WEATHER AND CIRCULATION OF MAY 1979
Blocking over Canada

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1. Mean circulation

Contrary to the normal situation, the midlatitude westerlies over the Western Hemisphere increased in strength from April to May and wave features embedded in those westerlies generally progressed. This brought mean troughs to the central Pacific, central North America and east of Newfoundland as mean ridges progressed to western North America and the western Atlantic (Figs. 1 and 2). The North American ridge surmounted a deep, stationary trough to the south.

The mid-Pacific trough was associated with a strong baroclinic zone and stronger than normal westerlies from the southeast Asia coast to the East Pacific (Figs. 3 and 4). The strong westerlies continued eastward along the northern border of the United States, south of a blocking ridge over north-central Canada. Flow about this ridge and the strong north-central Atlantic ridge contributed to a deep and very cold trough over the British Isles. This, in turn, helped build a strong and quite warm ridge north of the Caspian Sea, replacing the cold, cyclonic conditions of the previous month (Wagner,

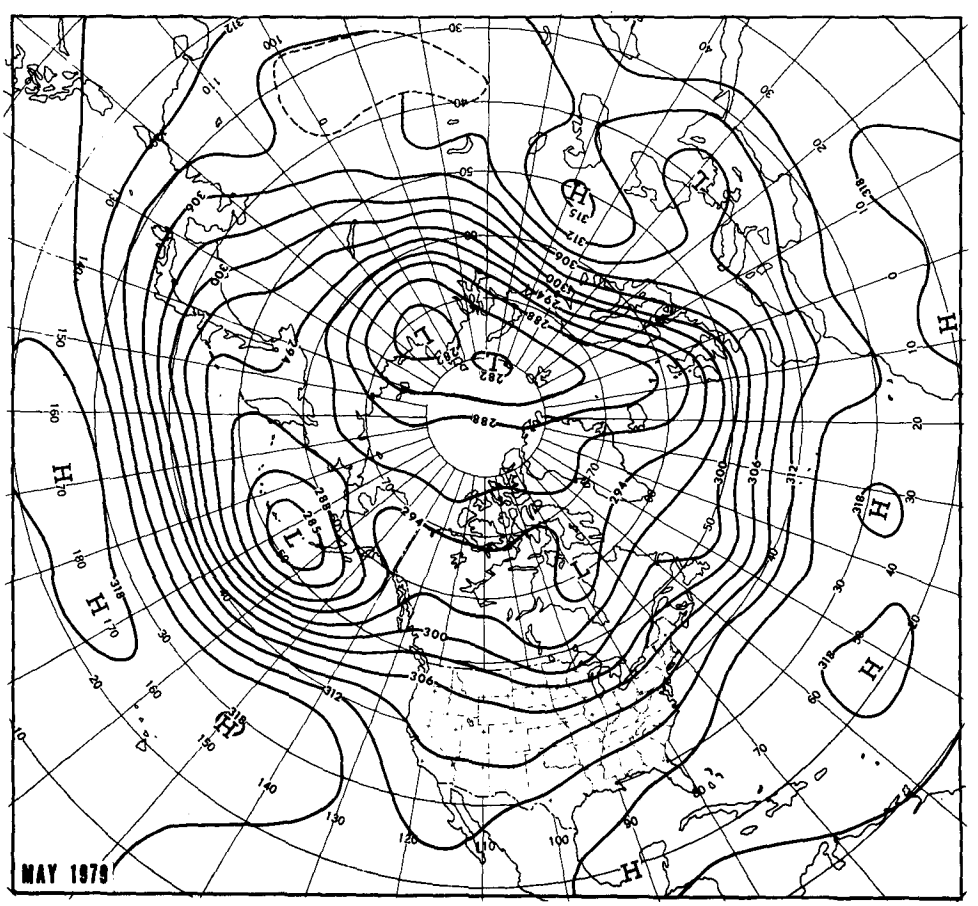

FIG. 1. Mean 700 mb contours (dam) for May 1979.

