WEATHER AND CIRCULATION OF MAY 1975

Near-Record Warmth in the Great Lakes Region

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1. Mean circulation

The mean 700 mb flow during May was highly amplified over most of the Northern Hemisphere (Figs. 1, 2, and 3). Strong ridges protruded northward over the eastern Atlantic, eastern Europe, and northeastern Asia, disrupting the westerly flow in those areas; diversion of the westerlies to the north and south of the blocking ridges is apparent over Europe and eastern Asia (Fig. 3). The blocking ridges, themselves the locus of relatively warm air, advected quite cool air over western Asia and the north-central Pacific (Fig. 4). The latter advection, coupled with the pre-existing and long-standing warmth over middle latitudes of the Pacific, generated a strong thermal gradient over the northwestern and north-central Pacific. This enhanced supply of zonal available potential energy

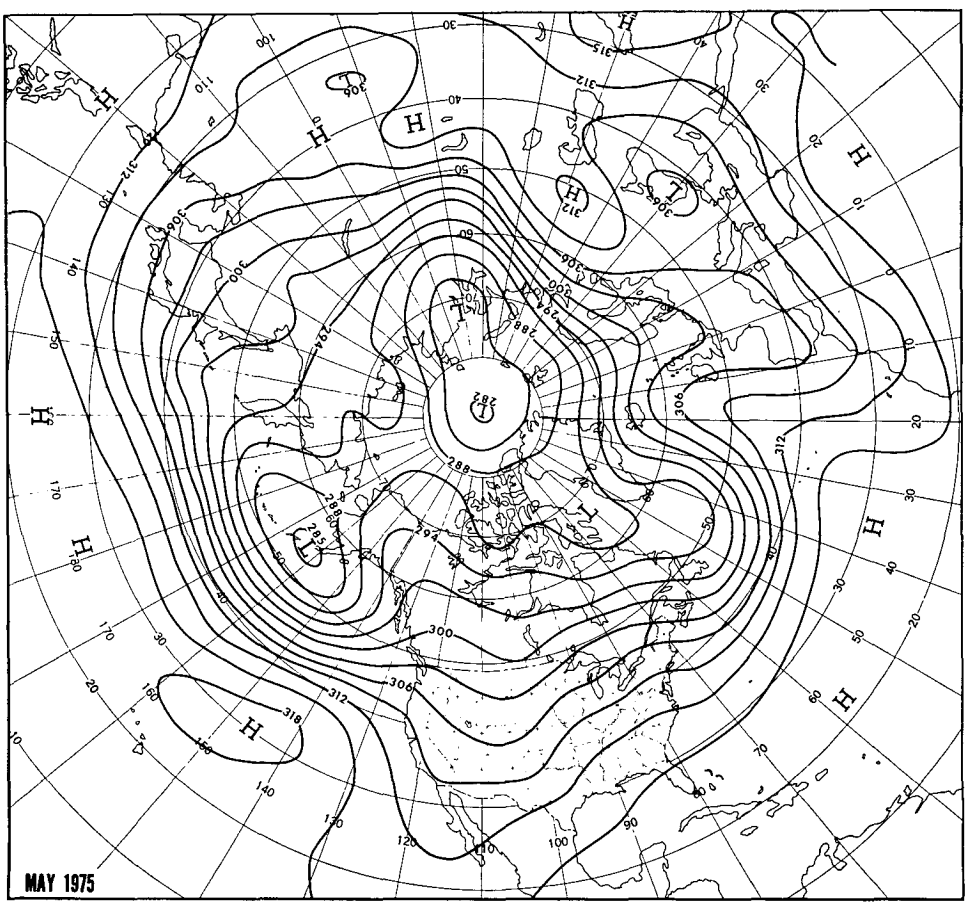


FIG. 1. Mean 700 mb height contours (dekameters) for May 1975.

