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Climatic Perspectives

A WEEKLY REVIEW OF CANADIAN CLIMATE

MAY 13,1983 (Aussi disponible en français) VOL 5 NO 19

FOR THE PERIOD MAY 3-9, 1983

• Southern Ontario-Tornado update:

Photo by M.J. Newark

On May 2, severe thunderstorms spawned at least 8 tornadoes in southern Ontario. No deaths occurred, however 12 people were injured, 2 seriously. The full extent of the damage has not yet been appraised, but it may easily be in many millions of dollars. Above, photograph of Kerringan's fruit market at Reeces Corners after a tornado ripped through the area. /page 8

(also see "TORNADOES IN SOUTHERN ONTARIO", Climatic Perspectives Vol. 5, No. 18)

• El Niño believed to be the cause of the mild Canadian winter /page 6-7

and much more inside.....

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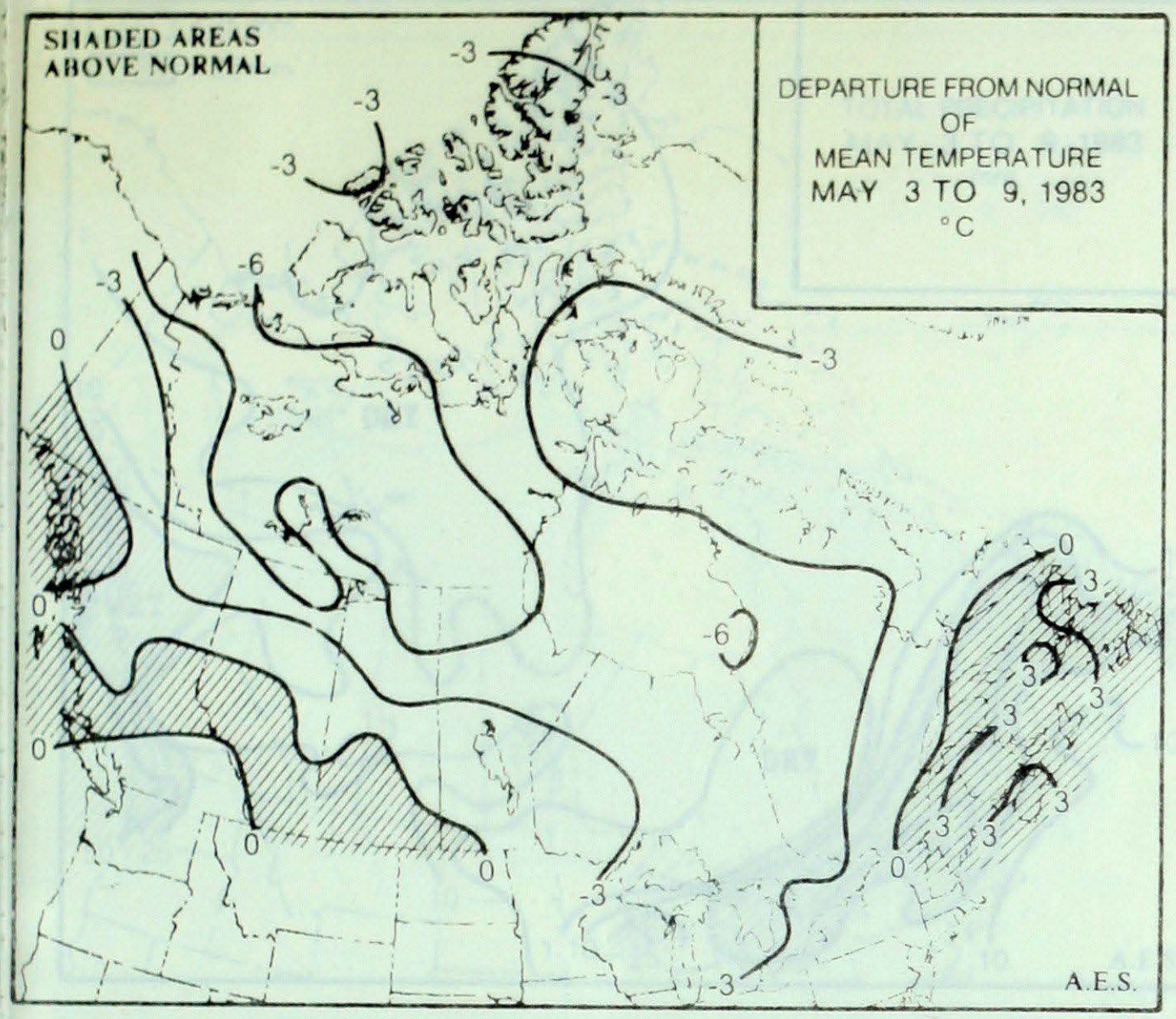
NOTE: The data shown in this publication are based on unverified reports from approximately 225 Canadian synoptic stations.

Canada



WEEKLY TEMPERATURES EXTREMES (°C)

	MAXIMUM		MINIMUM	
YUKON TERRITORY	16.6	Whitehorse	-27.2	Shingle Point
NORTHWEST TERRITORIES	10.7	Fort Smith	-34.1	Cape Young
BRITISH COLUMBIA	22.5	Penticton	-3.1	Puntzi Mt.
ALBERTA	21.6	Medicine Hat	-10.5	Fort Chipewyan
SASKATCHEWAN	23.1	Estevan	-14.9	Collins Bay
MANITOBA	21.6	Gretna	-25.2	Churchill
ONTARIO	22.8	Toronto	-21.0	Winisk
QUEBEC	22.7	Sutton Jnct	-18.8	Inoucdjouac
NEW BRUNSWICK	22.5	Chatham	-2.4	Charlo
NOVA SCOTIA	21.4	Greenwood	-1.2	Truro
PRINCE EDWARD ISLAND	19.1	Summerside	0.9	East Point
NEWFOUNDLAND	20.7	St. Johns	-11.3	Hopedale

ACROSS THE NATION

Warmest mean temperature	12.6	Greenwood, NS
Coolest mean temperature	-19.8	Eureka, NWT

ACROSS THE COUNTRY...

