

THE WEATHER AND CIRCULATION OF JUNE 1962

A Generally Cool Month

RAYMOND A. GREEN

Extended Forecast Branch, U.S. Weather Bureau, Washington, D.C.

1. INTRODUCTION

June 1962 became the third consecutive month that large-scale blocking in the Pacific was the outstanding feature of the mean circulation of the Northern Hemisphere. Significant blocking also appeared in Canada for the first time since March. Its presence was associated with a southward push of cool air into the Midwestern United States where a heat wave had prevailed in May. In some areas the resulting temperature change was sufficient to reverse the normal upward trend for this time of year, with a number of stations reporting the rare occurrence of cooler averages for June than for May. At the same time precipitation exceeded normal in the Gulf Coast and South Atlantic States where drought conditions were observed in April and May.

2. MEAN CIRCULATION

Not only was the ridge over the eastern Aleutians (fig. 1) the strongest observed for this area in any June in the records of the Extended Forecast Branch (since 1933), the +400-ft. anomaly in the ridge equaled the strongest on record (June 1939) over the Northern Hemisphere. The largest 700-mb. height anomalies of the hemisphere have been associated with mean ridges in the Pacific for the past three months. This blocking ridge was associated with the familiar split in the westerly flow pattern that resulted in a higher-latitude ridge and a deep low-latitude trough. The blocking was reflected at sea level by mean pressures as much as 10 mb. above normal in the ridge and 3 mb. below in the trough.

Circulation features downstream, moulded to a great extent by the Pacific ridge, were also much different from normal. In western Canada, where ridge conditions normally prevail in June [1], cyclonic flow and negative height anomalies were the rule. The blocking ridge over the Great Lakes was much weaker, but exhibited characteristics similar to blocking in the Pacific. From the Maritime Provinces of Canada a rather uniform band of westerlies prevailed across the North Atlantic and northern Europe to north-central Asia. Vigorous mean troughs were located in eastern Europe and off the east coast of Asia, the latter being ideally suited in both position and amplitude to support the strong ridge in the eastern Aleutians.

3. MID-MONTH CIRCULATION TRANSITION

While blocking in Canada was present in the monthly average circulation, it was solely a characteristic of the circulation during the first half of the month in which a ridge and weak westerlies extended from southeastern United States to north-central Canada (fig. 2A). A strong positive height anomaly center was located north of Hudson Bay, where height anomalies had increased as much as 250 ft. from the previous half-month (not shown). At the same time, a large area of zonally oriented positive height departures dominated the Pacific.

In late June (fig. 2B), while only a small remnant of earlier positive height anomalies appeared in Canada, heights had risen sharply in the Bering Sea and had fallen in the western and eastern Pacific (fig. 2C). Thus the circulation amplified and blocking increased in the Pacific and diminished over North America during the month. These changes brought about a form of retrogression in the planetary wave pattern, with the establishment of a trough in the Gulf of Alaska and virtual elimination of the early June trough over western United States. Downstream, the westerlies increased over southern Canada and the United States with a corresponding warmer trend in the half-month temperature anomalies over most of the United States.

4. TEMPERATURE

The temperature anomaly pattern for June (fig. 3) was devoid of large departures and corresponded well in most areas with the 700-mb. height departures of figure 1. Temperatures averaged generally warmer than normal in the Great Basin, the upper portion of the Northern Plains, and also in the Northeast, in agreement with the height anomaly pattern. The outstanding exception to the general correspondence occurred over the Great Lakes where local cooling from the water may have been unusually pronounced with subnormal westerly flow. Elsewhere, except for the extreme Southeast, temperatures and 700-mb. height averaged below normal.