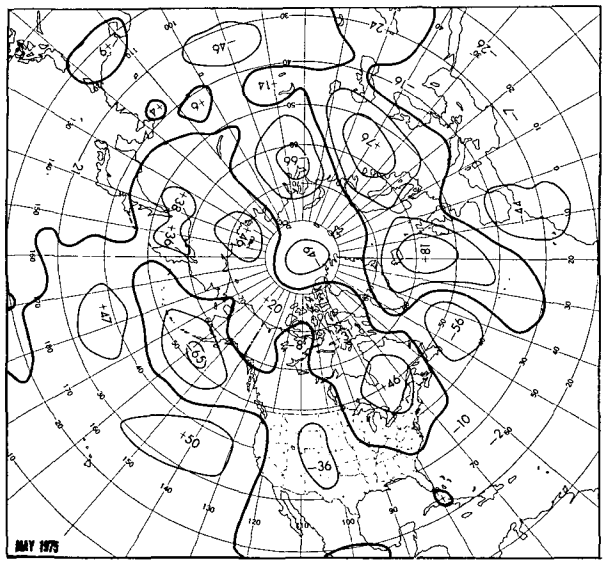


FIG. 2. Departure from normal of mean 700 mb height (m) for May 1975.

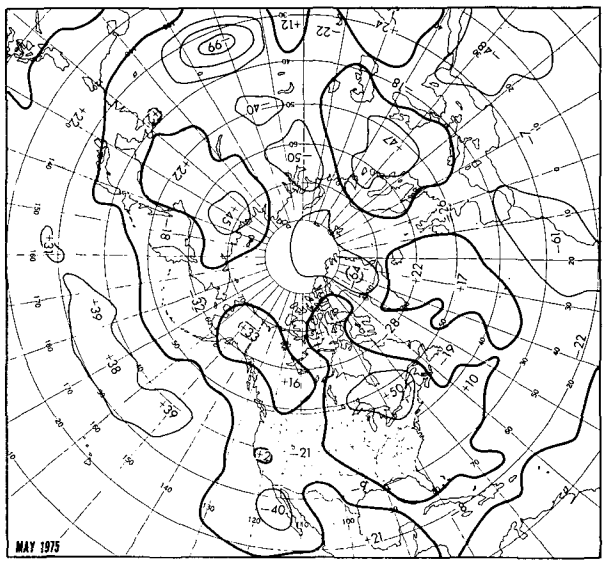


FIG. 4. Departure from normal of mean 1000 to 700 mb thickness (m) for May 1975.

apparently contributed to the development of a deep mean low and accompanying strong westerlies over the north Pacific. Along the wind speed maximum at 700 mb, the westerlies were more than 5 m s^{-1} above normal from 170°E to 136°W, representing a marked acceleration from the previous month (Wagner, 1975). It was primarily this acceleration which led to an increase from April to May in the 700 mb temperate westerlies index for the Western Hemisphere—an event which occurs in about one-third of the years.

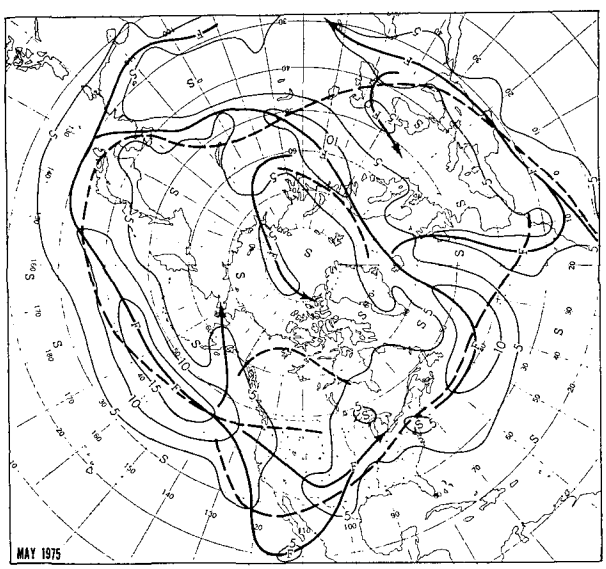


FIG. 3. Mean 700 mb geostrophic windspeed (m s^{-1}) for May 1975. Solid arrows are observed axes of maximum windspeed; dashed lines, the normal.

Over the United States, the western mean trough remained deep and essentially stationary while the eastern ridge progressed and amplified at middle latitudes. This amplification occurred as a mean ridge built over western Canada and the antecedent blocking ridge over Hudson Bay (Wagner, 1975) weakened.

