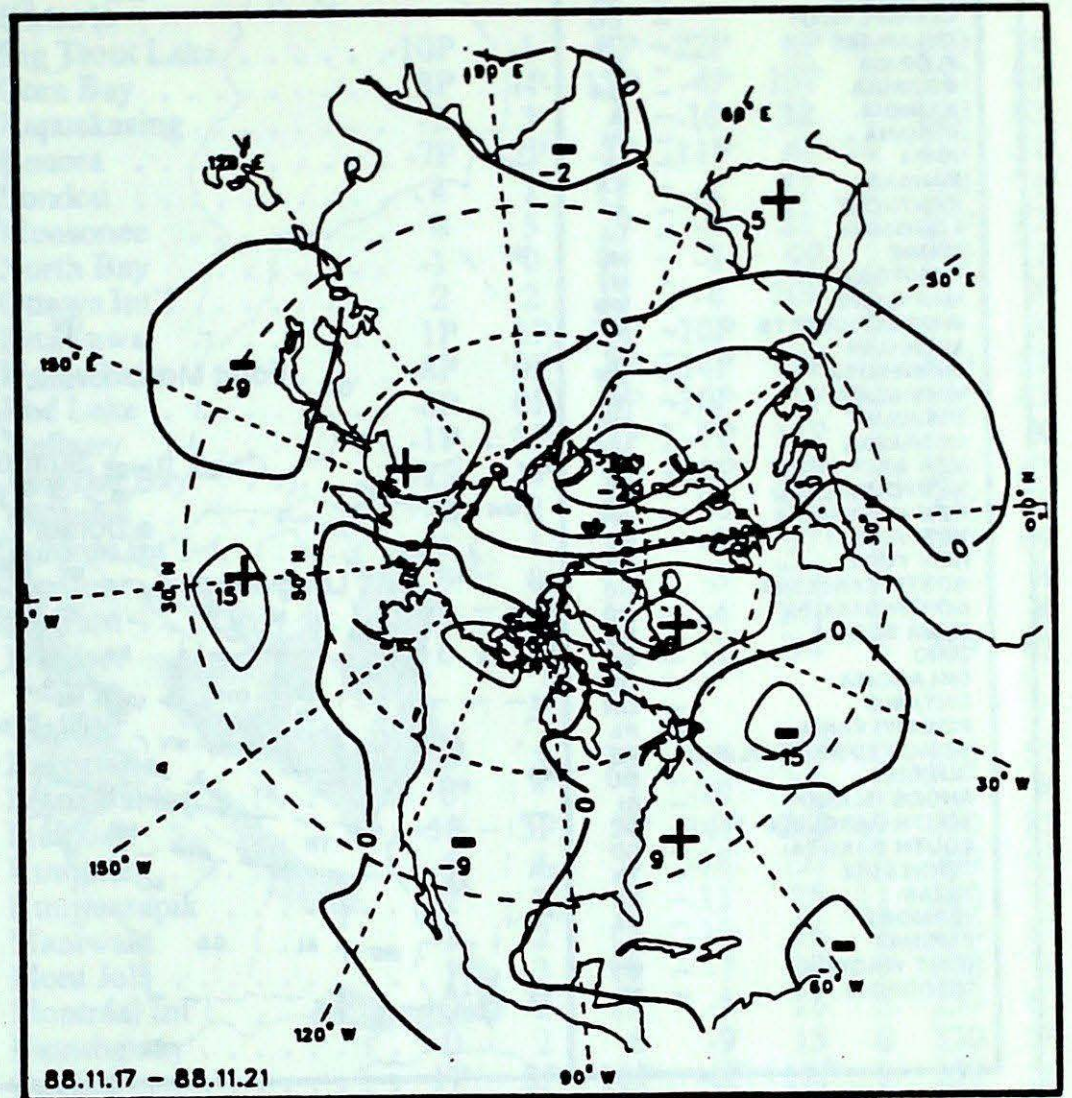
weekly and monthly supplement: \$35.00
 foreign: \$42.00
 monthly issue: \$10.00
 foreign: \$12.00

Orders must be prepaid by money order or cheque payable to Receiver General for Canada. Canadian Government Publishing Centre, Ottawa, Ontario, Canada K1A 0S9 (819) 997-2560

