

# WEATHER AND CIRCULATION OF AUGUST 1972

## Five Hurricanes in the East Pacific

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### 1. MEAN CIRCULATION

The temperate westerlies index ( $0^{\circ}$ – $180^{\circ}$ W) increased to near normal during August after reaching a seasonal minimum during the last half of July. The increase was accompanied by progression of most of the midlatitude circulation features between the east coast of Asia and the east coast of North America (figs. 1, 2). From the mid-Atlantic to Central Asia, however, the circulation regime changed little.

The strong blocking ridge over eastern Europe continued to move southward, as it did during July (Taubensee 1972).

At high latitudes, both components of the split polar vortex that had existed in July deepened during August (figs. 1–3). As the high-latitude westerlies gained speed, the previous blocking ridge over Alaska rapidly diminished (fig. 3). Over North America, the core of the westerlies was displaced north of normal (fig. 4); slower flow than normal prevailed over the United States.

### 2. TEMPERATURE

The strong, mean ridge extending from the northwestern United States to Alaska (figs. 1, 2) drove cool air south-

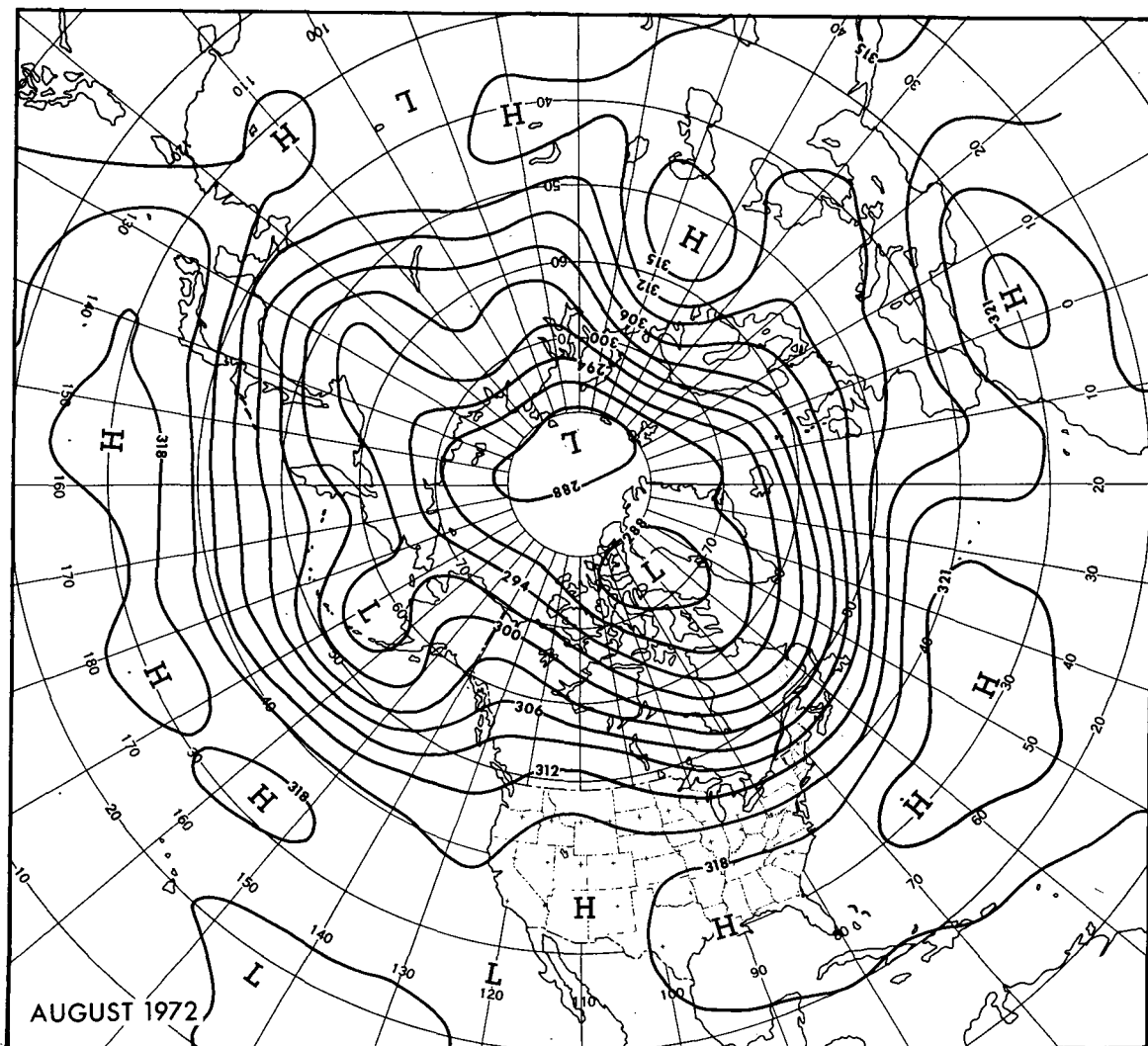


FIGURE 1.—Mean 700-mb contours in dekameters (dam) for August 1972.

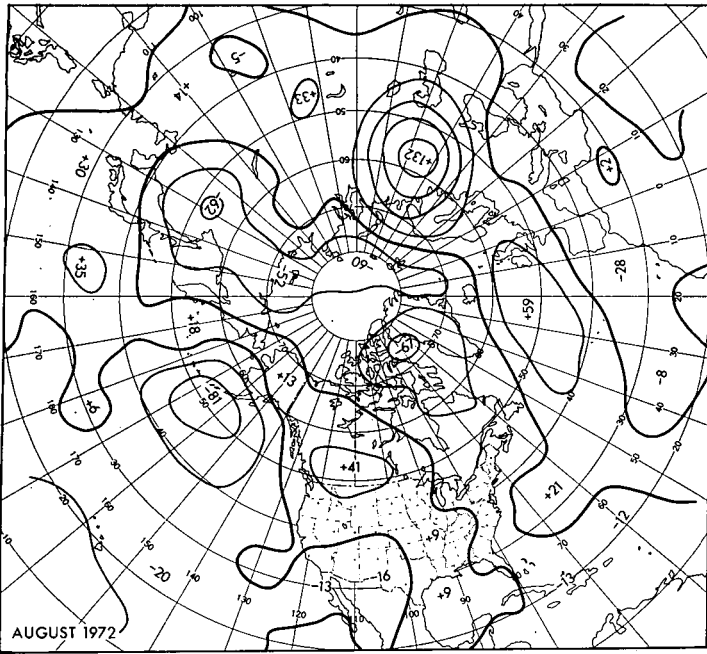


FIGURE 2.—Departure from normal of mean 700-mb height in meters (m) for August 1972.

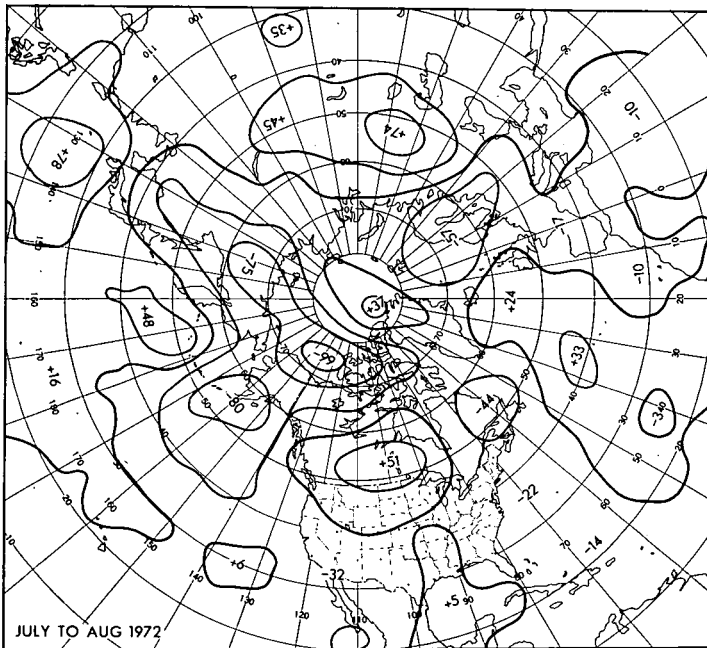


FIGURE 3.—Mean 700-mb height anomaly change (m) from July to August 1972.

