WEATHER AND CIRCULATION OF MAY 1976
Temperature Reversal Over the United States

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1. Mean circulation

The mean 700 mb circulation in the Northern Hemisphere was rather chaotic during May with the wave trains at the various latitudes generally out of phase (Figs. 1 and 2). The ridge over western North America together with the trough to its east were a notable exception.

The mean flow across mid-latitudes of the North Pacific was rather flat and stronger than normal (Figs. 1, 2 and 3), as was the case in April (Wagner, 1976). There was, however, a diminution in the cold air supply at high latitudes of the Pacific (Fig. 4) and an associated decline in the strength of the Pacific baroclinic zone and of the westerlies there.

Accompanying this decline of the Pacific westerlies there was a shortening of the downstream wavelength, bringing a strong mean 700 mb ridge to the western United States and a deep trough to the East. This represented a reversal of wave phase from the previous month over the United States.

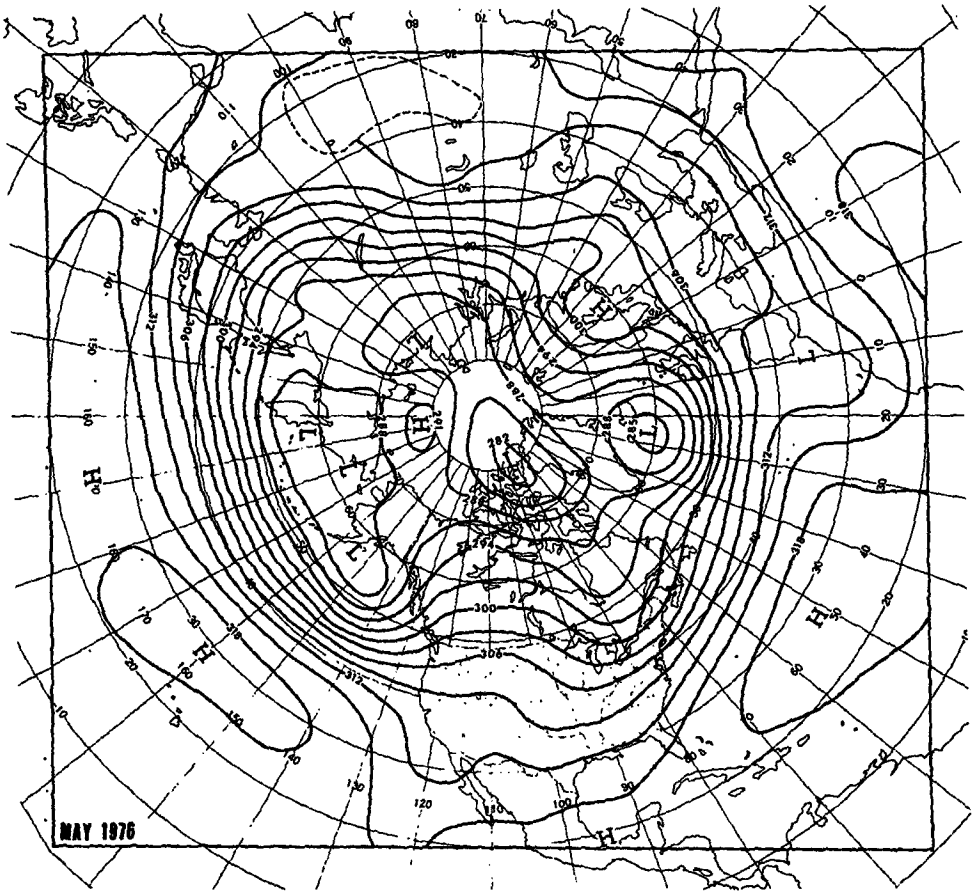


FIG. 1. Mean 700 mb height contours (dam) for May 1976.