2. Temperature

The persistent mean trough in the West kept mean temperatures below normal over much of the western half of the Nation (Fig. 5). Temperatures rose above normal in most of the West Coast states, however, where mean heights increased considerably from April to May. In response to the demise of the Hudson Bay block and the building ridge over the East, monthly mean temperatures warmed to above normal over most of the eastern half of the country for the first time since

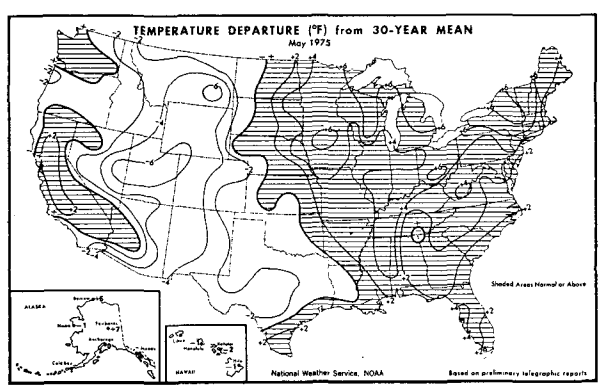


FIG. 5. Departure from normal of average surface air temperature (°F) for May 1975 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1975).

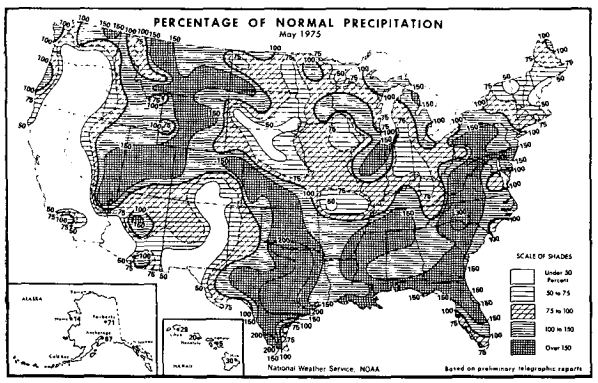


FIG. 6. Percentage of normal precipitation for May 1975 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1975).

February. From the northern Mississippi Valley through New England, mean temperatures rose from well below normal in April (Wagner, 1975) to among the warmest of record in May. It was the warmest May of record at Alpena, Mich., second warmest at Sault Ste. Marie, Mich., third warmest at Houghton Lake, Mich., and Burlington, Vt., and equal to the third warmest at Duluth, Minn. Several stations in the Northeast reported the warmest May since 1944. Well to the south, this was the warmest May of record at Tampa, Fla.

While interior Alaska experienced above normal temperatures under a somewhat stronger than normal mean ridge, western and southern coastal parts of the state mostly observed below normal temperatures. Below normal temperatures were also recorded in much of Hawaii.

3. Precipitation

Precipitation exceeded normal over most of the Rocky Mountain states in response to vorticity maxima moving from the Pacific to the western trough (Fig. 6). Storms moving out of the mean trough were concentrated on two tracks where precipitation also exceeded normal. One was near the weak Great Lakes wind speed maximum (Fig. 3); the other was across the South. This was the wettest May on record at Milford, Utah, and one of the wettest at Tallahassee, Fla. Record May snowfall was observed at Milford, Utah, and accumulations at Grand Junction, Colo., and Pocatello, Idaho, were among the largest of record.

The moderately strong ridge over Alaska coupled with a somewhat depressed storm track in the east Pacific brought subnormal precipitation to most of that state. Relatively dry conditions also prevailed in Hawaii where mean heights were above normal.

4. Variability within the month

a. April 28–May 4

Although Hudson Bay blocking was still strong early in May, cold advection east of the block was centered