While positive height anomalies in Canada, favorable to cooling in the United States, were prominent for only part of June, their imprint on the monthly change from

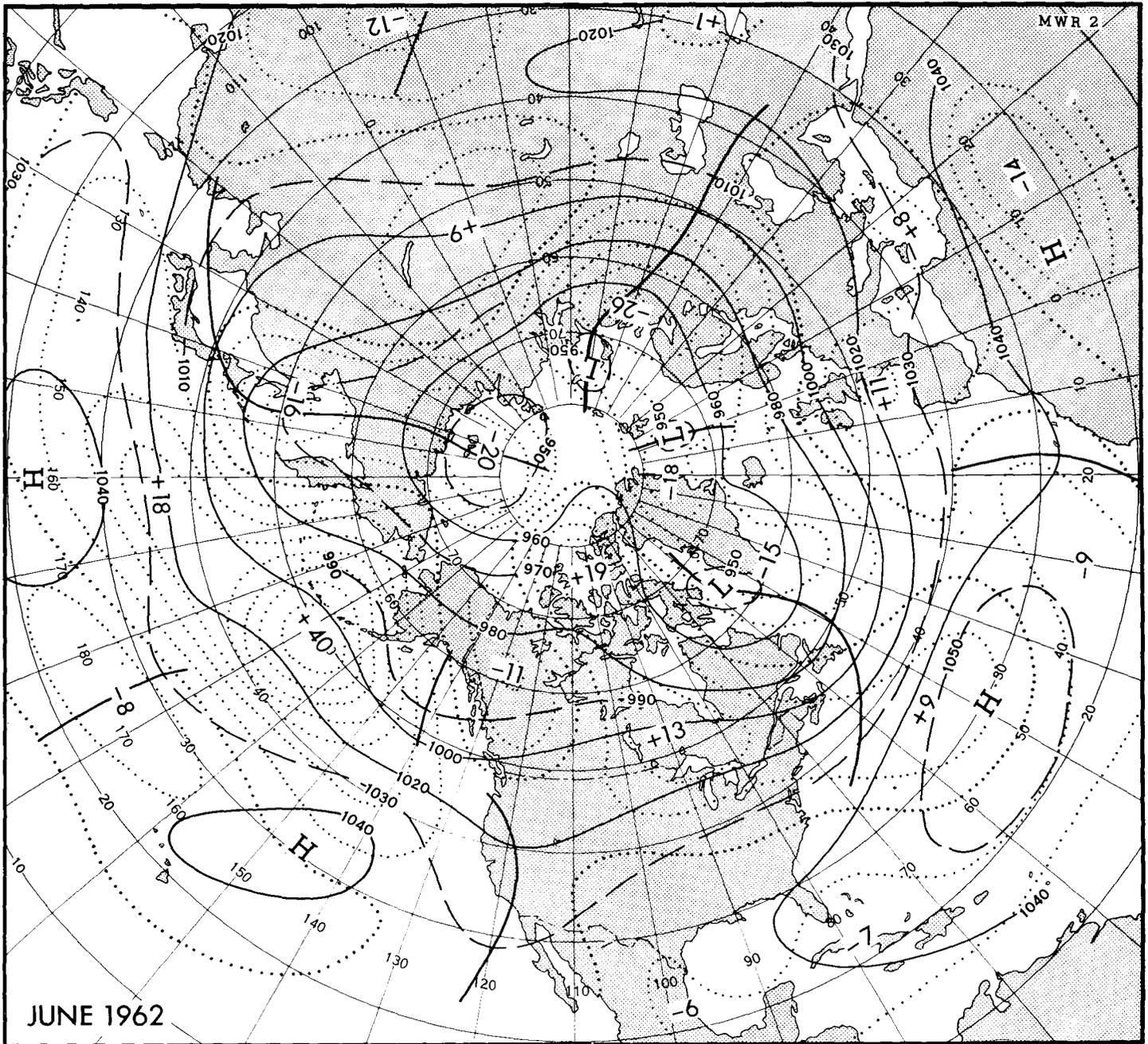


FIGURE 1.—Mean 700-mb. contours (solid) and height departures from normal (dotted), both in tens of feet, for June 1962. In response to blocking over Canada, westerlies were slower than normal over the United States east of the Rocky Mountains.