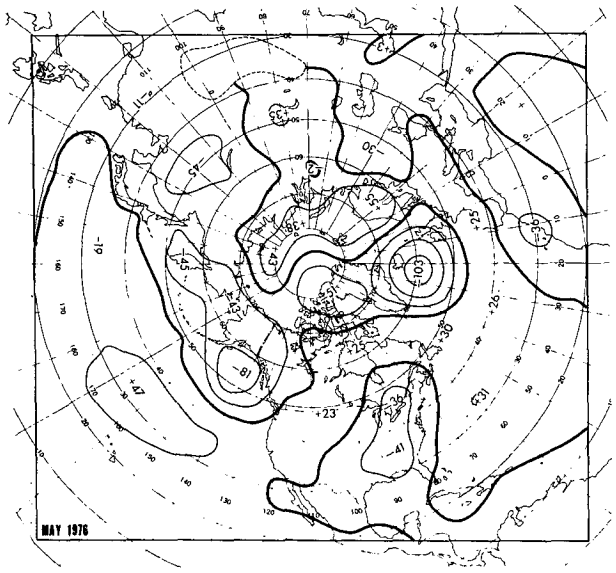


FIG. 2. Departure from normal of mean 700 mb height (m) for May 1976.

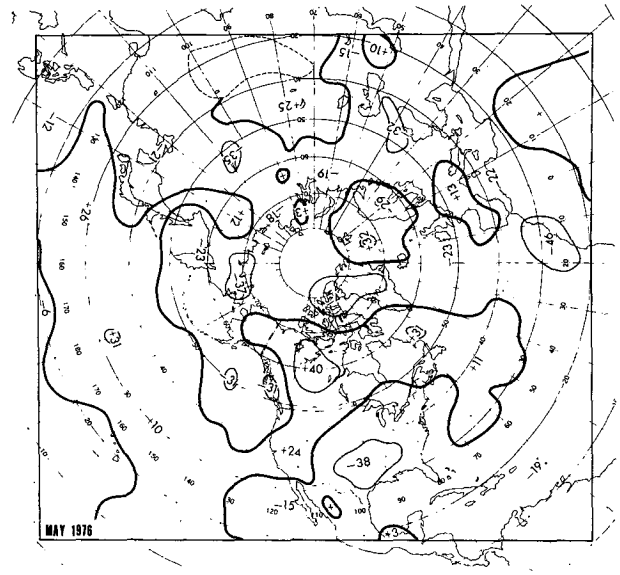


FIG. 4. Departure from normal of mean 1000 to 700 mb thickness (m) for May 1976.

The mean flow over the Atlantic flattened considerably this month as a deep low developed southwest of Iceland displacing a previous blocking ridge to Scandinavia and returning the axis of the 700 mb westerlies to its normal location over southern Great Britain. At longitudes near the Scandinavian blocking ridge, the flow was fractionalized into three segments (Fig. 3). The southernmost wind speed maximum fed vorticity to the still-active Mediteranean trough, while the mid-latitude and high-latitude maxima supported mean troughs near the Black Sea and over the Tamyr Peninsula. Amplification of the flow at high latitudes led to a well-defined wavenumber 2 pattern between 70 and 80°N where three waves had existed in April.

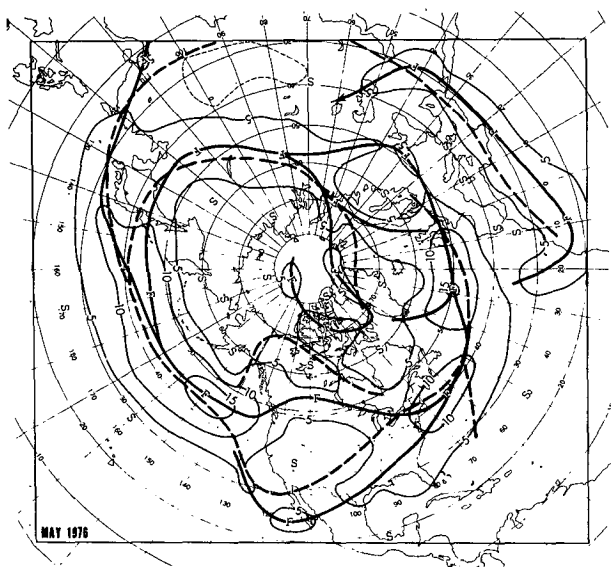


FIG. 3. Mean 700 mb geostrophic wind speed (m s^{-1}) for May 1976. Solid arrows indicate observed axes of maximum wind speed and dashed lines, the normal.