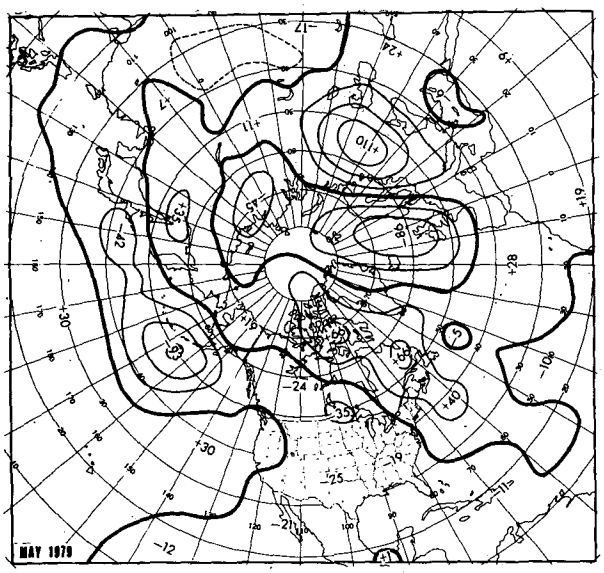

FIG. 2. Departure from normal of mean 700 mb height (m) for May 1979.

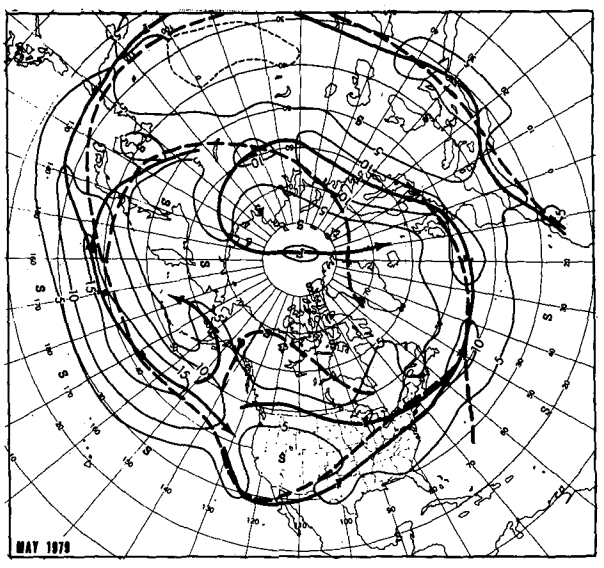

FIG. 4. Mean 700 mb geostrophic wind speed (m s^{-1}) for May 1979. Solid arrows indicate observed axes of maximum wind speed and dashed lines, the normal.

1979). A strong baroclinic zone formed between this warm ridge and the cold air to the north and an active storm track and fast westerlies returned to the Arctic coast of Europe. To the east, a deep trough developed over the Tamyr Peninsula, replacing a ridge which weakened and progressed to the Sea of Okhotsk.

2. Temperature

Mean temperature averaged below normal over a large portion of the country from the Great Plains to the Great Lakes and the Southeast (Fig. 5).

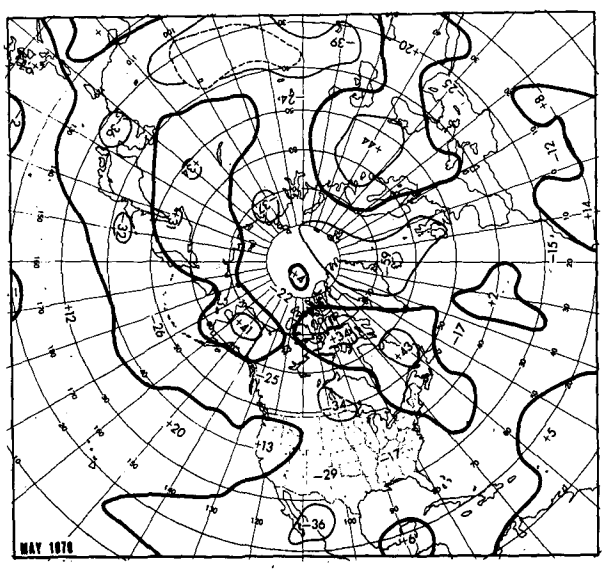

FIG. 3. Departure from normal of mean 1000–700 mb thickness (m) for May 1979.