Yukon and the Northwest Territories

After several weeks of balmy weather, temperatures dropped to just below normal in the Yukon. Elsewhere, readings were 3 to 8 degrees below normal. An influx of moist air from the Gulf of Alaska kept a pall of dark clouds over the Yukon. Mixture of rain and snow fell several times during the week west of the Mackenzie valley. Tungsten received the most snowfall, 27 cm. precipitation in northern Yukon, further deteriorated roads; vehicles weight restrictions continue to be imposed on northern Yukon highways.

British Columbia

Relatively pleasant spring weather gave way to a more unsettled regime after mid-week. Mean temperatures were near normal except in northern region, where occasional snow and cold Arctic air failed to relinquish its grip.

The forest fire hazard is rated moderate along the north coast and in parts of the interior. On May 8, hail damage occurred to fruit trees in the Osyoos and Oliver districts of the southern Okanagan valley.

Prairie Provinces

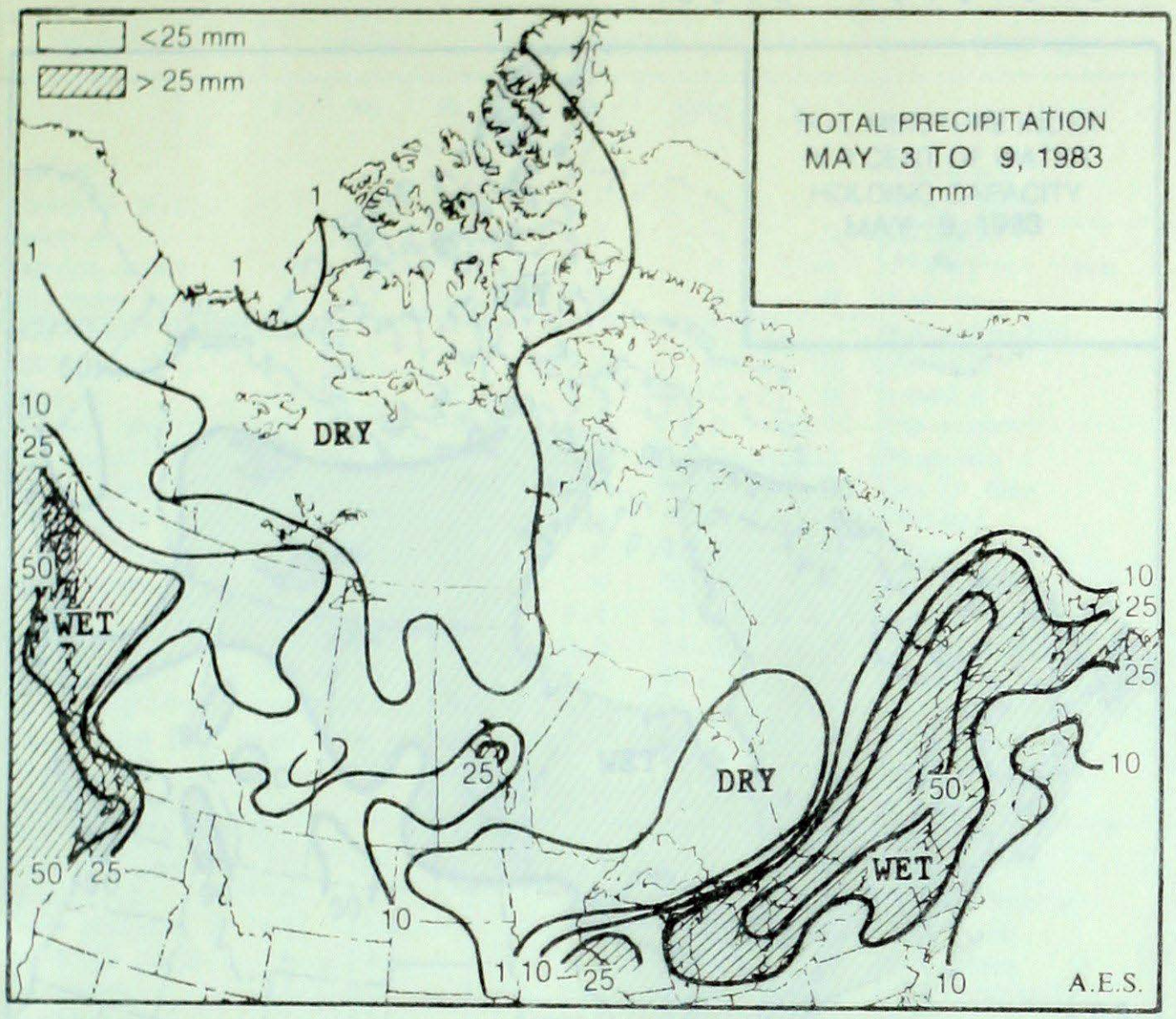
Weather systems gave generally unsettled weather to most regions. On May 8, more than 20 cm of new snow was reported in the Alberta foot-hills.

Seeding has commenced in the south, but is progressing slowly due to the recent cool spring weather and resultant below normal soil temperatures. Grain crops seeded last Autumn have fared very well through this past mild winter.

Since April 1, many areas of southern Prairies have received only 15 per cent of their precipitation total, but little concern has been expressed due to ample soil moisture reserves.