May was considerable (see +270 ft., fig. 4A). From the area of maximum change in northern Canada a positive belt extended across the western United States to Baja California, while an area of negative change extended from a center over Greenland to another over Tennessee. There was good agreement between this pattern and changes in temperature anomaly (fig. 4B). Cooling was especially pronounced in the south-central Plains, where a strengthening northerly component is implied by the height change field. It was in that area and eastward that temperatures were cooler than in May, as indicated by

TABLE 1.—Stations reporting lower average temperature for June than for May 1962

Station	Temperature (°F.)	
	May	June
Cairo, Ill.....	77.1	76.7
Dodge City, Kans.....	71.1	70.9
Topeka, Kans.....	72.7	72.5
Wichita, Kans.....	75.4	75.1
Tulsa, Okla.....	75.3	75.2
Greenville, S.C.....	76.5	76.4
Nashville, Tenn.....	75.2	75.0

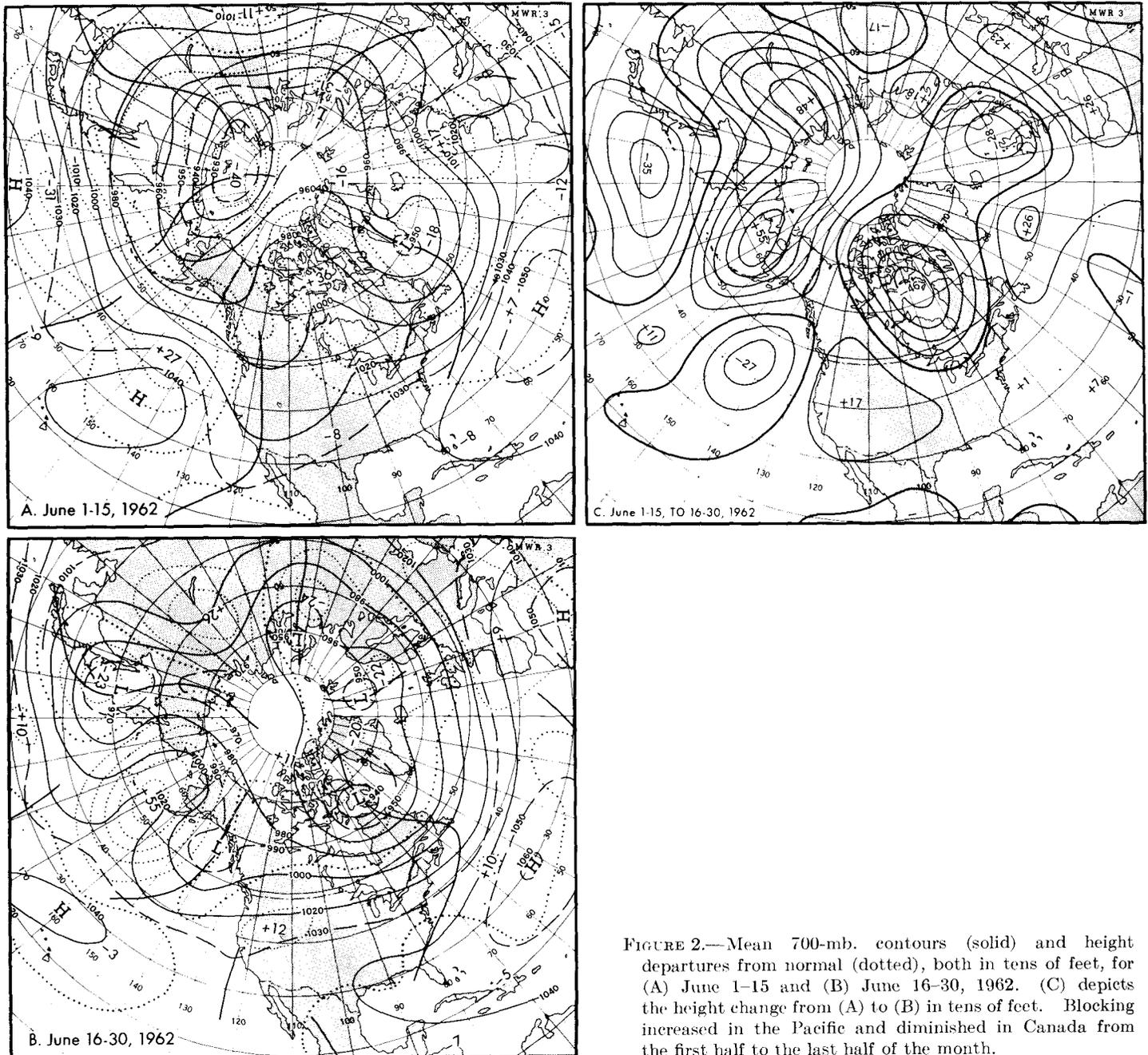


FIGURE 2.—Mean 700-mb. contours (solid) and height departures from normal (dotted), both in tens of feet, for (A) June 1-15 and (B) June 16-30, 1962. (C) depicts the height change from (A) to (B) in tens of feet. Blocking increased in the Pacific and diminished in Canada from the first half to the last half of the month.

the representative list of cities shown in table 1. Nashville, Tenn., and Cairo, Ill., reported this the first such occurrence since records began in 1871 and 1872, respectively.