2. Temperatures

The combined effects of the strong ridge over the western United States and the deep trough in the East brought relative warmth to the West and the northern Great Plains and colder than normal temperatures to the East and South (Fig. 5). In keeping with the phase change of the mean circulation over the United States, this was, to a large extent, a reversal from the temperature anomaly pattern of April. This was the second coldest May of record at Shreveport, La., and the third coldest at Jackson, Miss. The deep mean trough in the Gulf of Alaska, together with the strong ridge over the

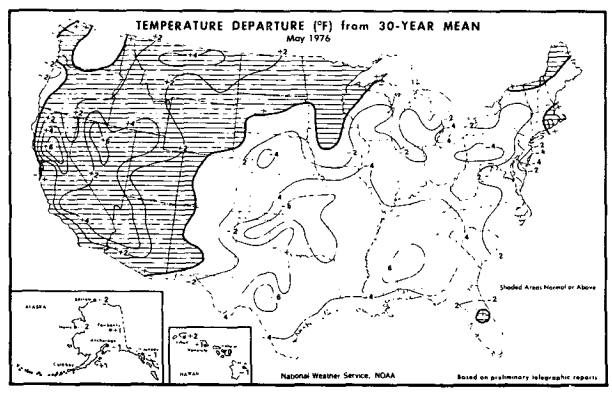


FIG. 5. Departure from normal of average surface air temperature (°F) for May 1976 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1976).

Arctic, brought below normal temperatures to most of Alaska this month.

3. Precipitation

Precipitation exceeded normal at most locations near and east of the broad mean trough over the eastern United States (Fig. 6). There was, however, a notable exception, centered over Ohio, where precipitation was less than half the May normal. This area was located between wind speed axes to the north and south (Fig. 3).

Less than half the normal May precipitation also occurred in extensive areas under and east of the strong western ridge. This was the driest May of record at Duluth, Minn., tied for the second driest in Fargo, N. D. and was the fourth driest at Medford, Ore. Above normal precipitation in the Southwest represented absolute values of generally less than 1 inch and was largely the result of an active Southwest trough early in the month. The 1.06 inches observed at Phoenix produced the second wettest May of record there; nine-tenths of this amount fell on one day, 4 May.

Although precipitation was generally near or below normal in Alaska, Yakutat (in advance of the deep Gulf of Alaska trough) reported a monthly total of 18.15 inches, 10.13 above normal. Rainfall amounts in Hawaii, near a stronger than normal subtropical ridge, were less than one-half of normal at three of the four stations where preliminary reports were available. The total at Kahului was only 0.01 inch, about 2% of normal.

4. Weekly variability

a. 3–9 May

The monthly mean temperature anomaly pattern of warm in the west and cold in the east was set early in the month as a mean ridge was observed over the Northwest and a mean trough was found over the Great Lakes

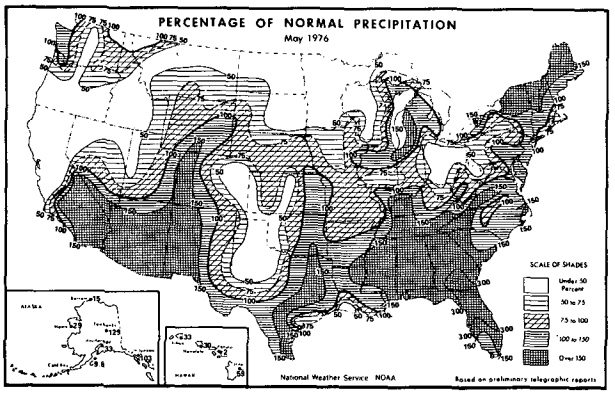


FIG. 6. Percentage of normal precipitation for May 1976 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1976).

TABLE 1. Record temperatures observed in May 1976.