Ontario

Lately, rain during the weekend has become a common occurrence



WEEKLY TOTAL PRECIPITATION EXTREMES (mm)

YUKON	27.0	Tungsten
NORTHWEST TERRITORIES	19.4	Fort Smith
BRITISH COLUMBIA	69.4	Cape Scott
ALBERTA	20.8	Peace River
SASKATCHEWAN	18.6	Wynyard
MANITOBA	27.0	Norway House
ONTARIO	76.8	Britt
QUEBEC	109.4	Baie Comeau
NEW BRUNSWICK	22.4	Saint John
NOVA SCOTIA	19.8	Yarmouth
PRINCE EDWARD ISLAND	17.3	Charlottetown
NEWFOUNDLAND	56.0	St. Lawrence

ICE

Predominantly southerly flow of mild air contributed to a rapid erosion and decay of the southern edge of pack ice. The pack ice was now confined to areas north of the Baie Verte Peninsula. An open water lead, about 40 km, wide existed up the Labrador coast to near Saglek Bay. However, periods of northerly winds may temporarily close the shore lead along the Baie Verte Peninsula. The Gulf of St. Lawrence was now completely open water.

in southern Ontario; the past weekend being no exception. Heavy downpours of 30-45 mm caused local flooding in the already rain-soaked southern Ontario. At Wiarton, 44 mm of rain on May 7, even exceeded the record 24-hours rainfall for May (40 mm). In addition, cold temperatures turned rain to snow that reached as far south as Lake Ontario; at North Bay, 12 cm of new snow remained on the ground by the end of the week.

Owing to the heavy rains, field-work in southern Ontario has been delayed 2 to 3 weeks.

Québec

Heavy rains of 70-110 mm caused flooding in several areas of southern Québec. Communities south of Montréal experienced extensive flooding when the Richelieu River flooded; residents had to abandon their homes. Other major flood-affected areas included Ottawa valley and the suburbs of Québec city where rainfall amounted to about 80 mm.

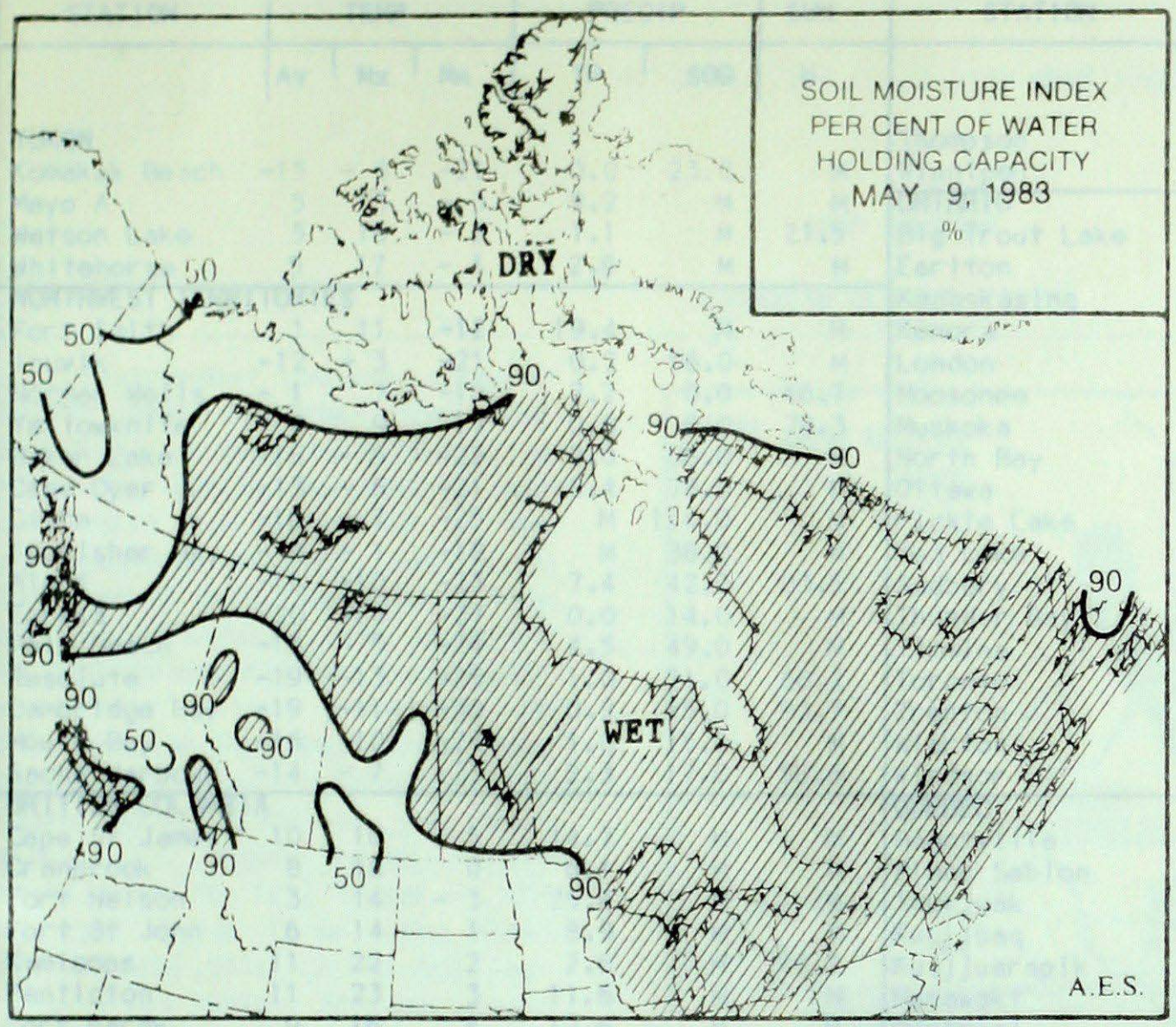
Since the beginning of May, several southern Québec stations have already received more than their normal monthly rainfall; for example, 116 mm has fallen at Québec city compared to the monthly mean of 86 mm.

Snow and cold temperatures dominated northern Québec's weather. New snow added to the snow cover; at Inukjuak, snow on the ground increased from 11 to 70 cm in one week. Because of the heavy rains, agricultural areas were completely saturated. Field-work was at a standstill.