5. PRECIPITATION

Added to the direct influence of circulation on temperature in the South was the cooling effect of increased cloudiness and precipitation, particularly in the Gulf Coast and South Atlantic States. Drought relief began there with showers late in May [2] and rainfall amounts exceeded normal over most of that area in June (fig. 5).

As much as twice the normal precipitation fell along the coast of the Carolinas and westward into the Tennessee Valley just south of the axis of maximum frontal activity (fig. 6), in southern Louisiana, and east of the Continental Divide from the Texas coast through the Plains States to Montana. In the latter area westerlies were weaker than normal across the Divide (fig. 1) causing a reduction in the drying effect of downslope winds. Overrunning and frontal activity accounted for much more precipitation from the Central Plains northward than in the South, where squall lines were frequent and air mass showers predominated. This was the wettest June since records

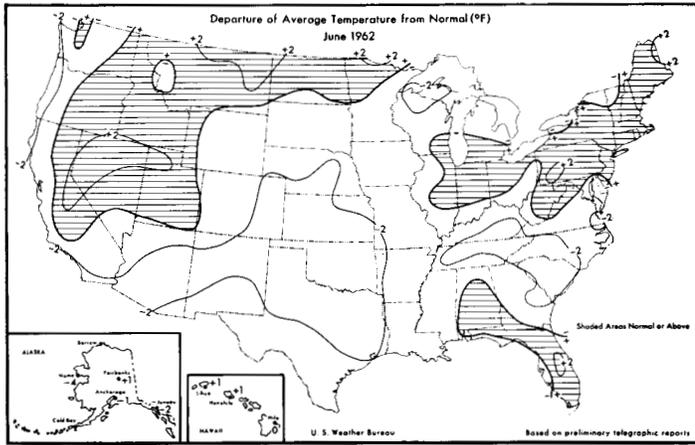


FIGURE 3.—Departure of average surface temperature from normal (°F.) for June 1962. Note the absence of large departures. (From [3].)

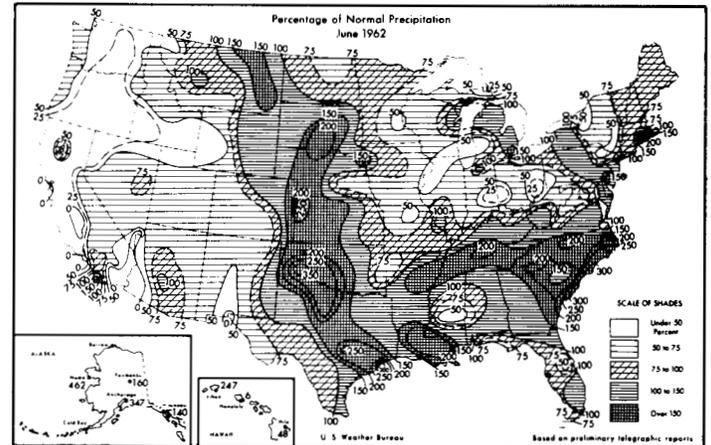


FIGURE 5.—Percentage of normal precipitation for June 1962. Drought was broken in the South. (From [3].)

