

WEATHER AND CIRCULATION OF AUGUST 1974

Relief from Heat and Drought in the Central United States

ROBERT R. DICKSON

National Meteorological Center, National Weather Service, NOAA, Washington, D. C. 20233

1. Mean circulation

The mean 700-mb flow during August was highly amplified over the Pacific, but was flat and relatively fast at mid-latitudes from eastern North America to western Asia (Figs. 1, 2 and 3). Over much of the hemisphere radical changes occurred from the previous month. At middle latitudes, essentially all of the August mean troughs, including that over the central United States, replaced July mean ridges (Wagner, 1974). Furthermore, the strong mean ridge observed over the east Pacific in August supplanted a previous deep mean trough. Heights were above normal over most of the Arctic with strong ridges observed over Alaska, Greenland and the Barents Sea. Strong subtropical ridges were observed over both the Atlantic and Pacific Oceans.

2. Temperature

The marked circulation changes over North America from July to August were accompanied by equally pronounced temperature changes in the United States. Increasing northerly flow between the east Pacific-

Alaska ridge and the Great Plains-Hudson Bay trough drove cold air masses over the central portions of the United States (Fig. 4). Over parts of the northern and central Great Plains the near record warmth of July gave way to near record cold in August.

Temperatures were above normal in the Northeast in advance of the mean trough as well as along the West Coast where heights were above normal and the influx maritime air was impeded. Both Alaska and Hawaii observed above normal 700-mb mean heights and above normal mean temperatures.

3. Precipitation

Development of a mean trough in the central United States brought increasing storminess and above normal precipitation to most locations east of the Continental Divide (Fig. 5). This was the wettest August of record at such widely scattered locations as Sault Ste. Marie, Mich., Dodge City, Kan., Springfield, Ill., Lexington, Ky., San Antonio, Tex., and Charleston, S. C. The rainfall total at Sault Ste. Marie was also a record high for any month of the year. Near record August rainfall

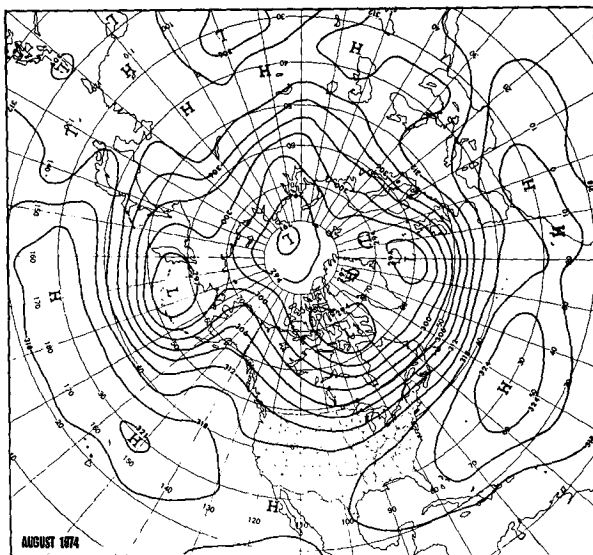


FIG. 1. Mean 700-mb height contours (dekameters) for August 1974.

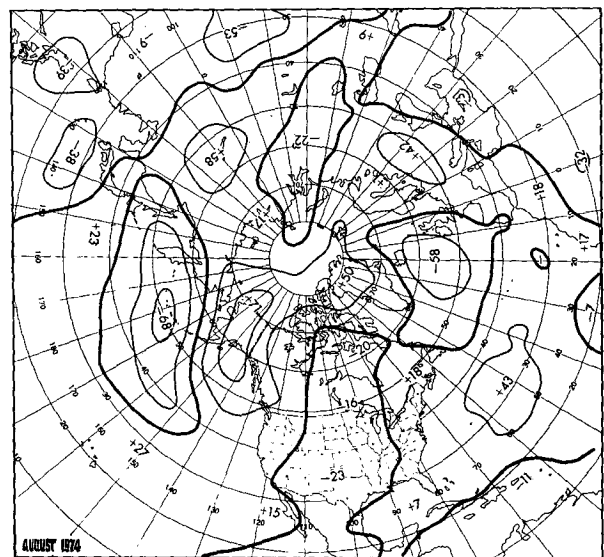


FIG. 2. Departure from normal of mean 700-mb height (m) for August 1974.