Atlantic Provinces

Southerly flow of mild air kept temperatures 2 to 5 degrees above normal across the Provinces. Owing to the mild spring weather growth of the winter wheat crop was 2 weeks ahead of schedule in Nova Scotia and 3 weeks ahead of schedule in Prince Edward Island. Heavy rains abated in New Brunswick; water level in the Saint John River was now receding, and by the week's end, it was below the critical stage. Fields remained saturated, and heavy farm machinery could not be used.

SOIL MOISTURE



Soil Moisture Index

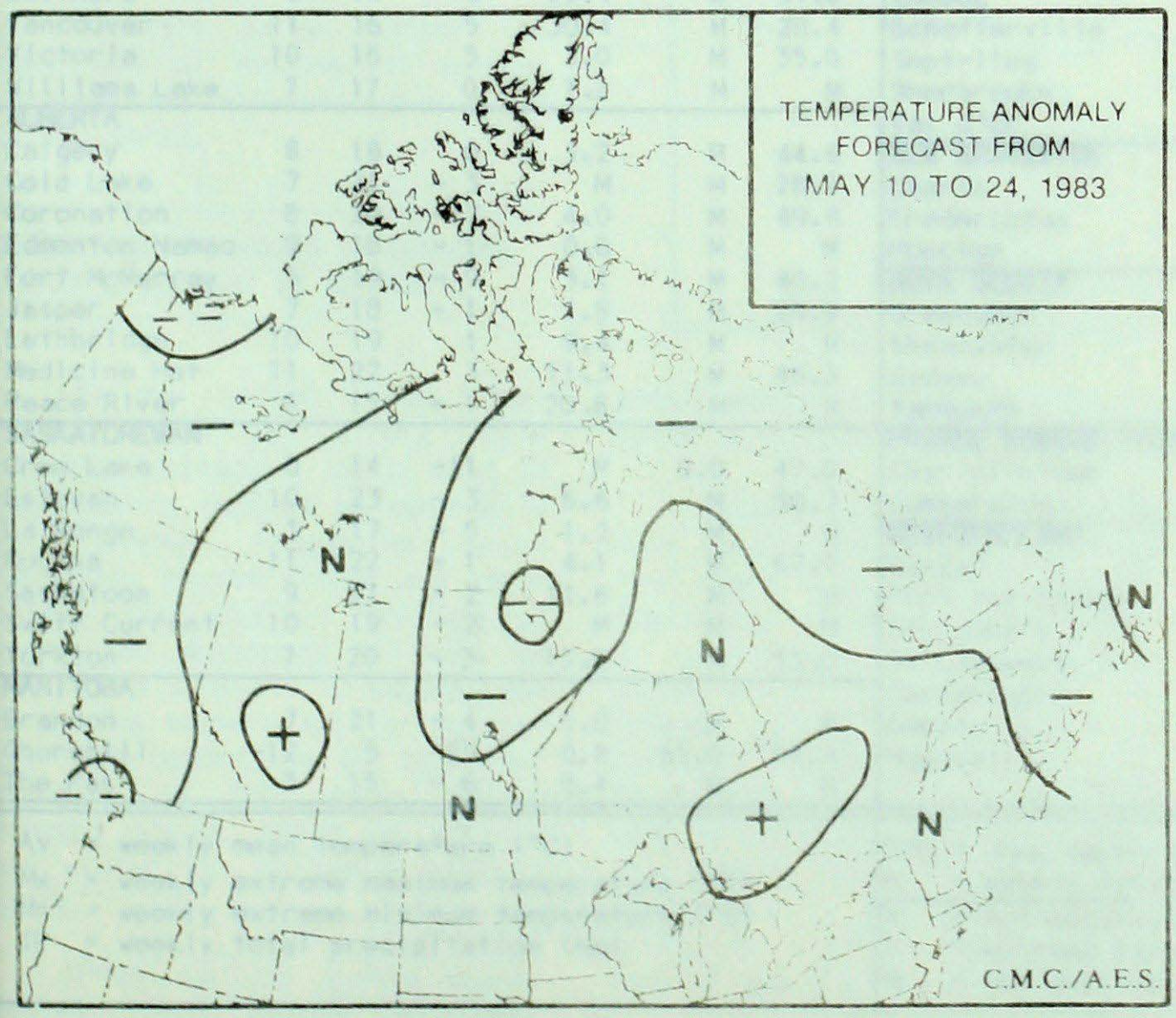
A derived index mapped as a percentage of the assumed soil water holding capacity at each station. It is a relative indicator of the moisture status of the soil.

100 = completely saturated

50 = 50% of assumed holding capacity

0 = absolutely dry

TEMPERATURE ANOMALY FORECAST



Temperature Anomaly Forecast

The temperature anomaly forecast, for each of the 70 canadian stations, is prepared by doing a search of historical weather maps to find cases similar to the present. The principle used is that a prediction for the next 15 days may be based on what is known to have actually happened during the 15-day periods. After the five best sets are selected, the surface temperature anomalies are calculated. This results in five separate forecasts. These are then averaged to provide the consensus forecast depicted.