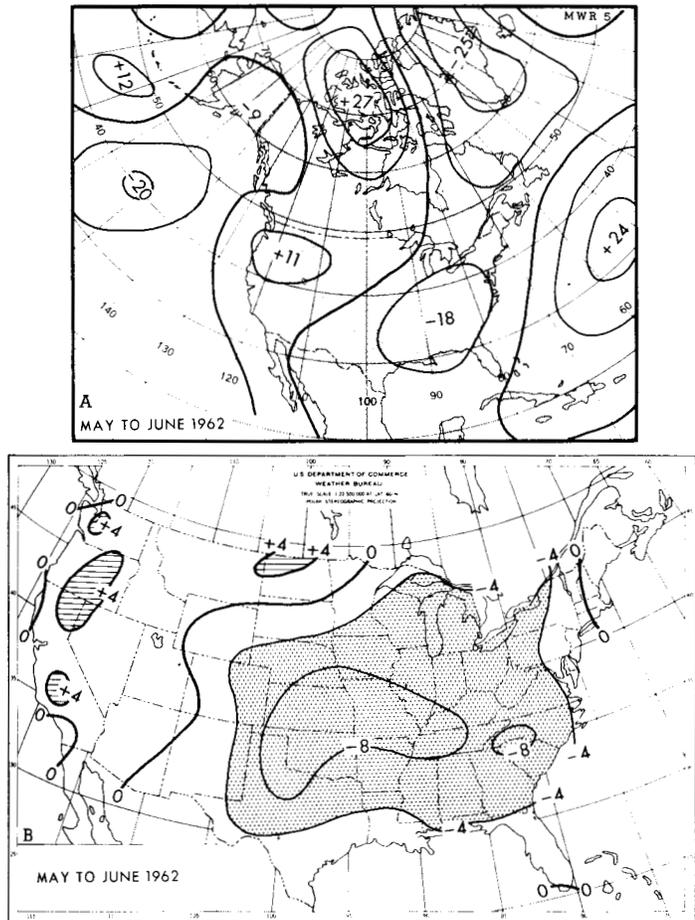


FIGURE 4.—(A) Change in mean 700-mb. height departures from normal (tens of feet), and (B) change of surface temperature departure from normal (°F.), from May to June 1962. In general there was good correspondence of the change fields in the United States.

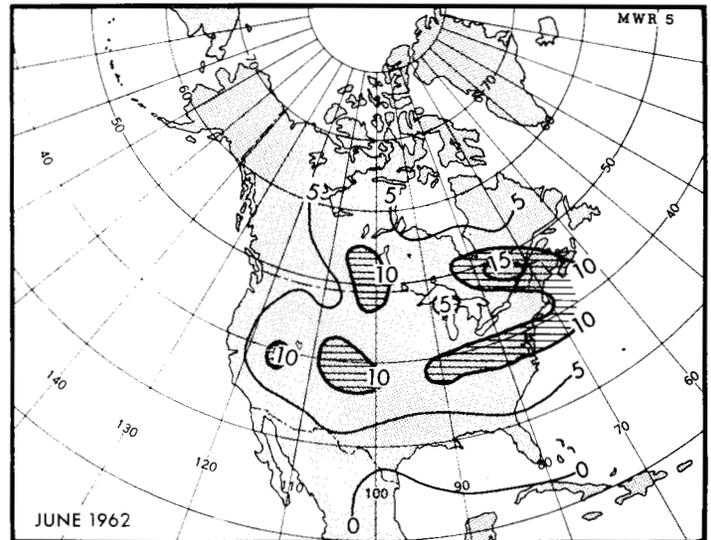


FIGURE 6.—Number of days with fronts in equal-area (66,000 n. mi.²) quadrilaterals for June 1962. Precipitation generally exceeded normal along and south of the axis of maximum frontal frequency from Virginia to Colorado. Overrunning accounted for much precipitation in the Central Plains.

began at Amarillo, Tex. (1892), Wilmington, N.C. (1871), and at Spartanburg, S.C., and the wettest since 1893 at Charleston, S.C.

There were some dry regions also, the most extensive of which was almost all the area west of the Continental Divide, where the Pacific coast trough was weaker than normal (fig. 1). Substantially less than normal precipitation fell over most of the upper Mississippi Valley and in the Ohio Valley where Dayton, Ohio and Parkersburg, W. Va., reported their driest June of record dating back to 1883 and 1889 respectively. Combined deficits of May and June brought on drought conditions in portions of the Northeast, with the driest area centered in northeastern Pennsylvania, southeastern New York, and northern New Jersey. At Albany and Syracuse, N.Y., the May-June totals were 38 percent and 35 percent of normal, respectively, and the corresponding figure at Scranton, Pa., was only 32 percent.