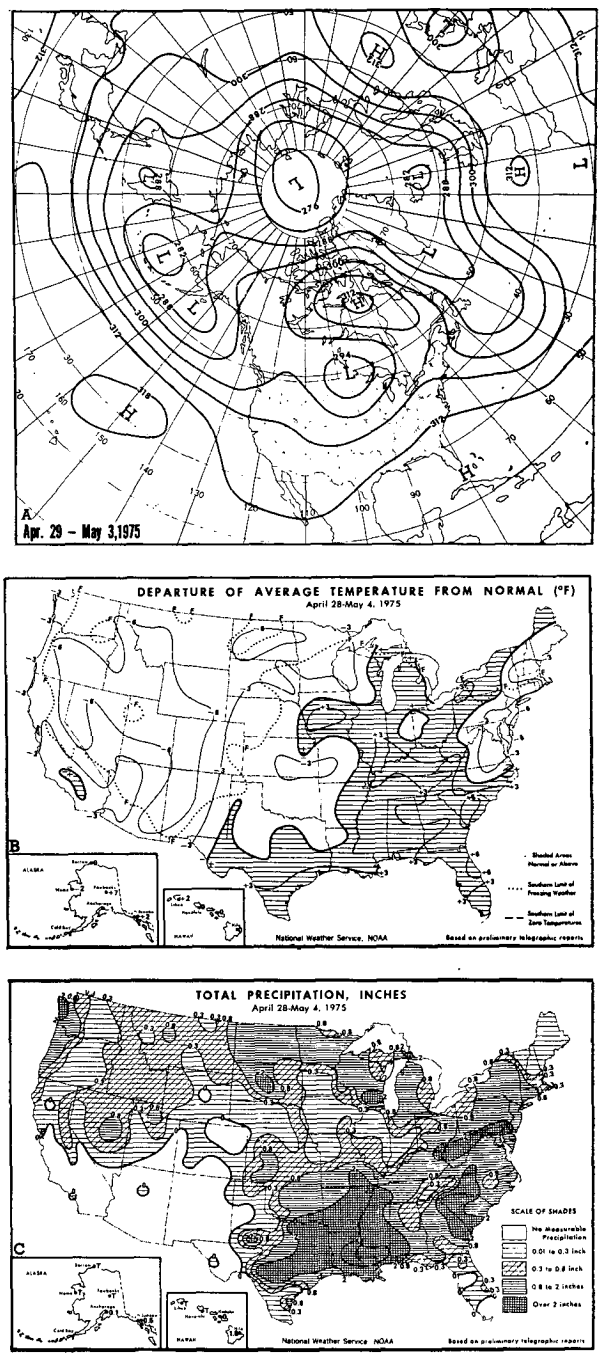
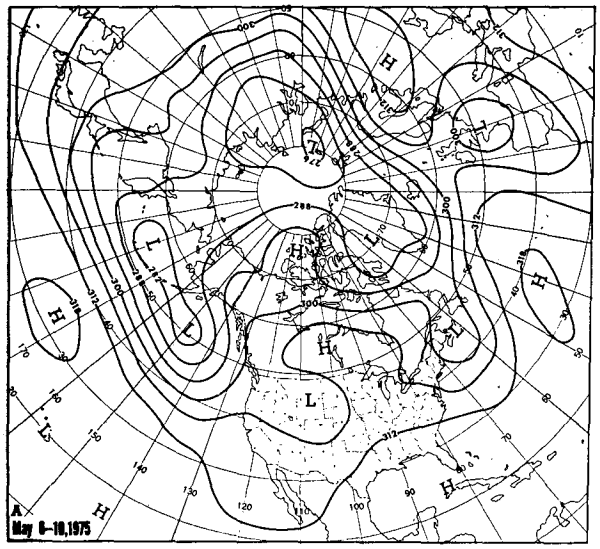
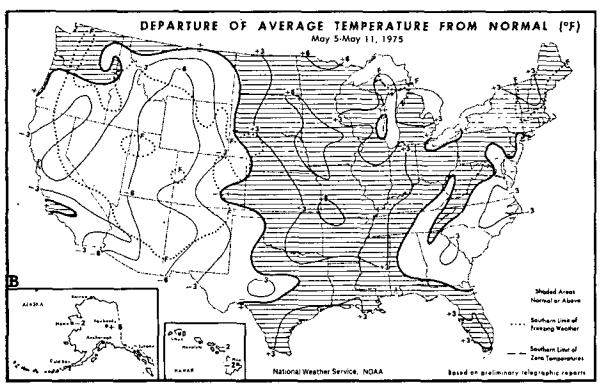


FIG. 7. (A) Mean 700 mb contours (dam) for 29 April–3 May 1975; (B) departure from normal of average surface air temperature (°F); and (C) total precipitation (inches) for week of 28 April–4 May, 1975 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1975).