++ much above normal

\+ above normal

N normal

\- below normal

-- much below normal

TEMPERATURE PRECIPITATION AND BRIGHT SUNSHINE DATA FOR THE WEEK ENDING 0100 EST MAY 10, 1983

STATION	TEMP			PRECIP		SUN
	Av	Mx	Mn	TP	SOG	H
YUKON						
Komakuk Beach	-15	- 8	-21	0.0	23.0	M
Mayo A	5	13	- 3	9.2	M	M
Watson Lake	5	16	- 3	1.1	M	21.5
Whitehorse	5	17	- 3	2.8	M	M
NORTHWEST TERRITORIES						
Fort Smith	1	11	-12	19.4	M	M
Inuvik	-12	- 3	-21	0.2	56.0	M
Norman Wells	- 1	7	-10	2.2	0.0	48.7
Yellowknife	- 4	9	-17	0.0	0.0	78.3
Baker Lake	-16	- 5	-22	0.0	86.0	M
Cape Dyer	-13	- 6	-21	8.4	78.0	M
Clyde	-16	- 7	-25	M	114.0	M
Frobisher Bay	- 8	- 1	-18	M	38.0	M
Alert	-16	-10	-23	7.4	42.0	83.5
Eureka	-20	-14	-27	0.0	14.0	M
Hall Beach	-13	- 5	-24	4.5	49.0	M
Resolute	-19	-13	-25	1.0	21.0	66.2
Cambridge Bay	-19	-11	-30	0.2	45.0	93.7
Mould Bay	-16	-10	-24	1.0	15.0	M
Sachs Harbour	-14	- 7	-23	2.3	17.0	58.6
BRITISH COLUMBIA						
Cape St James	10	16	5	14.7	M	M
Cranbrook	8	18	0	6.1	M	M
Fort Nelson	3	14	- 3	25.4	M	M
Fort St John	6	14	1	8.9	M	M
Kamloops	11	22	2	2.6	M	49.2
Pentlcton	11	23	3	11.6	M	M
Port Hardy	9	16	4	17.6	M	M
Prince George	8	16	- 1	4.9	M	41.6
Prince Rupert	8	12	0	35.9	M	30.3
Revelstoke	11	22	3	14.6	M	38.1
Smithers	8	14	0	29.4	M	31.0
Vancouver	11	16	5	30.4	M	28.4
Victoria	10	16	5	3.0	M	35.0
Williams Lake	7	17	0	7.2	M	M
ALBERTA						
Calgary	8	18	0	3.2	M	44.6
Cold Lake	7	21	- 3	M	M	28.2
Coronation	8	20	- 7	4.0	M	49.8
Edmonton Namao	9	18	- 1	0.8	M	M
Fort McMurray	5	19	- 9	3.1	M	40.2
Jasper	7	18	- 1	1.8	M	25.9
Lethbridge	10	19	1	9.4	M	M
Medicine Hat	11	22	3	11.3	M	46.3
Peace River	6	15	- 1	20.8	M	M
SASKATCHEWAN						
Cree Lake	0	14	-11	M	0.0	47.0
Estevan	10	23	- 3	6.6	M	50.7
La Ronge	3	17	- 5	1.2	M	M
Regina	11	22	- 1	4.1	M	67.9
Saskatoon	9	21	- 2	11.6	M	M
Swift Current	10	19	- 2	M	M	M
Yorkton	7	20	- 3	13.5	M	53.0
MANITOBA						
Brandon	7	21	- 4	5.0	M	M
Churchill	-12	5	-25	0.8	65.0	58.4
The Pas	3	15	- 6	8.4	M	M
Thompson	0	16	-11	0.0	0.0	67.0
Winnipeg	5	20	- 7	0.2	M	76.5
ONTARIO						
Big Trout Lake	- 4	13	-18	13.9	3.0	M
Earlton	3	14	- 7	M	M	M
Kapuskasing	2	13	- 9	0.4	M	M
Kenora	7	18	- 4	1.2	M	M
London	8	20	- 2	30.5	M	44.9
Moosonee	- 2	10	-12	0.2	M	M
Muskoka	7	14	- 4	67.7	M	M
North Bay	4	15	- 5	48.6	0.0	44.1
Ottawa	8	15	0	46.3	M	21.0
Pickle Lake	1	18	- 9	1.2	M	M
Red Lake	4	18	- 7	3.4	M	77.4
Sudbury	4	16	- 5	17.2	M	45.8
Thunder Bay	3	15	- 6	0.0	M	M
Timmins	2	14	- 8	0.4	0.0	M
Toronto	8	23	- 1	18.7	M	M
Trenton	9	22	0	M	M	M
Wiarton	5	12	- 1	57.7	M	M
Windsor	9	22	0	22.7	M	M
QUEBEC						
Bagotville	5	15	- 1	88.0	1.0	M
Blanc Sablon	4	13	- 2	18.4	M	M
Inukjuak	-10	- 4	-19	11.6	70.0	20.6
Kuujjuaq	- 3	7	-12	2.6	4.0	M
Kuujjuarapik	- 8	3	-15	7.6	0.0	M
Manawaki	5	14	- 3	77.4	M	16.2
Montréal	9	17	1	39.8	M	18.9
Mont-Joli	5	14	0	69.8	M	22.0
Natashquan	4	11	- 4	27.4	M	M
Nitchequon	- 4	3	-12	11.6	21.0	47.0
Québec	8	16	1	81.5	M	19.0
Schefferville	- 5	3	-15	7.9	19.0	44.1
Sept-Iles	4	13	- 3	65.6	M	M
Sherbrooke	9	23	- 1	45.6	M	23.4
Val d'Or	2	12	- 7	5.6	M	45.9
NEW BRUNSWICK						
Charlo	7	18	- 2	17.4	M	M
Fredericton	12	21	0	12.2	M	M
Moncton	13	21	0	5.9	M	56.3
NOVA SCOTIA						
Greenwood	13	21	0	18.4	M	M
Shearwater	9	18	3	9.2	M	35.8
Sydney	10	19	0	10.2	M	M
Yarmouth	9	17	3	19.8	M	48.5
PRINCE EDWARD ISLAND						
Charlottetown	12	19	2	17.3	M	M
Summerside	12	19	3	13.4	M	M
NEWFOUNDLAND						
Gander	8	18	0	19.4	M	26.1
Port aux Basques	5	9	2	28.8	M	M
St. John's	8	21	- 2	21.8	M	M
St Lawrence	7	13	- 1	56.0	M	M
Cartwright	1	13	- 6	27.9	5.0	27.4
Goose	1	13	- 7	47.9	9.0	17.6
Hopedale	- 2	8	-11	6.0	27.0	M

Av = weekly mean temperature (°C)
Mx = weekly extreme maximum temperature (°C)
Mn = weekly extreme minimum temperature (°C)
TP = weekly total precipitation (mm)

SOG = snow depth on ground (cm), last day of the period
H = weekly total bright sunshine (hrs)

X = not observed
P = extreme value based on less than 7 days
M = not available at press time

Canadian Climate Centre,
Atmospheric Environment Service,
4905 Dufferin Street,
Downsview, Ontario,
CANADA M3H 5T4

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Telephone Enquiries: (416)667/4711/4906

EDITOR: A. Shabbar; ASSISTANT EDITOR: R. Sarrazin; WRITER: A. Radomski.