Station	Temperature (°F)	Date	Remarks
St. Louis, Mo.	31	3	Lowest so late in season
Sioux City, Ia.	25	3	Lowest so late in season
Wichita, Kan.	31	3	Lowest so late in season
Nashville, Tenn.	34	4	Lowest so late in season
Hatteras, N. C.	41	5	Lowest so late in season
Huron, S. D.	17	6	Lowest so late in season
Red Bluff, Cal.	102	12	Highest so early in season
Reno, Nev.	91	13	Highest so early in season
Bakersfield, Cal.	107	13	Highest equalled for month
Charleston, S. C.	43	19	Lowest so late in season
Sault Ste. Marie, Mich.	23	19	Lowest so late in season

(Fig. 7). The strong ridge over western Canada evolved from a highly amplified blocking ridge of the previous week and caused a continuation of strong cold air advection to the United States. Record low temperatures for so late in the season were observed at several locations eastward from the Great Plains this week (Table 1).

Heaviest precipitation occurred in the vicinity of the eastern trough and in advance of the trough over the Southwest. The latter trough was at its greatest intensity for the month and produced the bulk of the month's precipitation over the Southwest.

b. 10–16 May

Wave features progressed over the United States this week bringing a mean ridge to the west coast and a mean trough to the southern Mississippi Valley (Fig. 8). This was the warmest week of the month. The flattening flow over western Canada eliminated the advection of continental polar air into the United States and warm temperatures dominated the North and East as well as the West. Record high temperatures were observed in parts of California (Table 1).

The deep mean trough over the lower Mississippi Valley gave relatively heavy precipitation amounts to much of the South this week while the Southwest dried out. Tornado outbreaks occurred in the lower Mississippi Valley, the Gulf and south Atlantic states, and also over Illinois, Kentucky and the Carolinas.

c. 17–23 May

Wave features continued to progress bringing a mean ridge to the Great Plains and mean troughs to both the east Pacific and the East Coast of the United States (Fig. 9). The Great Plains ridge extended northeastward to an amplified ridge over Hudson Bay. This, together with a deep trough over New England, reinstituted the advection of cold air over the East while cold air also began to move over the far West. Record low temperatures for so late in the season were observed at Charleston, S. C., and Saulte Ste. Marie, Mich., and equalled at several locations in the Southeast on 19 May.