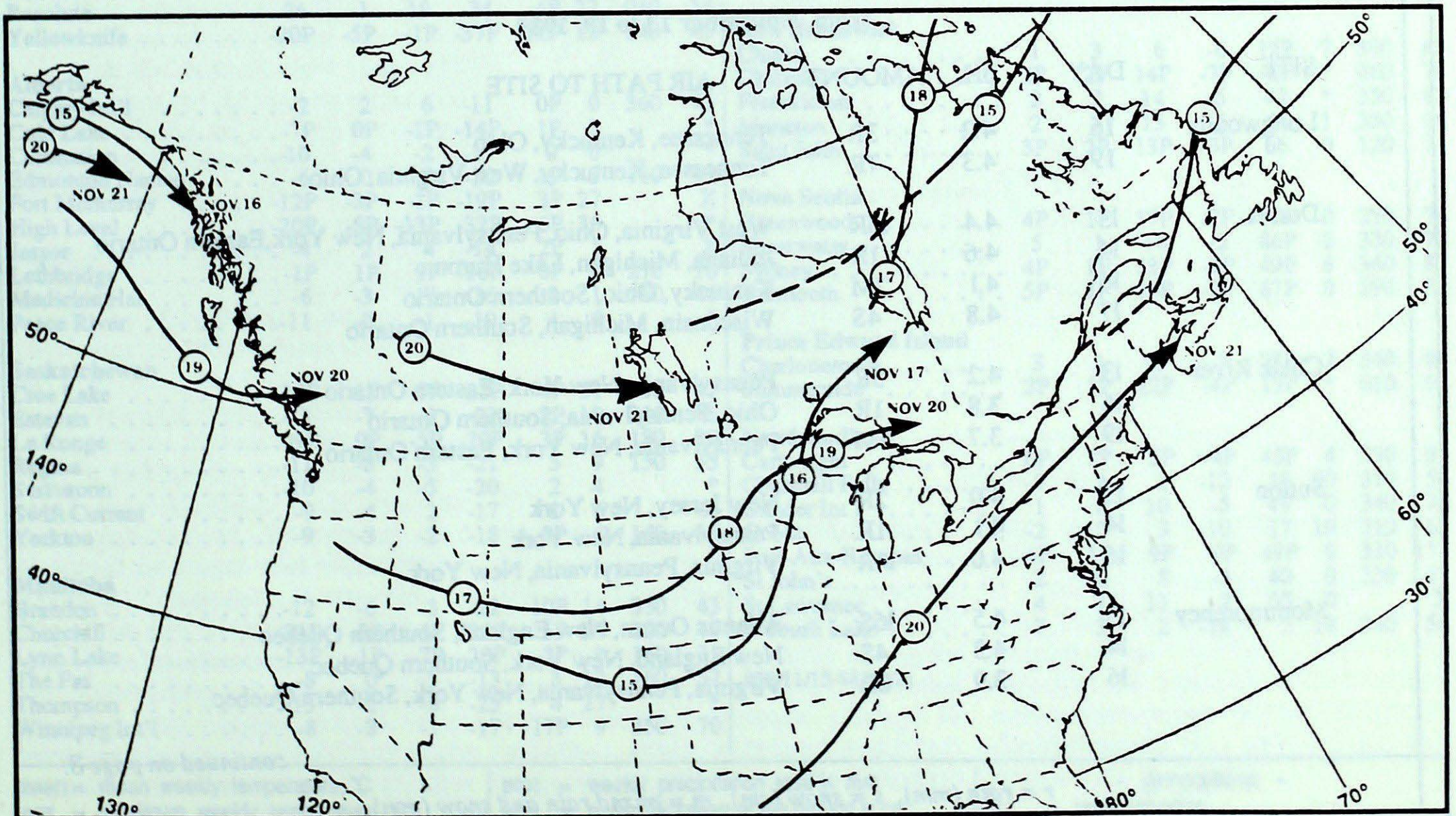
50 kPa ATMOSPHERIC CIRCULATION



Mean geopotential height
50 kPa level (10 decameter intervals)



Mean geopotential height anomaly
50 kPa level (10 decameter intervals)