EL NIÑO: THE CHILD WITH MANY FACES

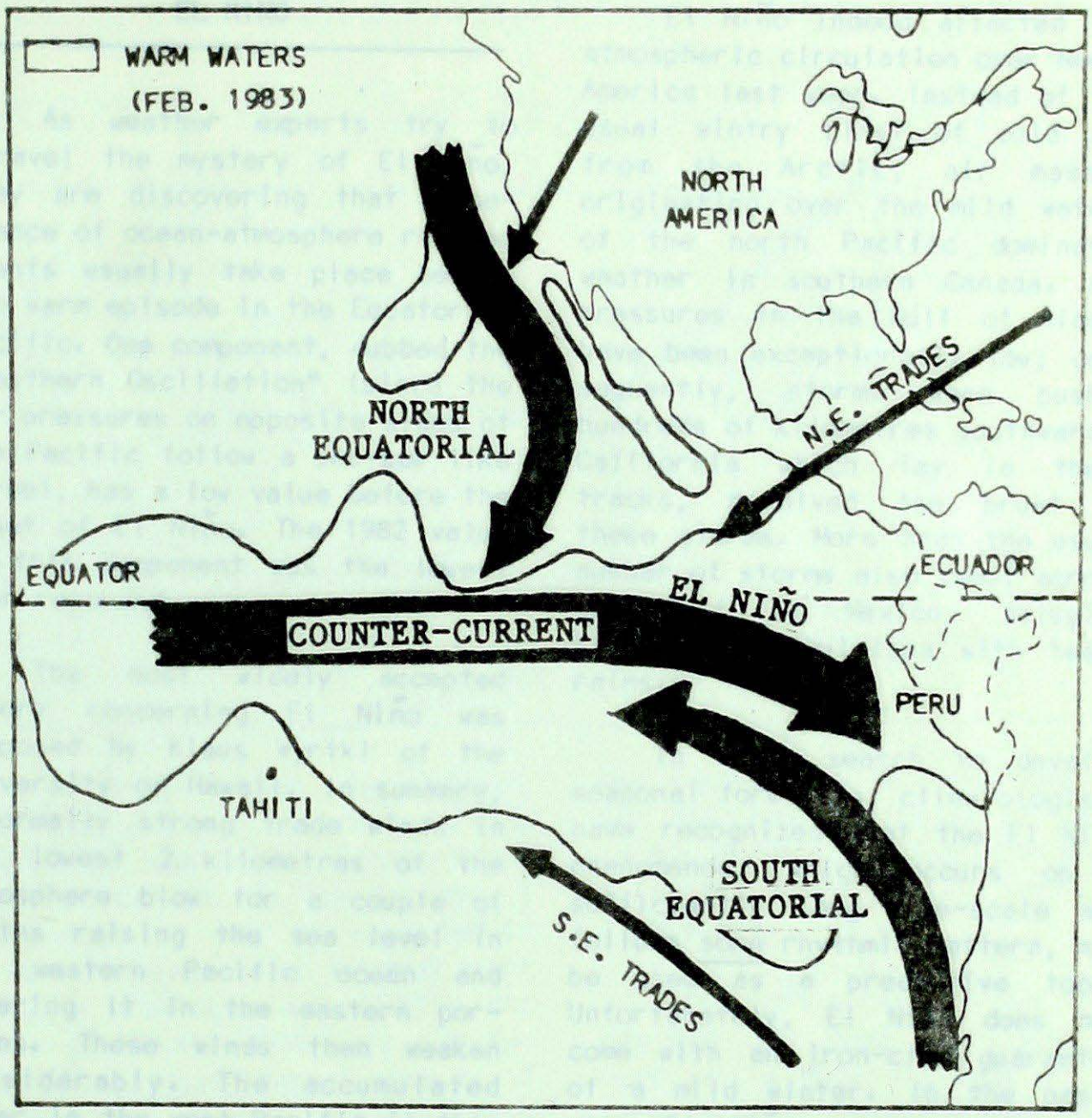
BY

AMIR SHABBAR

CANADIAN CLIMATE CENTRE

Environment Canada climatologist have confirmed that most Canadians escaped the bitter sting of winter during the 1982-83 season. With the exception of the northeastern Arctic, record to near-record mild temperatures were set across Canada. Some locations in Ontario experienced their mildest winter in half a century. On the Canadian Prairies winter temperatures were, on average, 5°C above normal, and in the Maritimes, 3°C above normal. Fruit trees were in full bloom in the Okanagan valley three weeks ahead of schedule this spring and logging in the central British Columbia came to a standstill in mid-March because of the early spring thaw.

Canada's balmy weather was only part of the unusual weather picture that affected other parts of the world.



DISASTEROUS FLOODING IN ECUADOR: RECORD DROUGHT IN AUSTRALIA

In the United States, torrential rain and strong winds pounded California, while most of the country enjoyed an abnormally mild winter. Staggering record rainfalls caused floods and landslides that claimed hundreds of lives and destroyed millions of dollars of property in Ecuador and Peru. The eastern half of Australia experienced one of its worst droughts in 200 years. Severe drought struck parts of Africa, and winter was unusually cold in India.

Other curious events accompanied these weather extremes. Millions of sea birds have fled their traditional nesting grounds on Christmas Island and many other islands in the mid-Pacific. Warm water mammals have shown up as far north as northern California.