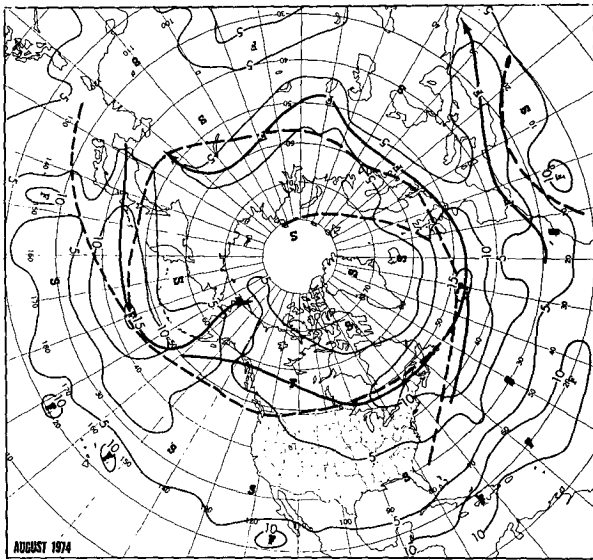


FIG. 3. Mean 700-mb geostrophic wind speed (m/s) for August 1974. Solid arrows indicate observed axes of maximum wind speed and dashed lines, the normal.

was observed in the vicinity of the above listed stations and also in Montana. This precipitation regime was in marked contrast to that of July when drought conditions had developed in portions of the Great Plains and Midwest (Wagner, 1974).

Development of the strong mean ridge over the east Pacific contributed to the dryness observed in the West Coast states.

4. Weekly variability

a. July 29–August 4

The heat wave which had affected the northern and central Great Plains during July was convincingly broken in the first part of August (Fig. 6B). This resulted from an amplification of the long wave pattern

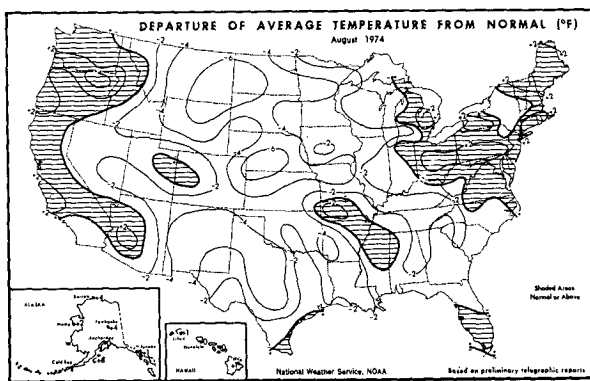


FIG. 4. Departure from normal of average surface temperature ($^{\circ}$ F) for August 1974 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1974).

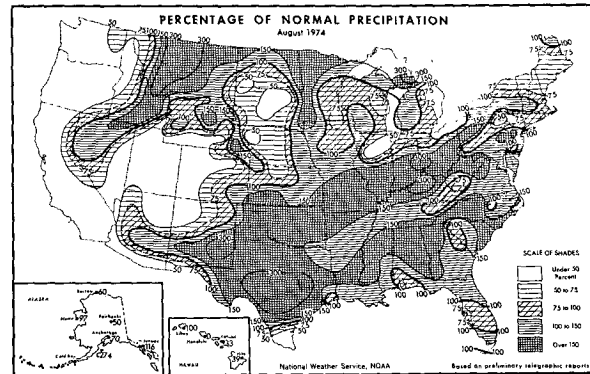


FIG. 5. Percentage of normal precipitation for August 1974 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1974).

over North America coupled with the retrogression of a moderately deep trough to the Midwest (Fig. 6A). Precipitation was generally substantial in advance of the upper trough but was spotty over much of the Corn Belt which had been affected by drought during July (Fig. 6C). The retrograding trough brought significant rainfall to Texas which also had been seriously affected by the drought.

b. August 5–11

The long waves in the vicinity of North America progressed bringing a strong ridge to the east Pacific, a trough to the Great Plains and a blocking-type ridge near Hudson Bay this week (Fig. 7). This gave sub-normal temperatures to most of the Nation; exceptions were the West Coast States and the Great Lakes. The westward location of the mean trough continued the trend toward the westward spread of precipitation, and rains were general over the Great Plains. Rainfall was widespread and moderately heavy in the Southeast, an area of sluggish flow to the south of the blocking ridge.