Very cold air entered the country to the west of the blocking-related mean trough over the north-central states. Other factors contributing to the widespread cold weather were the moderately strong ridge near the West Coast and the extensive cloudiness which prevailed in the Southeast. It was the eighth consecutive month with below-normal mean temperature at Fargo, ND, and Sioux City, IA.

Above-normal mean temperatures were generally confined to the Northeast and the Far West. The former was an area of enhanced southerly wind components, while the latter was located east of a deep mean trough with an associated extensive area of southwesterly flow.

An upper level ridge over northern Alaska with strong southeasterly flow on its southern flank produced above-normal temperatures in

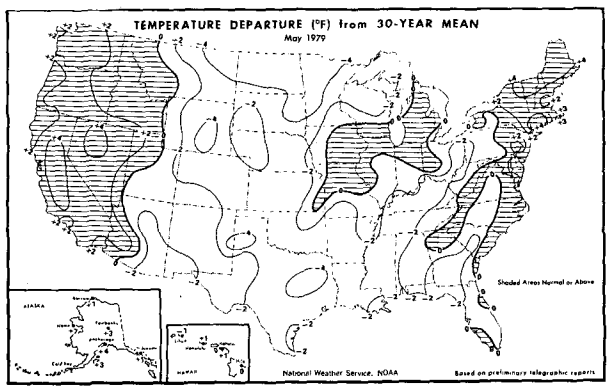

FIG. 5. Departure from normal of average surface air temperature (°F) for May 1979 (from National Oceanic & Atmospheric Administration & Economics, Statistics and Cooperatives Service, 1979).

Alaska. Temperatures in Hawaii averaged near normal.

3. Precipitation

A broad area of greater than normal precipitation was observed over the southern half of the country as upper level vorticies were driven into the deep southwestern trough and crossed the country in the southern branch of the westerlies (Fig. 6). Storm systems moving in the northern branch of the westerlies contributed to some areas of above normal precipitation along the northern border as well as along the East Coast in advance of the mean trough. Some quite dry spots were observed between the northern and southern rainy areas as well as over southwest Texas where the strong southwesterly flow produced a rain shadow.

It was the wettest May of record at Winslow, AZ (1.39 inches), and the wettest May since the early 1940's at Phoenix, AZ (0.76 inches), and Albuquerque, NM (2.48 inches). It was also the wettest May of record at Norfolk, VA (10.12 inches), and the second wettest May at Providence, RI (7.62 inches). At Sheridan, WY, the combination of cold and wet conditions yielded the greatest May snowfall of record (12.5 inches). Casper, WY, recorded 22.7 inches of snow, 19.5 inches above the May normal.

The deep mean low near the Aleutians gave about twice the normal May precipitation to that part of Alaska. Most of the remainder of the state, however, was quite dry. To the south the subtropical ridge near Hawaii was somewhat stronger than normal and precipitation was subnormal; both Kahului and Honolulu observed only about 20% of the normal May rainfall.

4. Weekly variability

a. 30 April–6 May

Early in the month several blocking ridges were located at high latitudes around the Northern Hemisphere (Fig. 7). Such ridges over the Canadian Archipelago and the northwestern Atlantic were related to southward-displaced mean lows near the Aleutians, Hudson Bay and Newfoundland and slack westerlies with a trough over the south-central United States.