6. SEVERE STORMS

Tornado activity was slight in the North Central States where these violent storms are normally most frequent in June. In this case the circulation (fig. 1) was not favorable for such development. The mean trough was too far west, the anomalous flow was easterly instead of southerly in the Midwest, and the mid-tropospheric jet was displaced northward into southern Canada. Thus the temperature pattern (fig. 3) lacked the contrast between cool Pacific and tropical Gulf air masses necessary for development of the vigorous wave cyclones with which tornadoes are most often associated. Possibly because of the proximity of a mean trough in early June (fig. 2A), several tornadoes were observed in Wyoming, where Lander reported the first on record.

There were many severe local storms of less violent

intensity. Extensive hail and wind damage were reported in Montana, Nebraska, Minnesota, and Texas, and destructive winds in Missouri and Iowa. Excessive rainfall from a coastal storm late in the month caused major crop damage in North Carolina. Winds along the coast were not destructive, however, and there was little tidal damage to the Outer Banks.

REFERENCES

1. U.S. Weather Bureau, "Normal Weather Charts for the Northern Hemisphere," *Technical Paper No. 21*, Washington, D.C., 1952.
2. J. F. O'Connor, "The Weather and Circulation of May 1962—Record Heat in the Mid-West," *Monthly Weather Review*, vol. 90, No. 8, August 1962, pp. 365-370.
3. U.S. Weather Bureau, *Weekly Weather and Crop Bulletin, National Summary*, vol. XLIX, Nos. 27 and 28, June 2 and 9, 1962.

CORRECTION

Vol. 90, No. 7, July 1962:

P. 274: In figure 5 the plotted numbers show altitude ($\times 100$ ft.) instead of azimuth.

PP. 303 and 305: The maps shown in figures 7 and 9 are not the ones intended. The correct cuts for April 1962 are shown below.

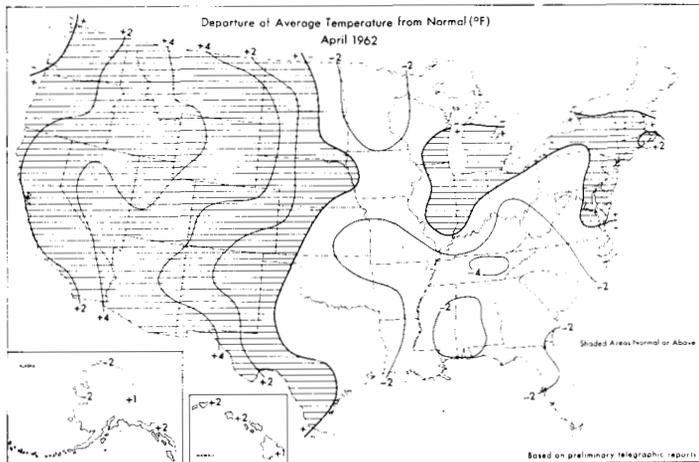


FIGURE 7.—Departure of average temperature from normal ($^{\circ}$ F.) for April 1962. Except for a small region from the southern Great Lakes eastward, temperatures averaged warm for the western and cool for the eastern half of the country.

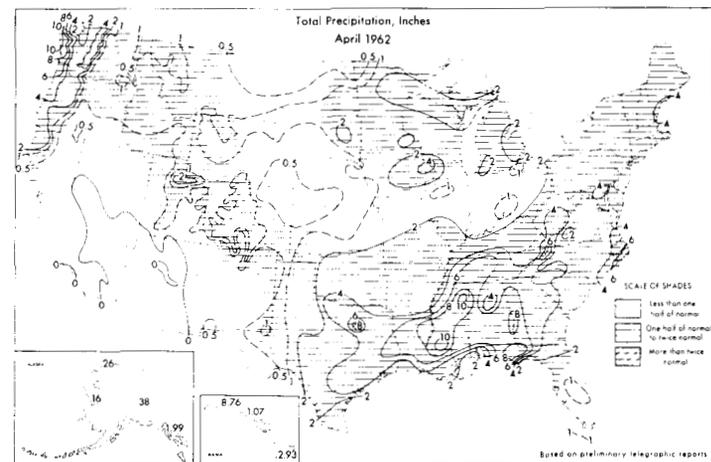


FIGURE 9.—Total precipitation in inches for April 1962. Largest amounts accumulated in the Southeast and the Pacific Northwest. Driest regions occurred in the Southwest and the northern Plains. (From [4].)