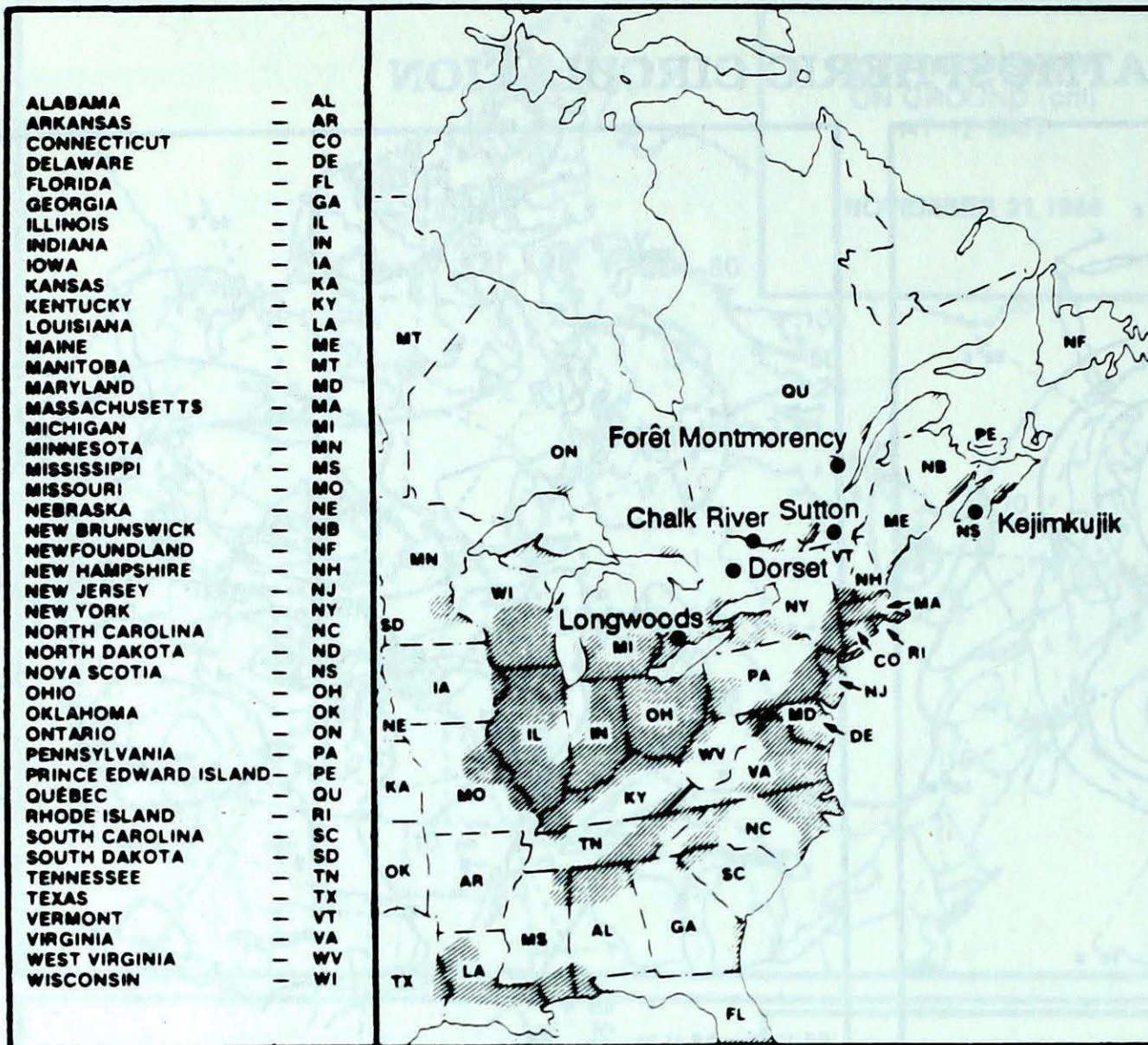


Storm track - Position of storm at 12 GMT each day during the period.

ACID RAIN REPORT

The reference map (left) shows the locations of sampling sites, where the acidity of precipitation is monitored. All are operated by Environment Canada except Dorset, which is a research station operated by the Ontario Ministry of the Environment. The map also shows the approximate areas (shaded), where SO₂ and NO_x emissions are greatest. The table below gives the weekly report summarizing the acidity (or pH) of the acid rain or snow that fell at the collection sites, and a description of the path travelled by the moisture laden air. Environmental damage to lakes and streams is usually observed in sensitive areas regularly receiving precipitation with pH readings less than 4.7, while pH readings less than 4.0 are serious.