Climatologists with Environment Canada and elsewhere believe that there is a common denominator explaining these confusing weather events. It is a phenomenon known as El Niño: A weak warm coastal current that develops off Peru and Ecuador around Christmas every year and that creates a vast body of warm water in the Equatorial Pacific Ocean. Peruvian fishermen gave it the name of "Corriente del Niño", in English "Current of the [Christ] Child".

During most of the year, the combined action of southeasterly trade winds and the Earth's rotation maintains the cold South Equatorial Current off western South America (see map). This cold current allows nutrient-rich water to upwell off Peru and Ecuador, thus providing one of the world's most productive fisheries. Every year, during the Christmas season the warm El Niño Current moves southward off Ecuador, literally blocking the nutrients from surfacing. A decrease in the quantity of phytoplankton available to the marine food chain causes a reduction in population of zooplankton, fish, sea birds and marine animals, but the effect is short-lived.

Occasionally however, the El Niño current is very intense and prolonged. Sea-surface temperatures rise 2-3°C above normal in

the equatorial eastern Pacific and may remain high for as long as 18 months. Fishery yields are significantly diminished, and unusually heavy rainfall in Ecuador and Peru results in flooding. In recent times, the term "El Niño" has come to be identified with the more extreme warming of the surface waters that occurs at intervals of 2 to 7 years. Since World War II, nine such El Niño events have occured, the more notable in 1957, 1965 and 1972-73.

1982-83 EL NIÑO STRONGEST ON RECORD YET TOTALLY UNEXPECTED

It is clear that the 1982-83 event will be the strongest on record and in many ways one of the most unusual. The 40-70 metre deep warm pool of surface water expanded from a few million square kilometres last October to nearly 30 million square kilometres by mid-March - an area about three times the size of Canada! Surface water temperatures were near 28°C with spot values up to 32°C: a startling 5°C above normal.

The 1982-83 El Niño caught most scientists off guard. In contrast to earlier El Niños, the 1982-83 event first manifested itself in the mid-Pacific rather than off Ecuador and Peru. Also, the strong easterly trade winds that usually precede El Niño were absent. Last year's El Chichón eruption compounded the problem; the Mexican volcano injected huge clouds of dust and aerosols into the atmosphere. Consequently, satellites over the Pacific were sensing temperatures which were, lower than true values.

By the end of October, when warm water appeared off western South America, it was clear that an El Niño of major proportions was occurring. And, as predicted, weather patterns were affected. Heavy rains caused flooding in Ecuador and Peru and elevated ocean temperatures resulted in the loss of a whole generation of anchovies off Peru. A high pressure area remained stagnant over the western Pacific and caused the driest season on record in Australia. In contrast, vigorous storms lashed the west coast of North and South America.

STRONG TRADE WINDS THAT WEAKEN SUDDENLY MAY SIGNAL THE ONSET OF EL NIÑO

As weather experts try to unravel the mystery of El Niño, they are discovering that a sequence of ocean-atmosphere related events usually take place before the warm episode in the Equatorial Pacific. One component, dubbed the "Southern Oscillation" (since the air pressures on opposite sides of the Pacific follow a see-saw like curve), has a low value before the onset of El Niño. The 1982 value of this component was the lowest ever recorded.

The most widely accepted theory concerning El Niño was proposed by Klaus Wyrtki of the University of Hawaii. In summary, abnormally strong trade winds in the lowest 2 kilometres of the atmosphere blow for a couple of months raising the sea level in the western Pacific ocean and lowering it in the eastern portions. These winds then weaken considerably. The accumulated water in the west Pacific is then transported to the east via the Equatorial Counter-Currents (much like water in a bathtub). The sea level and water temperature both increase along the South American Coast, burying the cool waters off Peru, and El Niño is born.

The burgeoning question remains: How does an oceanic process in Equatorial Pacific Ocean affect the winter in Canada? Climatologists at Environment Canada have been monitoring El Niño carefully. Computer models at Environment Canada's Canadian Climate Centre in Toronto revealed that the sea-surface temperature anomalies in the central equatorial Pacific may have a significant influence on winter climate in Canada. The development of a warm episode in the Equatorial Pacific is accompanied by a general warming of the Atmosphere near the equator. Since the equator-to-pole temperature difference is enhanced, the mean westerly air flow accelerates, bringing milder Pacific air over most of North America.

El Niño indeed affected the atmospheric circulation over North America last year. Instead of the usual wintry blast of cold air from the Arctic, air masses originating over the mild waters of the north Pacific dominated weather in southern Canada. Air pressures in the Gulf of Alaska have been exceptionally low; consequently, storms were pushed hundreds of kilometres southwards. California which lay in their tracks, received the brunt of these storms. More than the usual number of storms also swept across the Gulf of Mexico, deluging Florida and Louisiana with heavy rains.

In their search to develop seasonal forecasts, climatologists have recognized that the El Niño phenomenon, which occurs on a sufficiently long time-scale and follows some rhythmic pattern, may be used as a predictive tool. Unfortunately, El Niño does not come with an iron-clad guarantee of a mild winter. In the past, some El Niños accompanied very cold Canadian winters. When will the next strong El Niño develop and which of its many faces will it show in Canada? As yet, no one can answer these questions with certainty.