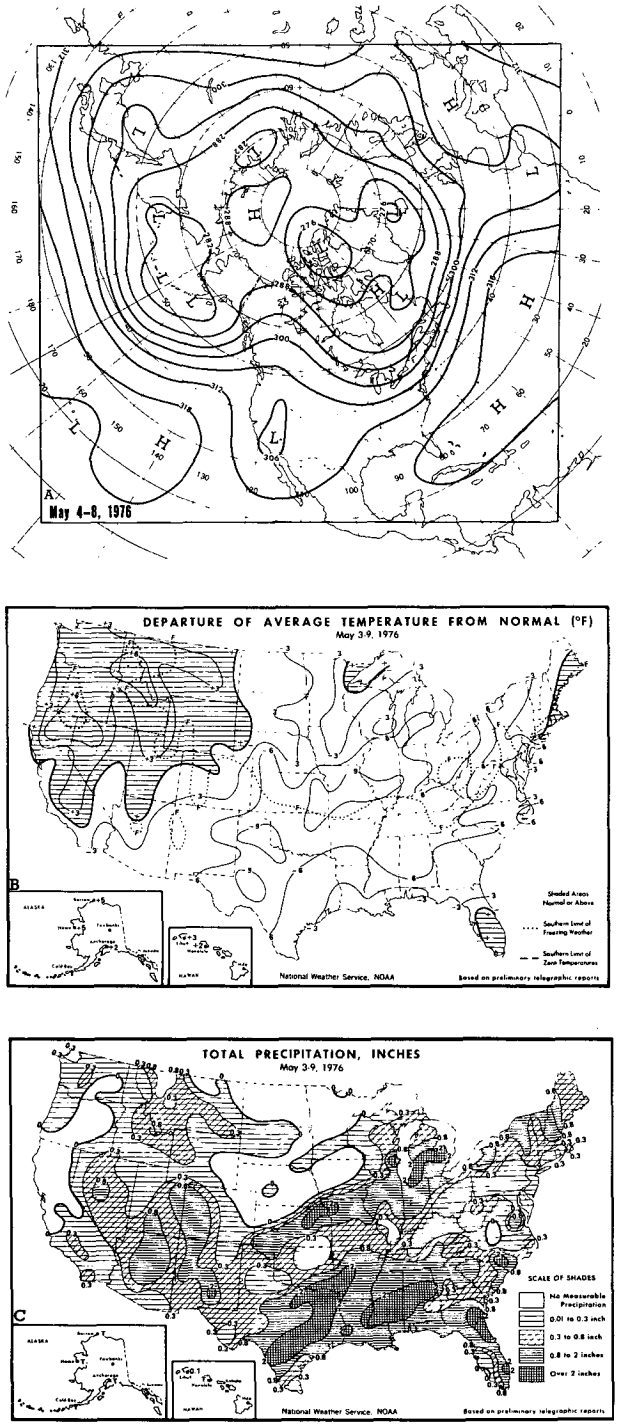


FIG. 7. (A) Mean 700 mb contours (dam) for 4–8 May 1976, (B) departure from normal of average surface temperature (°F), and (C) total precipitation (inches) for week of 3–9 May 1976 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1976).

The slowly moving eastern trough brought heavy precipitation to much of the East. An upper level low moving out of the Southwest engendered a moderately deep, nonfrontal, Gulf of Mexico surface low on 22 May. This low subsequently crossed the Florida panhandle producing the major portion of the heavy precipitation observed in the Southeast this week. A significant amount of precipitation occurred over the central Great Plains toward the end of the week when an upper level low moved over that area. Tornadoes were observed in North Carolina on 18 May.