For more information concerning the acid rain report, see Climatic Perspectives, Volume 5, Number 50, page 6.



from November 13 to 19, 1988

| SITE | DAY | pH | AMOUNT | AIR PATH TO SITE |
|-------------|-----|-----|--------|--|
| Longwoods | 16 | 4.2 | 3R | Tennessee, Kentucky, Ohio |
| | 19 | 4.3 | 7R | Tennessee, Kentucky, West Virginia, Ohio |
| Dorset | 13 | 4.4 | 13R | West Virginia, Ohio, Pennsylvania, New York, Eastern Ontario |
| | 14 | 4.6 | 1R | Indiana, Michigan, Lake Huron |
| | 16 | 4.1 | 2M | Kentucky, Ohio, Southern Ontario |
| | 17 | 4.8 | 4S | Wisconsin, Michigan, Southern Ontario |
| Chalk River | 13 | 4.2 | 5R | Pennsylvania, New York, Eastern Ontario |
| | 16 | 3.8 | 1R | Ohio, Pennsylvania, Southern Ontario |
| | 19 | 3.7 | 1M | Pennsylvania, New York, Eastern Ontario |
| Sutton | 13 | 4.0 | 2R | New Jersey, New York |
| | 14 | 4.1 | 1R | Pennsylvania, New York |
| | 16 | 4.0 | 14R | Virginia, Pennsylvania, New York |
| Montmorency | 13 | 4.5 | 16S | Atlantic Ocean, New England, Southern Quebec |
| | 14 | 4.3 | 4S | New England, New York, Southern Quebec |
| | 16 | 3.9 | 8R | Virginia, Pennsylvania, New York, Southern Quebec |

continued on page 8.

r = rain (mm), s = snow (cm), m = mixed rain and snow (mm)