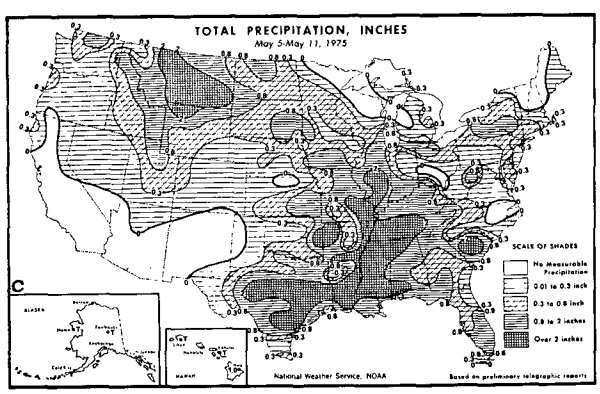
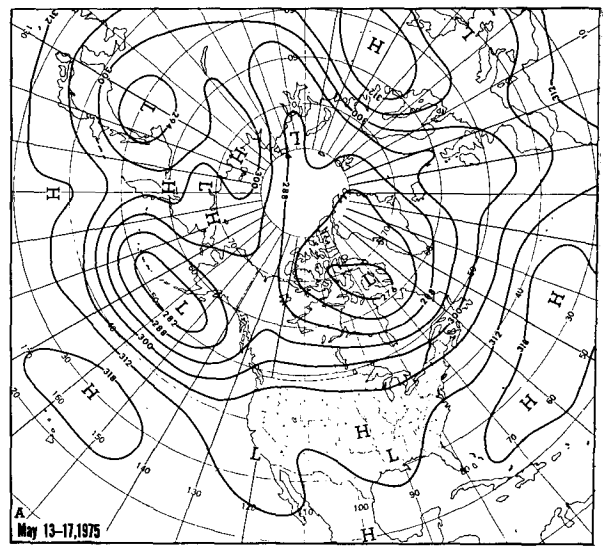
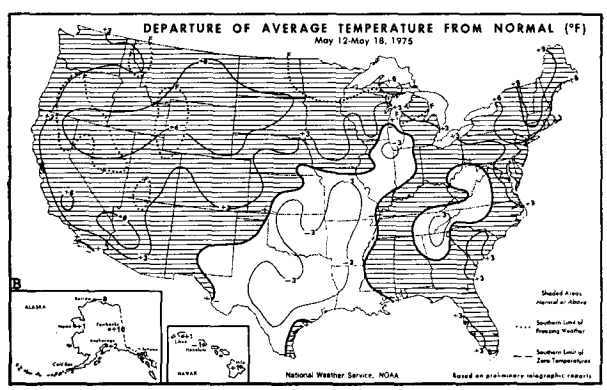


FIG. 8. Same as Fig. 7; (A) for 6–10 May 1975, (B) and (C) for week of 5–11 May 1975.

off the East Coast and influenced only the middle and north Atlantic Coast States (Fig. 7). Elsewhere over the United States a deep mean trough over the Great Plains and a moderately strong ridge in the East produced generally cold weather in the West and warm in the East.

Precipitation was widespread with greatest totals observed in the Gulf states in advance of the mean trough. Elko, Nev., had a near record May snowstorm (7.7 inches) on May 3 and 4 and Pocatello, Idaho, recorded its greatest 24 h May snowfall (4.6 inches) since 1910 on May 4.