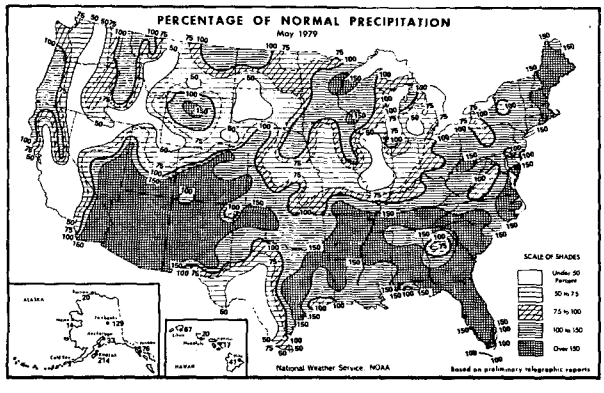

FIG. 6. Percentage of normal precipitation for May 1979 (from National Oceanic & Atmospheric Administration & Economics, Statistics and Cooperatives Service, 1979).

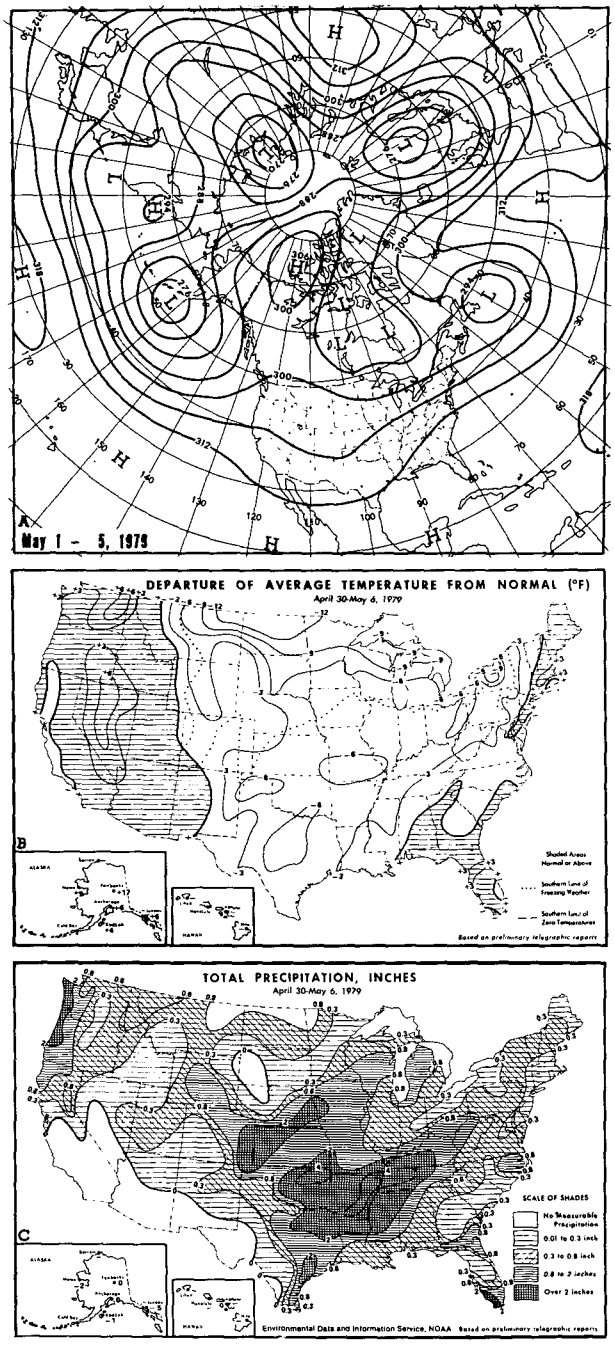

FIG. 7. (A) Mean 700 mb contours (dam) for 1–5 May 1979; (B) departure from normal of average surface air temperature (°F) and (C) total precipitation (inches) for week of 30 April–6 May 1979 (from National Oceanic & Atmospheric Administration and Economics, Statistics and Cooperatives Service, 1979).