| STATION | temperature | | | | precip. ptot | st | wind max | | STATION | temperature | | | | precip. ptot | st | wind max | |
|------------------------------|-------------|------|------|------|--------------|----|----------|-----|-----------------------------|-------------|------|-----|------|--------------|----|----------|-----|
| | moy | anom | max | min | | | dir | vit | | moy | anom | max | min | | | dir | vit |
| British Columbia | | | | | | | | | Ontario | | | | | | | | |
| Cape St James | 7P | 1P | 10P | 4P | 18P | * | 170 | 85 | Big Trout Lake | -10P | -1 | -3P | -22P | 6P | 46 | 040 | 76 |
| Cranbrook | -1P | 2P | 3P | -8P | 1P | 1 | | * | Gore Bay | 3P | 1P | 13P | -4P | 15P | 0 | 170 | 89 |
| Fort Nelson | -20 | -6 | -13 | -28 | 1 | 48 | | * | Kapuskasing | -2 | 3 | 9 | -10 | 32 | 6 | 220 | 63 |
| Fort St John | -11 | -4 | 0 | -22 | 4 | 13 | 350 | 52 | Kenora | -7P | -2P | -3P | -11P | 4P | 34 | 330 | 52 |
| Kamloops | 2 | 1 | 9 | -5 | 0P | 0 | 290 | 41 | London | 4 | 1 | 17 | -2 | 37 | 0 | 180 | 76 |
| Penticton | 3 | 1 | 7 | -5 | 7 | 0 | 190 | 69 | Moosonee | 0 | 5 | 9 | -5 | 21 | 4 | 110 | 43 |
| Port Hardy | 5 | 1 | 9 | 0 | 64 | 0 | 100 | 65 | North Bay | -1 | 0 | 14 | -8 | 9P | 2 | 170 | 72 |
| Prince George | 0P | 4 | 5P | -4P | 5P | 1 | 180 | 57 | Ottawa Int'l | 2 | 2 | 15 | -6 | 10P | 3 | | X |
| Prince Rupert | 4 | 1 | 9 | 0 | 71 | 0 | 170 | 81 | Petawawa | 1P | 2P | 15P | -10P | 5P | 5 | | X |
| Revelstoke | 2P | 2P | 5P | -2P | 10P | 0 | 150 | 31 | Pickle Lake | -8P | 0P | -4P | -14P | 13P | 44 | 330 | 59 |
| Smithers | -1 | 3 | 5 | -4 | 2P | 1 | 110 | 31 | Red Lake | -8P | 0P | -6P | -10P | 1P | 54 | 330 | 67 |
| Vancouver Int'l | 7 | 2 | 11 | 2 | 59 | 0 | 100 | 50 | Sudbury | -1P | 1P | 11P | -7P | 14P | 1 | | X |
| Victoria Int'l | 7P | 1P | 12P | 0P | 23P | 0 | 130 | 41 | Thunder Bay | -2P | 1P | 5P | -10P | 47P | 1 | 280 | 63 |
| Williams Lake | -1 | 2 | 5 | -8 | 3 | 1 | | X | Timmins | -2 | 2 | 12 | -12 | 25P | 10 | 220 | 65 |
| Yukon Territory | | | | | | | | | Toronto Int'l | | | | | | | | |
| Watson Lake | -18 | -2 | -11 | -33 | 6 | 33 | | * | Trenton | 3 | 0 | 14 | -5 | 21P | 0 | | X |
| Whitehorse | -8P | 2P | 1P | -19P | 2P | 11 | 150 | 81 | Warton | 3 | 0 | 19 | -4 | 14P | 0 | | X |
| Northwest Territories | | | | | | | | | Windsor | | | | | | | | |
| Alert | -23P | 4P | -8P | -31P | 3P | 45 | 210 | 91 | | 6 | 2 | 18 | -1 | 34 | 0 | 240 | 83 |
| Baker Lake | -28 | -8 | -10 | -35 | 4 | 47 | | * | Québec | | | | | | | | |
| Cambridge Bay | -34 | -10 | -28 | -37 | 2P | 10 | 120 | 35 | Bagotville | 0 | 3 | 10 | -6 | 14P | 10 | 290 | 57 |
| Cape Dyer | -13 | 2 | -1 | -26 | 84 | * | 090 | 67 | Blanc Sablon | 0 | * | 7 | -10 | 17 | 0 | | X |
| Clyde | -18 | 1 | -5 | -29 | 5 | 25 | 300 | 70 | Inukjuak | -5P | 3P | 0P | -16P | 26P | 19 | 050 | 85 |
| Coppermine | -31P | -9 | -23P | -36P | 1P | 19 | 100 | 46 | Kuujuuaq | -5 | 4 | 3 | -18 | 12P | 17 | 290 | 63 |
| Coral Harbour | -18 | -1 | -10 | -27 | 8P | 8 | | X | Kuujuuarapik | -2 | 3 | 5 | -11 | 25 | 11 | 300 | 72 |
| Eureka | -33 | -1 | -18 | -42 | 1P | 4 | 110 | 44 | Maniwaki | 1 | 2 | 13 | -10 | 16 | 8 | 190 | 61 |
| Fort Smith | -18 | -6 | -2 | -34 | 4P | 34 | | X | Mont Joli | 1 | 3 | 11 | -7 | 17 | 3 | 270 | 70 |
| Iqaluit | -10 | 3 | 1 | -25 | 4 | 17 | 080 | 80 | Montréal Int'l | 3 | 2 | 15 | -5 | 16 | 3 | 250 | 67 |
| Hall Beach | -24P | -3P | -10P | -36P | 11P | 43 | 300 | 57 | Natashquan | 0 | 2 | 6 | -9 | 15 | 0 | 330 | 59 |
| Inuvik | -33P | -12P | -25P | -41P | 2P | 25 | | X | Québec | 1P | 2P | 10P | -6P | 12P | 9 | 250 | 56 |
| Mould Bay | -33 | -5 | -25 | -40 | 2P | 15 | | X | Schefferville | -7 | 3 | 1 | -18 | 9 | 26 | 330 | 56 |