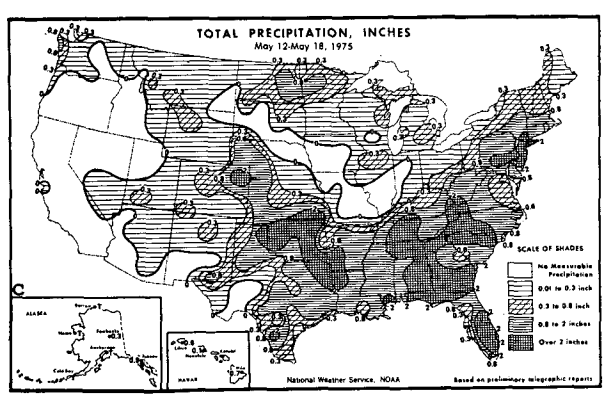
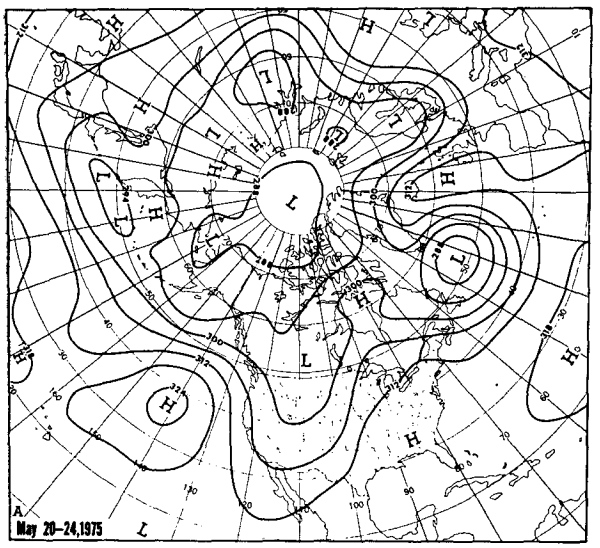
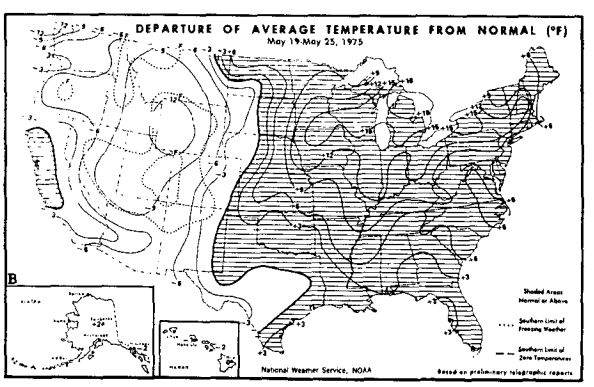


FIG. 9. Same as Fig. 7; (A) for 13–17 May 1975, (B) and (C) for week of 12–18 May 1975.

b. May 5–11

Despite the weakening and southward shift of the Hudson Bay block, the wave pattern over the United States and accompanying patterns of temperature and precipitation were quite similar to those of the previous week (Fig. 8). Coldest temperatures for so late in the season were observed at Albuquerque, N. Mex., on





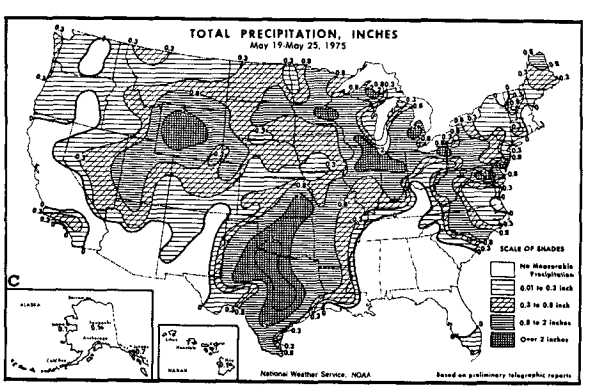
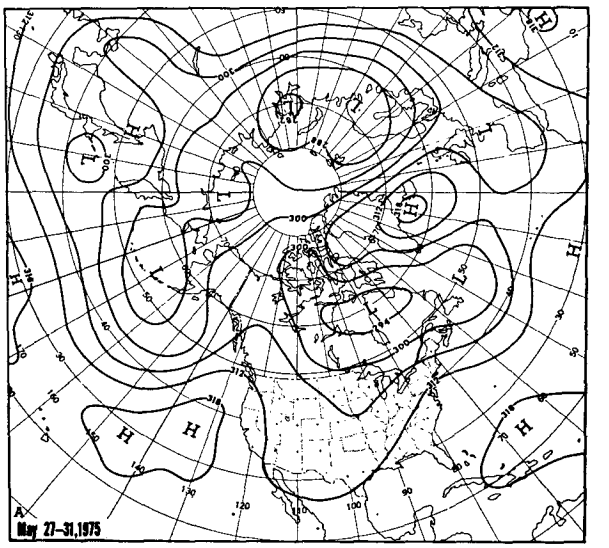
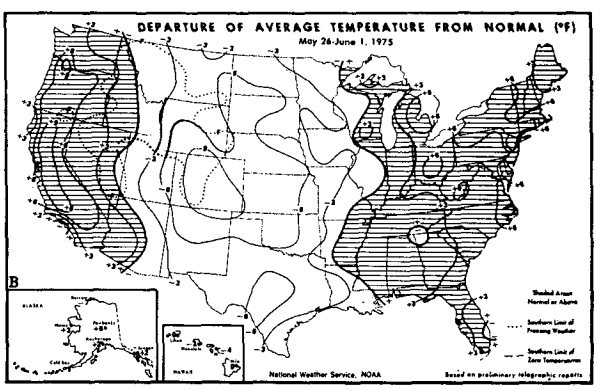