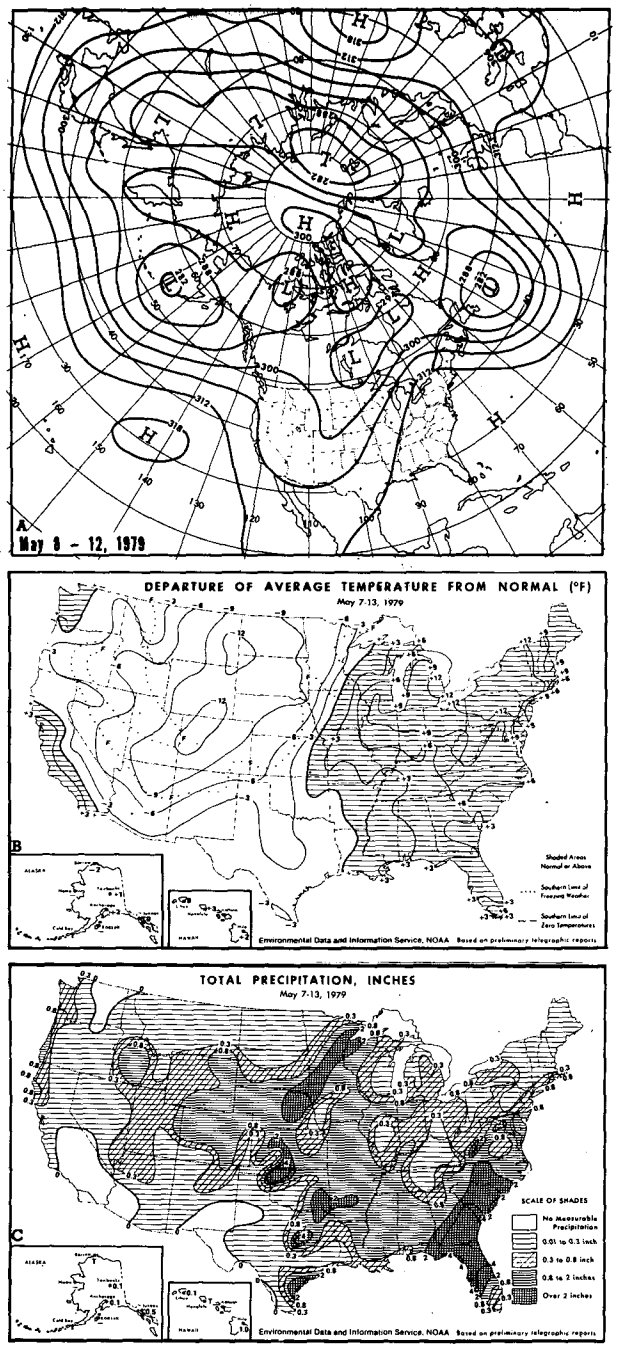

FIG. 8. As in Fig. 7 except (A) 8–12 May 1969 and (B) and (C) week of 7–13 May 1979.