| Norman Wells | -30 | -11 | -22 | -38 | 5P | 13 | | X | Sept-Iles | 0 | 3 | 4 | -8 | 23 | 3 | 320 | 61 |
| Resolute | -26 | -1 | -19 | -34 | 4P | 27 | 030 | 54 | Sherbrooke | 1 | 3 | 14 | -7 | 23P | 5 | 270 | 57 |
| Yellowknife | -20P | -5P | -1P | -37P | 12P | 28 | 140 | 46 | Val D'or | -2 | 2 | 9 | -14 | 8 | 5 | 210 | 65 |
| Alberta | | | | | | | | | New Brunswick | | | | | | | | |
| Calgary Int'l | -2 | 2 | 6 | -11 | 0P | 0 | 360 | 43 | Charlo | 1 | 3 | 6 | -6 | 15P | 7 | 300 | 63 |
| Cold Lake | -7P | 0P | -1P | -14P | 1P | 3 | | * | Chatham | 2P | 2P | 14P | -7P | 8P | * | 060 | 78 |
| Coronation | -10 | -4 | -2 | -17 | 0 | 0 | | * | Fredericton | 2 | 2 | 14 | -5 | 42 | * | 350 | 67 |
| Edmonton Namao | -6 | 0 | 2 | -12 | 1P | 3 | 160 | 41 | Moncton | 2 | 1 | 15 | -6 | 41 | 1 | 350 | 96 |
| Fort McMurray | -12P | -3P | -1P | -19P | 3P | 27 | | X | Saint John | 3P | 2P | 13P | -3P | 66 | 0 | 120 | 74 |
| High Level | -20P | -8P | -13P | -32P | 6P | 36 | | * | Nova Scotia | | | | | | | | |
| Jasper | -4 | 2 | 4 | -14 | 2P | 1 | | X | Greenwood | 4P | 1P | 17P | -2P | 40P | 0 | 290 | 74 |
| Lethbridge | -1P | 1P | 9P | -16P | 0P | 1 | 270 | 70 | Shearwater | 5 | 1 | 14 | -2 | 86P | 0 | 330 | 72 |
| Medicine Hat | -6 | -3 | 7 | -16 | 2 | 1 | 180 | 46 | Sydney | 4P | 1P | 13P | -2P | 49P | 6 | 360 | 87 |
| Peace River | -11 | -2 | -1 | -19 | 4 | 6 | | * | Yarmouth | 5P | 1P | 14P | -2P | 67P | 0 | 290 | 80 |
| Saskatchewan | | | | | | | | | Prince Edward Island | | | | | | | | |
| Cree Lake | -10P | -1P | -5P | -21P | 4P | 31 | 190 | 41 | Charlottetown | 3 | 1 | 13 | -3 | 27P | 2 | 360 | 89 |
| Estevan | -11 | -7 | -2 | -23 | 3P | 10 | 310 | 46 | Summerside | 3P | 1P | 12P | -4P | 13P | * | 010 | 96 |
| La Ronge | -9P | 0P | -5P | -20P | 3P | 16 | 180 | 39 | Newfoundland | | | | | | | | |
| Regina | -11 | -5 | -3 | -21 | 3 | 9 | 150 | 33 | Cartwright | 0P | 2P | 3P | -4P | 45P | 4 | 330 | 83 |
| Saskatoon | -10 | -4 | -5 | -20 | 2 | 4 | | * | Churchill Falls | -5 | 3 | 1 | -12 | 19 | 50 | 310 | 56 |
| Swift Current | -9 | -4 | 2 | -17 | 1 | 6 | | X | Gander Int'l | 1 | 0 | 10 | -5 | 49 | 0 | 340 | 76 |
| Yorkton | -9 | -3 | -2 | -18 | 5P | 6 | 160 | 37 | Goose | -2 | 2 | 3 | -10 | 17 | 10 | 310 | 65 |
| Manitoba | | | | | | | | | Port-Aux-Basques | | | | | | | | |
| Brandon | -12 | -6 | -3 | -22 | 10P | 14 | 330 | 43 | St John's | 4P | 1P | 9P | 0P | 49P | 0 | 330 | 111 |
| Churchill | -21P | -8P | -4P | -35P | 5P | 27 | 180 | 46 | St Lawrence | 2 | 0 | 8 | -3 | 40 | 0 | 330 | 67 |
| Lynn Lake | -13P | -1P | -7P | -20P | 2P | * | 160 | 31 | Wabush Lake | 4 | 1 | 11 | -2 | 50 | 0 | | X |
| The Pas | -8 | 0 | -5 | -13 | 3 | 12 | 160 | 37 | | -7 | 3 | 2 | -18 | 5 | 19 | 340 | 56 |
| Thompson | -13 | -2 | -6 | -25 | 4 | 27 | | * | 898/11/15-88/11/21 | | | | | | | | |
| Winnipeg Int'l | -8 | -3 | -1 | -17 | 17P | 9 | 350 | 70 | | | | | | | | | |

mean = mean weekly temperature, °C
 max = maximum weekly temperature, °C
 min = minimum weekly temperature, °C
 anom = mean temperature anomaly, °C
 ptot = weekly precipitation total in mm
 st = snow thickness on the ground in cm
 dir = direction of max wind, deg. from north.
 vit = wind speed in km/h
 - Annotations -
 X = no observation
 P = less than 7 days of data.
 * = missing data when going to printing.

Acid Rain continued from page 6

from November 13 to 19, 1988

| SITE | DAY | pH | AMOUNT | AIR PATH TO SITE |
|------------|-----|-----|--------|------------------|
| Kejimkujik | 13 | 5.2 | 20R | Atlantic Ocean |
| | 16 | 4.7 | 2R | Atlantic Ocean |
| | 17 | 5.2 | 23R | Atlantic Ocean |

r = rain (mm), s = snow (cm), m = mixed rain and snow (mm)