c. August 12–18

Amplification and retrogression of the east Pacific ridge brought a trough to the West Coast and flattening flow over the United States this week (Fig. 8). This gave cooler weather to the West Coast States and portions of the northern Great Plains, but a warming trend elsewhere. Precipitation was general but not heavy over the eastern two-thirds of the country in connection with storm systems moving in the westerlies and occasional slow-moving upper troughs in the southern fringe of the westerlies.

d. August 19–25

Flattening of the Pacific flow pattern resulted in some progression of the low-amplitude waves over the United States (Fig. 9). This produced an overall eastward

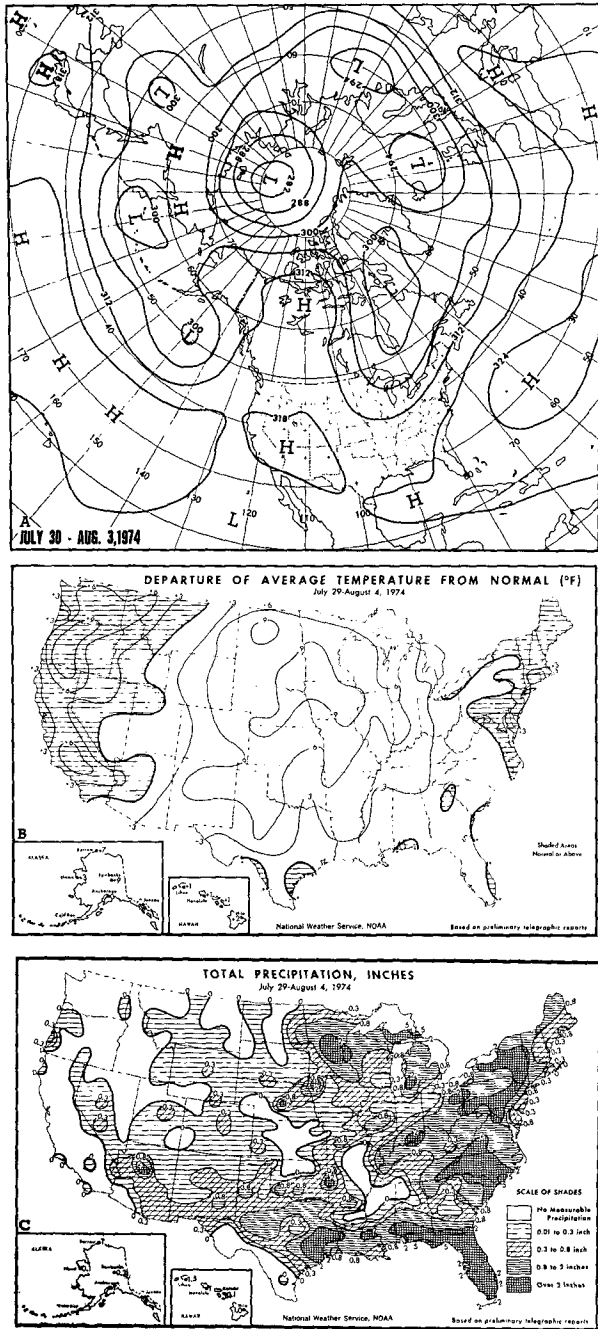


FIG. 6. (A) Mean 700-mb contours (dam) for 30 July-3 Aug. 1974; (B) departure from normal of average surface temperature ($^{\circ}$ F) and (C) total precipitation (inches) for week of 29 July-4 Aug. 1974 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1974).

displacement of the temperature pattern, but mean temperatures were not far from normal at most locations. The rainfall distribution in the southern Great Plains this week suggests the generation of a moist tongue moving northeastward between the eastern ridge and the amorphous western trough. Most of the

rainfall in the Southeast was associated with a single slow moving upper trough which was secluded from the northward moving westerlies early in the week and picked up again by the westerlies late in the week.

e. August 26-September 1

The Pacific flow pattern strongly amplified this week (Fig. 10), as was the case two weeks earlier (Fig. 8).