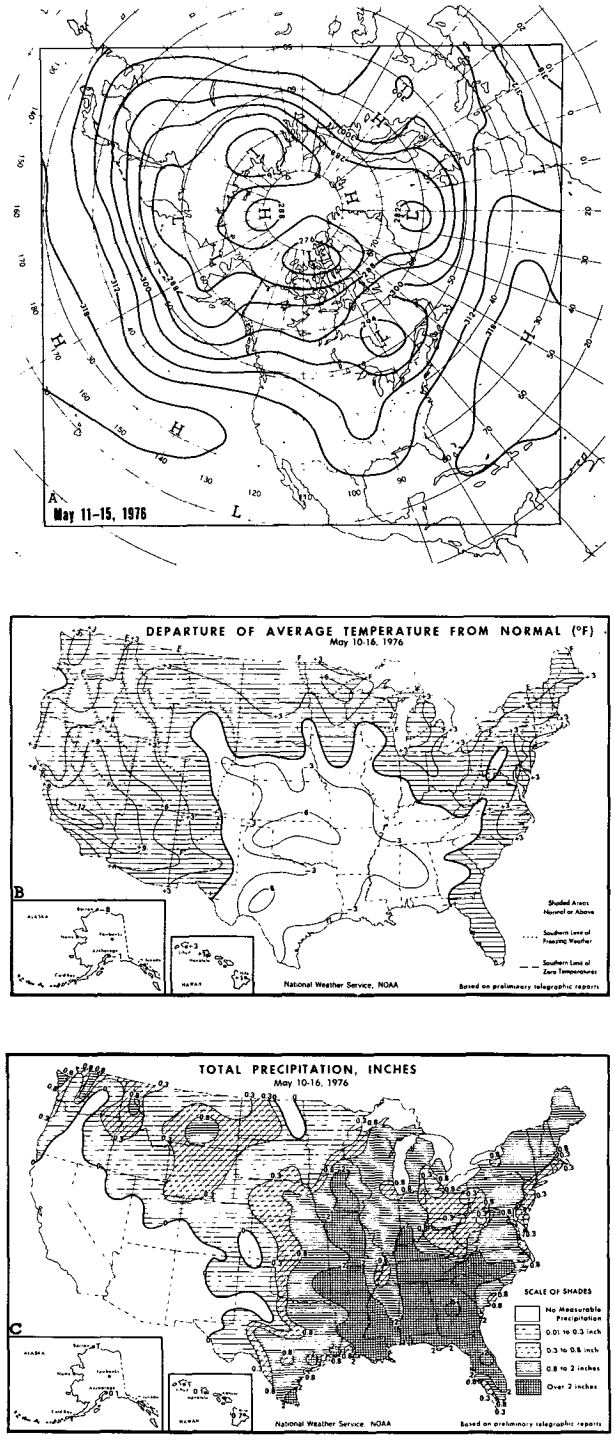
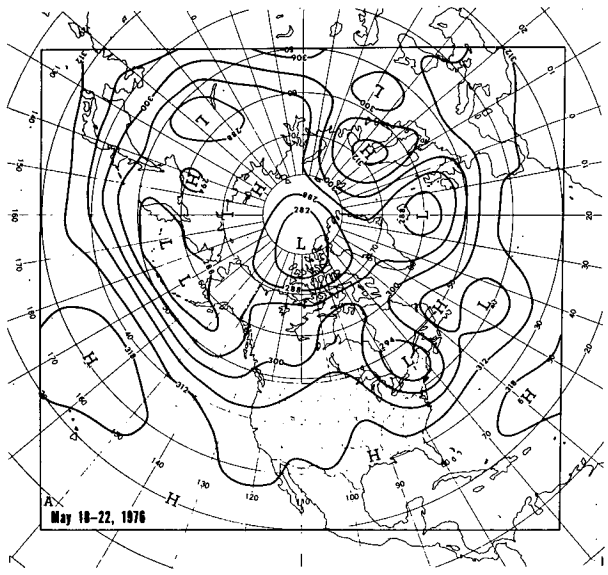
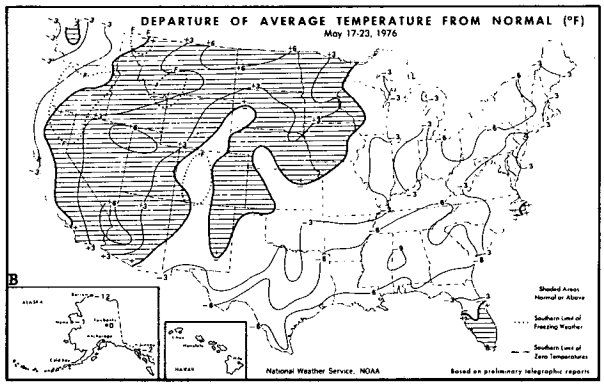


FIG. 8. As in Fig. 7, except for (A) 11–15 May 1976 and (B) and (C) week of 10–16 May 1976.





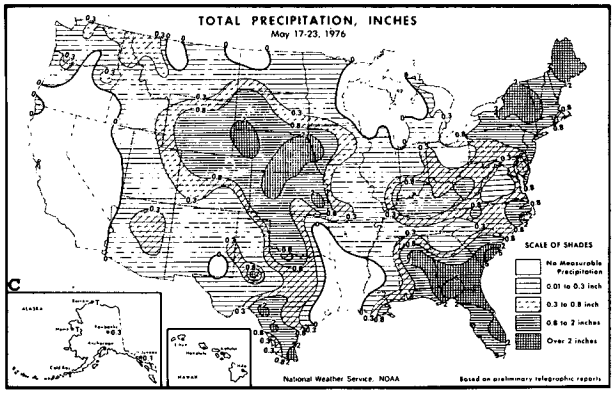
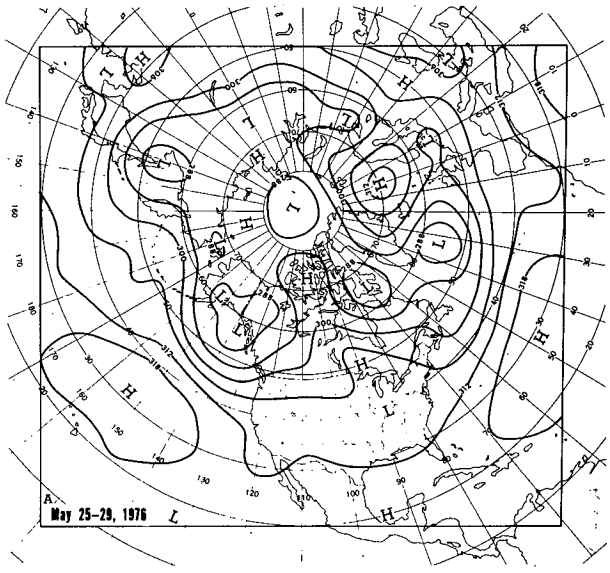