FIG. 10. Same as Fig. 7; (A) for 20–24 May 1975, (B) and (C) for week of 19–25 May 1975.





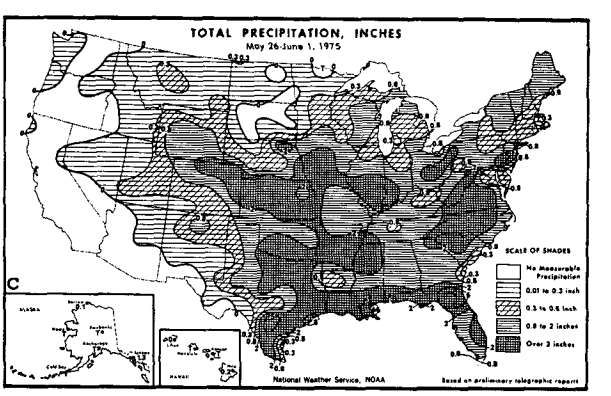


FIG. 11. Same as Fig. 7; (A) 27–31 May 1975; (B) and (C) for week of 26 May–1 June 1975.

May 6 and 7, and at El Paso, Tex., on May 8. Tornadoes were observed this week from Texas to South Dakota.

c. May 12–18

This was a week of rapid change over North America. Amplification and subsequent retrogression of the northwest Canada ridge brought a deep mean low near

Hudson Bay and fast, low amplitude flow along the Canada–United States border (Fig. 9). This produced warmer than normal temperatures over most of the Nation, but cool weather prevailed near the weak mean trough over the lower Mississippi Valley. Most of the week's precipitation was associated with two slow moving troughs that traversed the Nation in the southern fringe of the westerlies.

d. May 19–25

The mean flow pattern amplified this week from the eastern Pacific through the Atlantic bringing mean ridges to the east Pacific and the eastern United States and a deep mean trough to the West (Fig. 10). This highly amplified circulation regime produced the greatest temperature contrasts of the month in the United States. Mean temperatures varied from more than 12° below normal in western Wyoming to more than 18° above normal in Michigan. Coldest temperatures for so late in the season were observed at many locations west of the Continental Divide this week while warmest for so early was reported at Madison, Wisc., and Burlington, Vt.

Precipitation was concentrated under and in advance of the western mean trough and included a near record 31.5-inch snowstorm on May 19–21 at Lander, Wyo., and a record 24 h May snowfall (7.6 in.) on the 20th at Milford, Utah. As was the case two weeks earlier, tornadoes were widespread this week; they occurred from Texas to Minnesota and Michigan.

e. May 27–31

The amplified wave pattern progressed this week bringing the deep mean trough to the Great Plains and mean ridges to both West and East Coasts (Fig. 11). Both the pattern of temperature contrasts and the area of heavy precipitation moved eastward along with the mean wave pattern. Lowest temperature for so late in the season was recorded at Pocatello, Idaho, on May 29, and at several locations in the southern Great Plains on May 31. In contrast, the highest temperature for so early in the season was observed at Tampa, Fla., on May 26. This temperature (98°F) also equaled the all time high for all months at Tampa. Milford, Utah, reported record 24 h May precipitation on May 27 and Denver, Colo., observed 5.6 inches of snow on May 29—the greatest total for so late in the season.

REFERENCES

National Oceanic and Atmospheric Administration, U. S. Department of Commerce and Statistical Reporting Service, U. S. Department of Agriculture, 1975; *Weekly Weather and Crop Bulletin*, **62**, Nos. 18–23; 6, 13, 20, and 28 May 1975 and 3 and 10 June 1975.

Wagner, A. J., 1975: Weather and circulation of April 1975—Stormy with record cold. *Mon. Wea. Rev.*, **103**, 657–664.