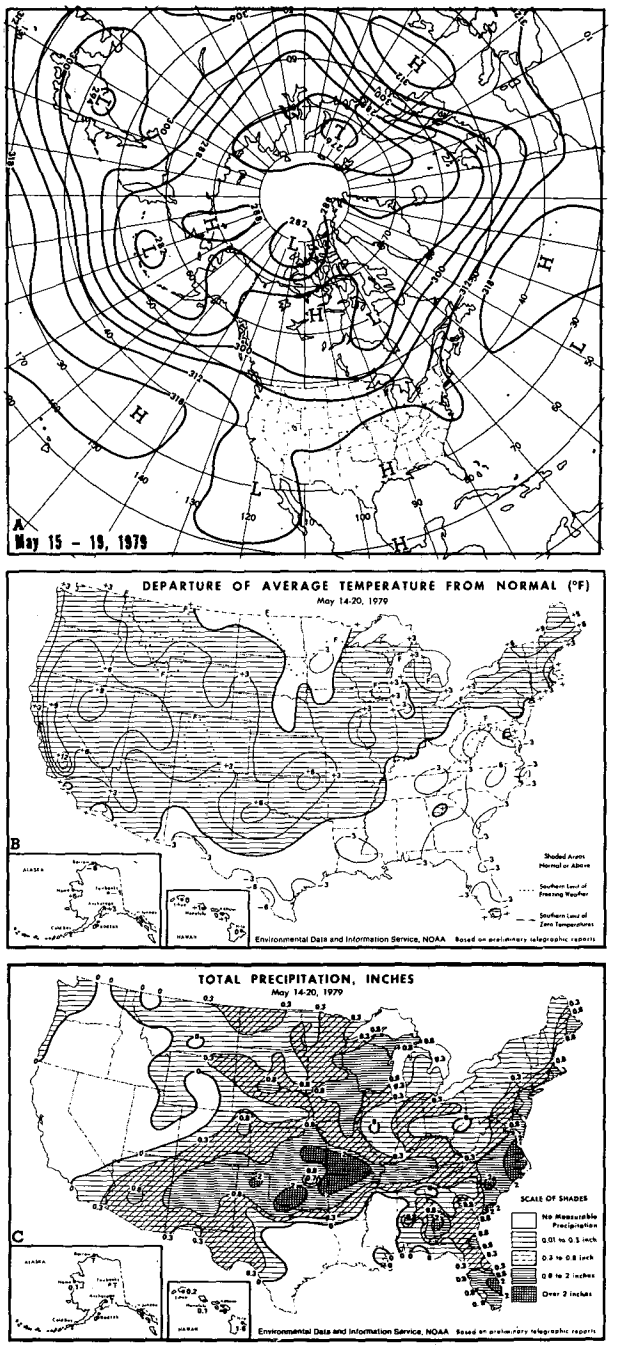

FIG. 9. As in Fig. 7 except (A) 15–19 May 1979 and (B) and (C) week of 14–20 May 1979.

While warm weather accompanied the western and eastern ridges, quite cold air was advected over the intervening area from central Canada. The record-low temperature for the month (26°F) was equaled at Rochester, NY, on 2 May.

Precipitation was widespread with heaviest amounts observed to the east of the south-central trough. This area was also the site of two outbreaks of about a dozen tornadoes each. Heavy rain on 2, 3 and 4 May produced flash flooding near Nashville, TN. Southwesterly flow along the coast of the Pacific Northwest made this the wettest week of the month there. Heavy snow occurred in Wyoming, Colorado and New Mexico.

b. 7–13 May

The high-latitude blocking ridge over northern Canada moved eastward and the wave pattern over the United States amplified and retrograded this