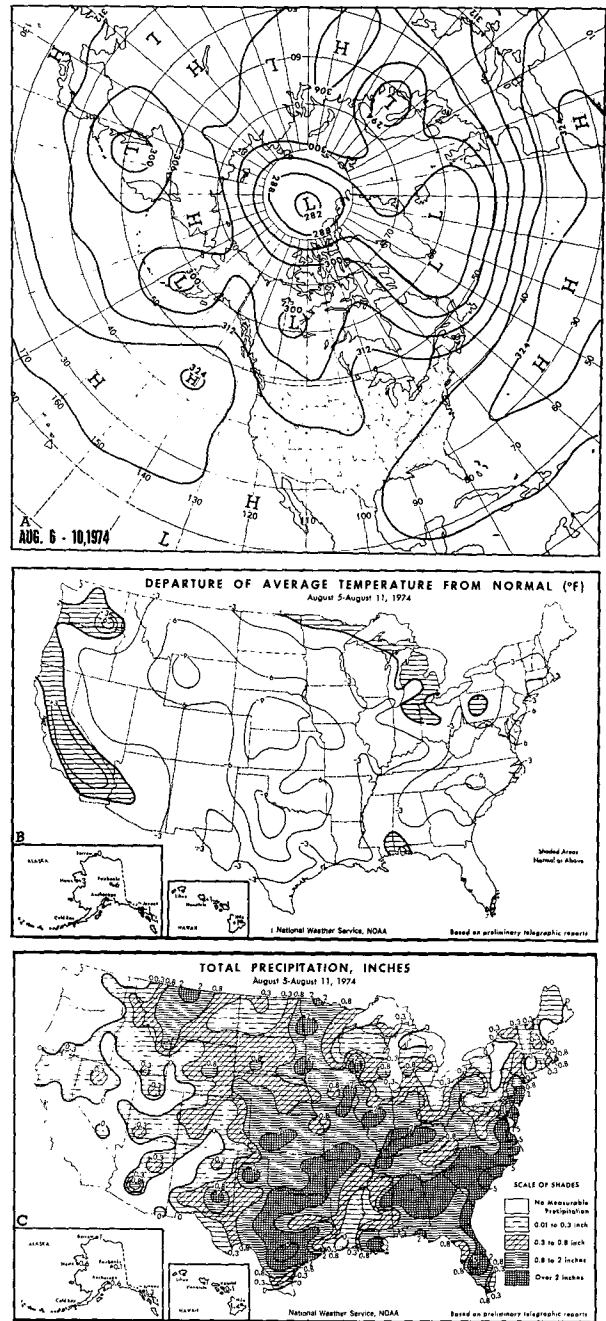


FIG. 7. Same as Fig. 6: (A) for 6-10 Aug. 1974; (B) and (C) for week of 5-11 Aug. 1974.

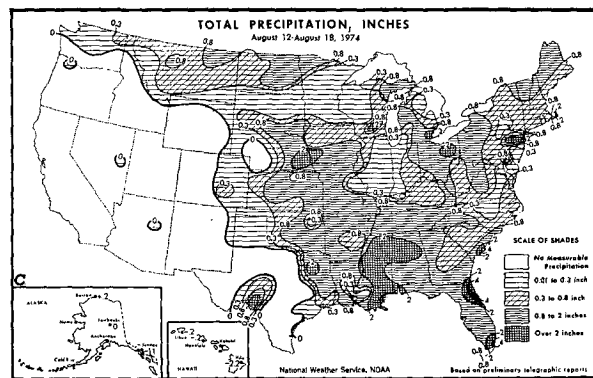
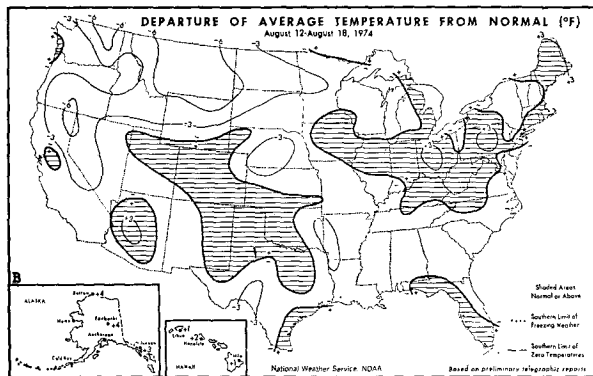
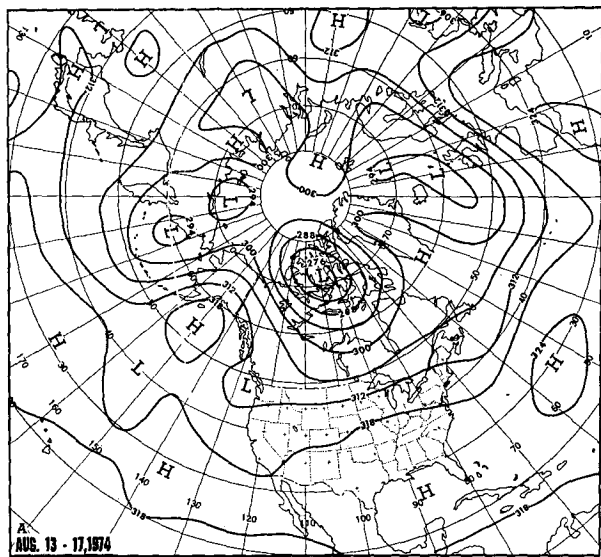