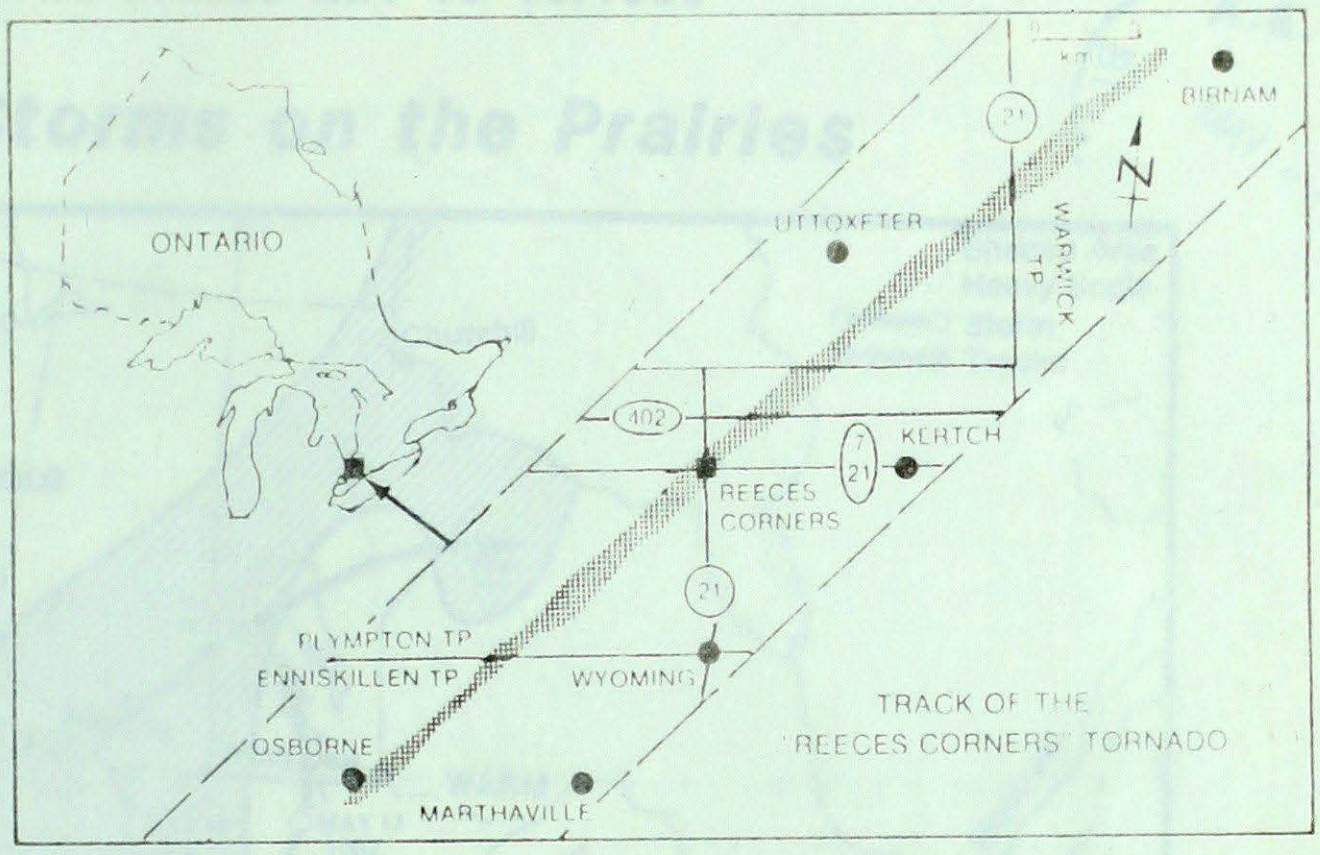
THE "REECES CORNERS" TORNADO

BY

M. J. NEWARK

CANADIAN CLIMATE CENTRE

Shortly after 1.00 p.m., on May 2, 1983 a severe tornado slashed across a part of southern Ontario in the vicinity of Sarnia, rated as an F4 (severe intensity, winds 330 to 415 km/h) on the Fujita F-scale. It touched down in Enniskillen Township, 9 kilometres west northwest of Petrolia. A continuous trail of destruction could be traced across Plympton and Warwick Townships for a distance of about 36 kilometres (see map) before the tornado lifted 5 kilometres west of Arkona. Damage width varied from 150 metres to 600 metres while damage area was 11 square kilometres. The path lay across a rural section of the province, and only one small community, the hamlet of Reeces Corners, was located on the damage track. Fortunately there were no human deaths, although 12 people were injured, 2 of them seriously. However, thousands of poultry and a number of cattle were killed in the flying debris.



This particular tornado was the most serious Canadian event in a series of May 2 tornadoes which progressed across the Great Lakes area. Tornadoes from the same family of storms also struck neighbouring U.S. States. At the time of writing, the outbreak is known to have produced at least 8 confirmed or suspected tornadoes on the Canadian side of the border (three of them in the vicinity of Toronto) and news of others is expected in due time.

On a statistical basis, a tornado of this magnitude was about due somewhere in southern Ontario. Records indicate that an F3 (winds 250-330 km/h) or stronger tornado can be expected there once every five years or so. The "Woodstock tornado" of 1979 was the last one in this category.

The area in which the "Reeces Corners" tornado occurred is located in the high tornado-risk-zone in Canada. On the average, 2 tornadoes per year are expected in a county-sized area in that part of the province, and a city the size of Sarnia (200 km^2) can expect bad tornado damage once in 10 years. For Reeces Corners (1.5 km^2) the risk is once in 1300 years!

In human terms, the extent of the damage caused by a tornado such as this one is difficult to comprehend unless it is actually witnessed. A number of farms along the track were completely flattened. Absolutely nothing remained of residences, barns, sheds, farm machinery except piles of rubble, and debris scattered across the fields. A poured concrete silo (a very strong and wind resistant structure) was demolished. Cars and trucks were overturned, and trees were splintered as if by an artillery barrage. For the people involved, especially the 50 families left homeless, it was a disaster. Yet the physical extent of the tornado was so localized that for the large majority of people in the three townships, the weather of May 2 was nothing more than a nuisance.

The full extent of the damage has not yet been appraised, but must be in many millions of dollars. Several large farming operations suffered individual losses exceeding a million dollars each and businesses in Reeces Corners also suffered extensively.

In one sense southern Ontario was lucky; the tornado travelled for more than 36 kilometres without striking a major population centre. History indicates however, there are no guarantees we will escape as easily the next time.