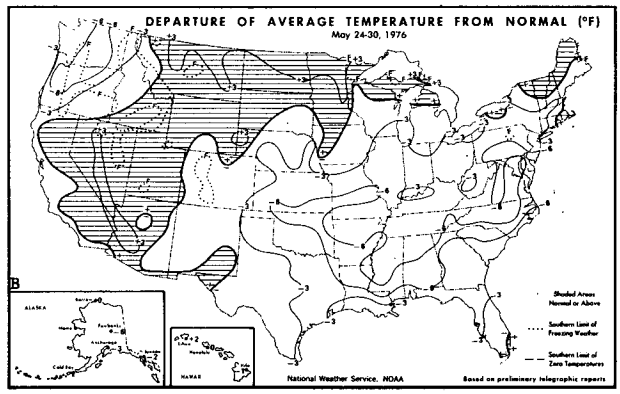
FIG. 9. As in Fig. 7, except for (A) 18–22 May 1976 and (B) and (C) week of 17–23 May 1976.

d. 24–30 May

A deep mean low which moved to the Gulf of Alaska helped maintain a strong mean ridge northward from the Great Lakes this week (Fig. 10). Over the United States, however, the mean flow became very weak, with a mean low trapped south of the strong Great Lakes ridge.

The temperature anomaly pattern changed little from the previous week. A strong polar high, northwest of the Great Lakes at the week's beginning, slowly settled southward; it was a major source of cool weather east of the Divide.





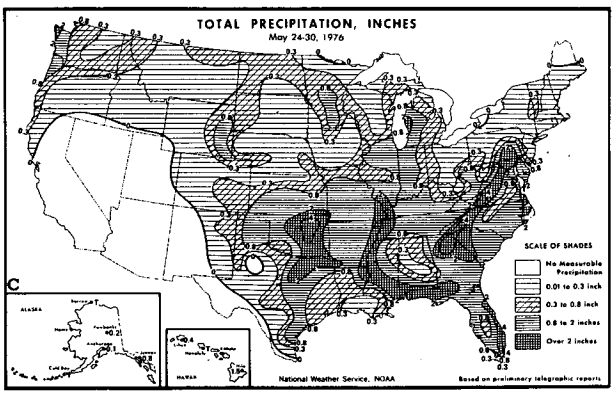


FIG. 10. As in Fig. 7, except for (A) 25–29 May 1976 and (B) and (C) week of 24–30 May 1976.

Heavy precipitation in the South and East was mainly connected with a slowly moving upper low traversing the South in the slack upper flow which prevailed. Heavy rainfall from a subsequent system on 30 May brought a major flash flood to Tulsa, Okla., with an estimated damage of 11.8 million dollars. Tornadoes were observed this week in Texas, Georgia and Tennessee.

5. Tropical activity

Two typhoons occurred over the southwest Pacific this month, south of the prevailing strong subtropical ridge (Figs. 1 & 2). Olga reached tropical storm strength east of the Philippines on 12 May, became a typhoon on 20 May, and subsequently caused extensive flooding upon crossing the northern island of the Philippines. Olga was downgraded to low status on 26 May.

Tropical Storm Pamela formed on 15 May near 8°N, 152°E and became a typhoon the next day. The storm moved northwestward and then northeastward, passing well east of Japan where it was downgraded to a low on 28 May. The eye of Typhoon Pamela passed over Guam on May 21, doing an estimated $500,000,000 damage. From 20–22 May more than 33 inches of rain fell on Guam, bolstering the monthly total to 40.13 inches—35.64 inches greater than normal.

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