FIG. 8. Same as Fig. 6: (A) for 13-17 Aug. 1974; (B) and (C) for week of 12-18 Aug. 1974.

In this instance, however, the Gulf of Alaska ridge was far enough east to preclude the development of a significant West Coast trough and, instead, a deep trough was observed extending from Texas to Hudson Bay. Enhanced northerly flow between this trough and the Gulf of Alaska ridge again brought subnormal temperatures to the middle one-third of the country while the West and the East became quite mild. Redevelop-

ment of a mean trough with strong thermal contrasts in the United States yielded an extensive area of heavy precipitation this week extending from eastern portions of the central and southern Great Plains to New England. A tropical disturbance which crossed the Gulf coast on the 26th contributed to the large rainfall totals observed in east Texas.

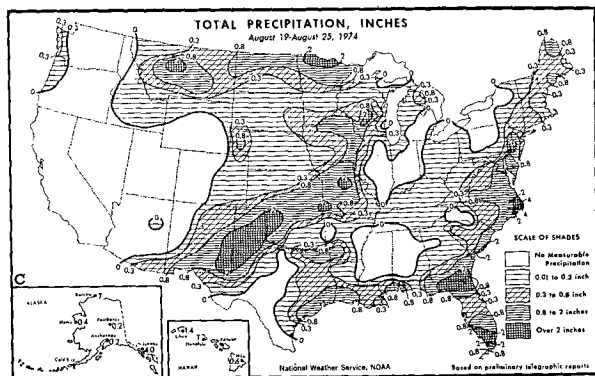
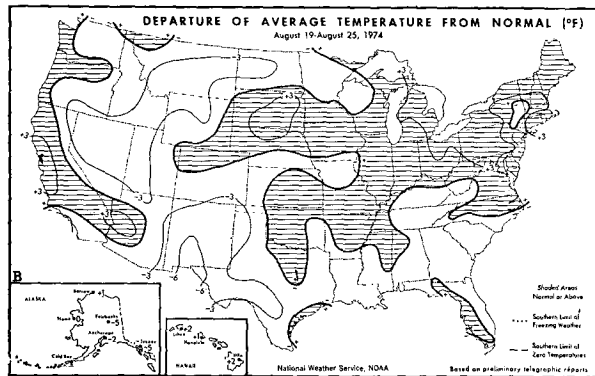
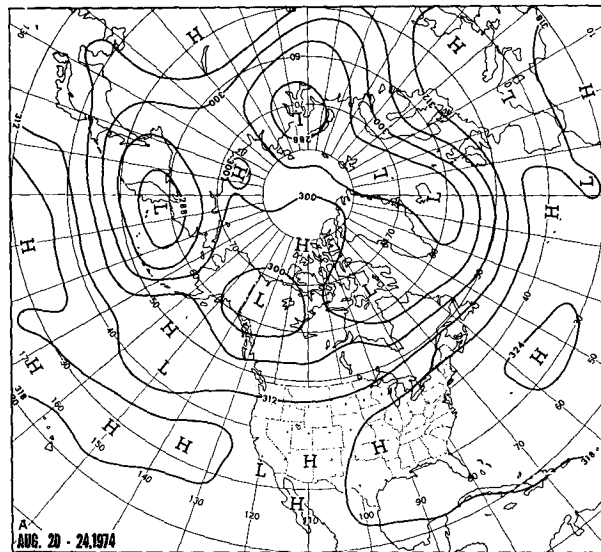


FIG. 9. Same as Fig. 6: (A) for 20-24 Aug. 1974; (B) and (C) for week of 19-25 Aug. 1974.