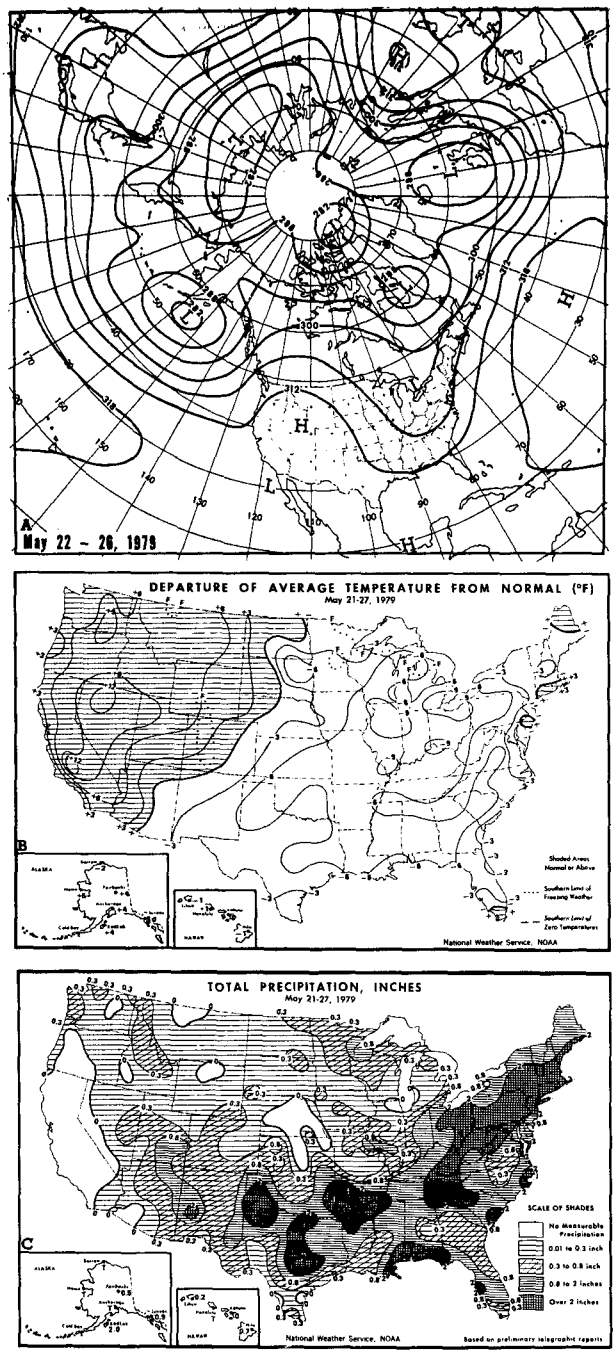

FIG. 10. As in Fig. 7 except (A) 22–26 May 1979 and (B) and (C) week of 21–27 May 1979.