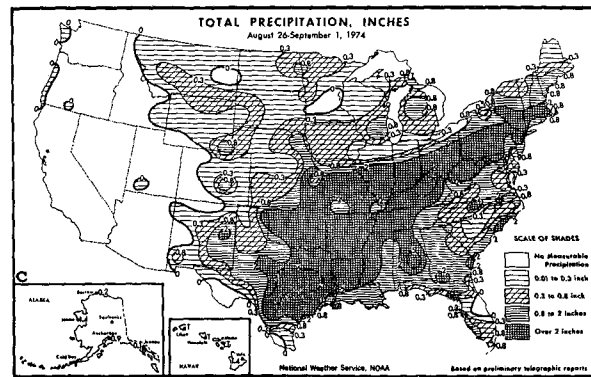
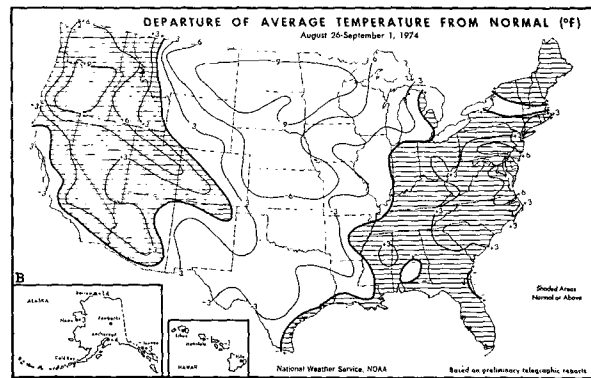
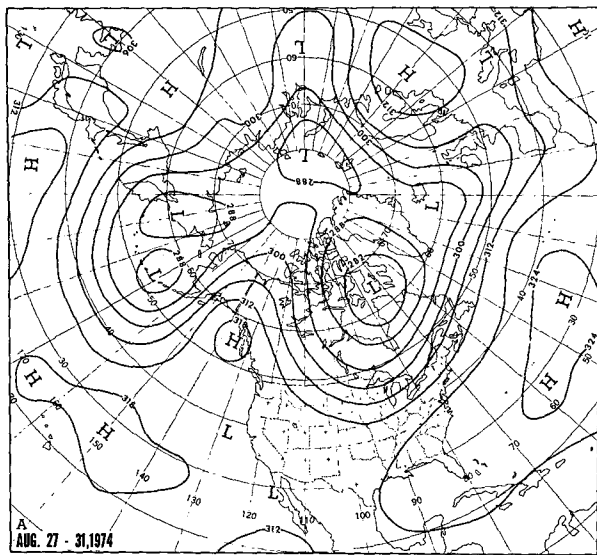


Fig. 10. Same as Fig. 6: (A) for 27-31 Aug. 1974; (B) and (C) for week of 26 Aug.-1 Sept. 1974.

5. Tropical activity

There was very little storminess in the tropical Atlantic this month. After tropical storm Alma dissipated in northern Venezuela at mid-month there were no named storms until the last few days of the month. At that time tropical storm Becky rapidly intensified to hurricane strength some 10° longitude east of Cape Hatteras and tropical storm Carmen appeared south of Haiti.

This was an active month for tropical storms in the southeast North Pacific—similar to August 1972 but in contrast to last August. After tropical storm Helga on August 10 and 11 there was little action until the last 10 days of the month when five storms—Ione, Joyce, Kirsten, Lorraine and Maggie—reached tropical storm intensity. All of these, except Lorraine, became hurricanes. On two days, August 26 and 27, all five storms were in existence.

There were 6 tropical storms in the west Pacific series this month, although one of them, Olive was observed south of Hawaii on only one day, August 24. West of the dateline, the storms (Lucy, Mary, Nadine, Polly and Rose) were scattered throughout the month beginning on August 9. Of these, only Mary and Polly reached typhoon strength—and Mary was rated a typhoon on only one day. Tropical storm Mary was unusual for its longevity. It first reached tropical storm strength southeast of Japan on August 12, became a typhoon for a short period on August 18 while passing south of Japan and hit the coast of China on August 20 where it was downgraded to a Low. Subsequently the storm moved eastward becoming a tropical storm again on August 24 and finally dissipated over Japan on August 26. Typhoon Polly was approaching southern Japan at the month's end.

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