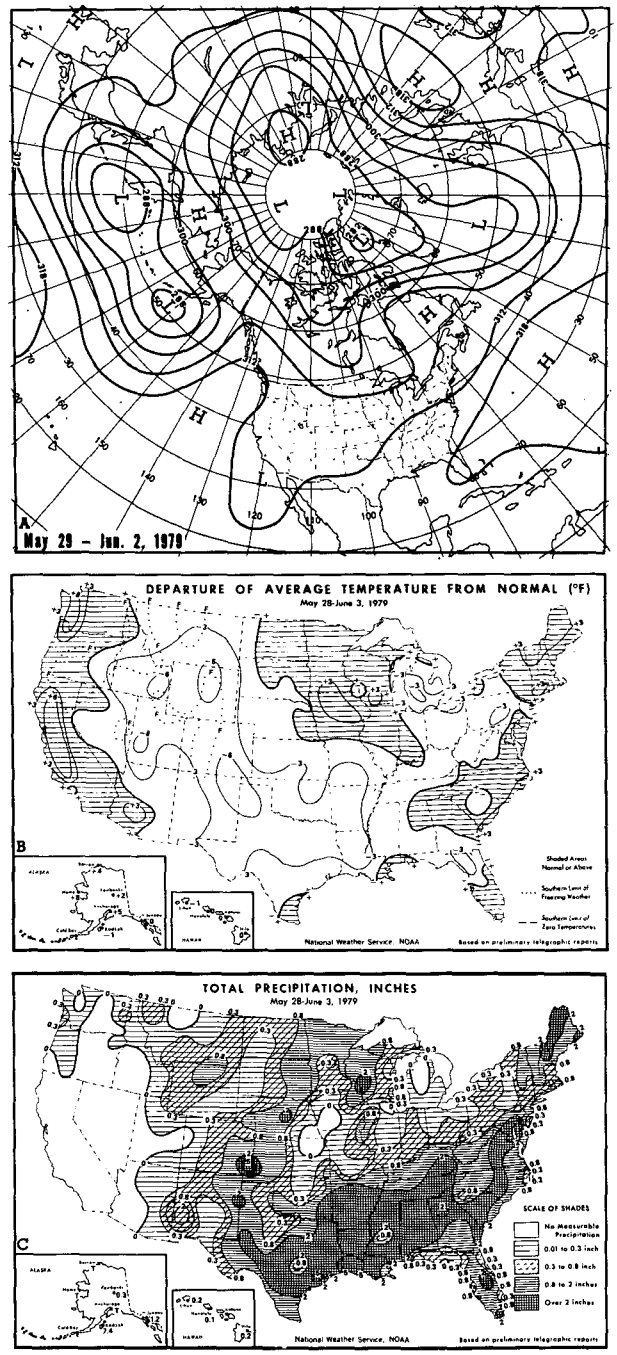

FIG. 11. As in Fig. 7 except (A) 29 May–2 June and (B) and (C) week of 28 May–3 June 1979.

week (Fig. 8) as the Pacific zonal westerlies declined. This displaced the temperature anomaly pattern over the United States to the west bringing cold weather to most of the western half of the country and warm weather to the eastern half. Parts of the northern and central Great Plains were very cold as continental polar air was brought into the country to the west of the deep and blocked trough over south-central Canada. Lowest temperatures for so late in the season were observed in Texas on 12 May following highest temperatures for so early in parts of New England on 9 May.

Heaviest precipitation occurred near the central trough and over the Southeast, an area affected by weak, slow-moving troughs. One such trough brought eighteen tornadoes to Florida on 8 May. Substantial snow occurred in the Rocky Mountains and the mountains of the Southwest.

c. 14–20 May

Cyclonic activity increased and blocking ridges weakened at high latitudes (Fig. 9). Over the United States this led to the northward movement of the westerlies and the associated storm track. The southwest tough, secluded from the westerlies, retrograded to west of Baja California, and a strong ridge built over the central United States replacing a previous trough. Remnants of this trough progressed to the east coast.

The deamplifying flow pattern brought warm and relatively dry weather to most of the United States. Below normal mean temperatures were confined mainly to the Southeast and South, areas affected by a strong Canadian high which crossed the northern border early in the week. The cutoff Baja California low brought precipitation to the Southwest. Rainfall at Phoenix, AZ, on 20 May set new May records for 5 min through 2 h.

d. 21–27 May

The 700 mb mean waves in the vicinity of North America progressed and amplified bringing a strong ridge to the West and a deep trough to the East (Fig. 10). The Baja California low weakened but remained important weatherwise.

Warm weather accompanied the western ridge while cool weather dominated the area to its east. Lowest temperatures for so late in the season were observed over much of the Southeast on 26 or 27 May.

Upper troughs moving out of the Southwest contributed to relatively heavy precipitation across the southern part of the country. Heavy precipitation also accompanied the eastern mean trough. Several tornadoes occurred near Houston, TX, on 22 May and in the Southeast on 24 May.

e. 28 May–3 June

The principal waves in the mean 700 mb flow near North America retrograded this week (Fig. 11). This brought a strong mean ridge to the east Pacific, a trough to mid-continent and a strong ridge to eastern Canada. The latter ridge blocked the normal course of the westerlies diverting a major branch to the north and a weaker current to the south. The mean low near Baja California, present for the third consecutive week, reintensified.

Above normal temperatures occurred near the west coast ridge, while cool air was advected over much of the country to its east. The northeastern quarter of the country with its complex upper level wave pattern was largely an exception. On 29 and 30 May record low temperatures for so late in the season were reported at scattered locations in the northwestern quarter of the country.

Upper level troughs moving from the Southwest again gave substantial precipitation to most of the Southern half of the country. Fairly heavy amounts also occurred in parts of the middle and north Atlantic States where rain producing systems, travelling in the weak upper level flow, were slow moving.

REFERENCES

National Oceanic and Atmospheric Administration, U.S. Department of Commerce, and Economics, Statistics and Cooperatives Service, U.S. Department of Agriculture, 1979: *Weekly Weather & Crop Bull.*, **66**, Nos. 19–23 (8, 15, 22 and 30 May and 5 June 1979).

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