ward over most areas east of the Continental Divide during August (fig. 5). Along the north-central border, however, where 700-mb heights increased most (fig. 3), temperatures rose from well below normal in July (Taubensee 1972) to above normal in August. Temperatures also exceeded normal over the Southeast, where a fairly strong upper level ridge was observed (figs. 1, 2). West of the divide, temperatures were above normal beneath the upper level ridge except for parts of the Southwest, where cloudy, wet weather prevailed (figs. 5, 6). The rainy regime over Texas also contributed to the cool weather observed there.

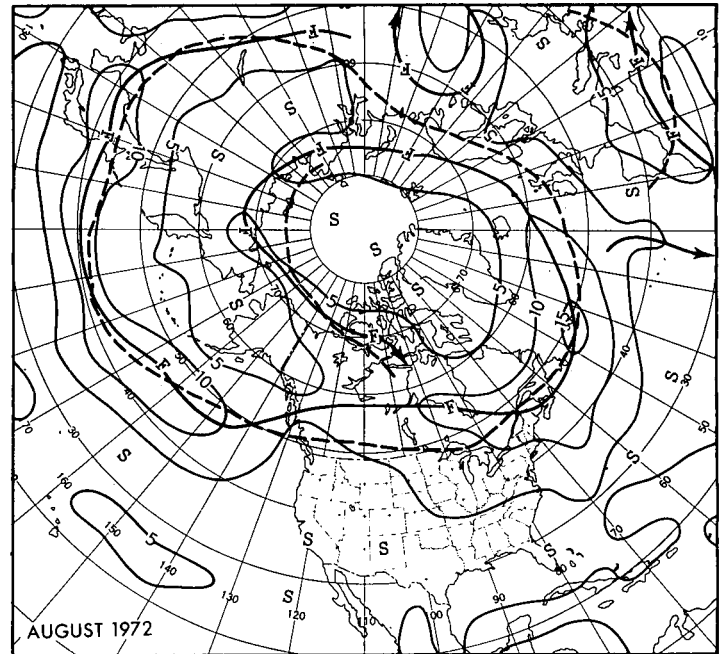


FIGURE 4.—Mean 700-mb geostrophic wind speed (m/s) for August 1972. Solid arrows show the observed axes of maximum wind speed, and dashed lines show the normal.

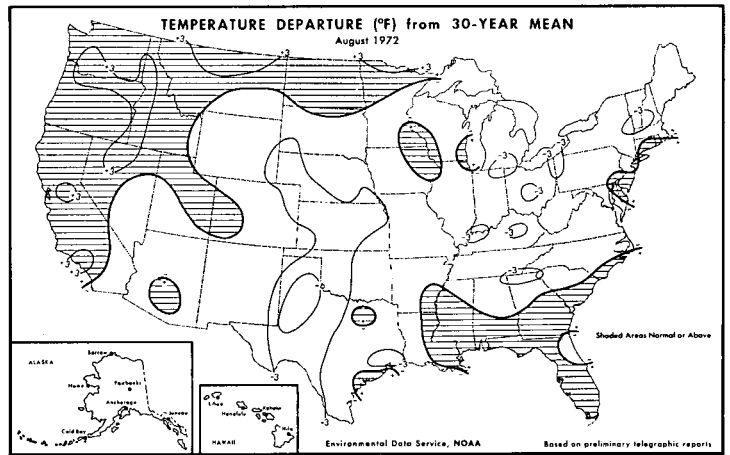


FIGURE 5.—Departure from normal of average surface temperature (°F) for August 1972 (from Environmental Data Service and Statistical Reporting Service 1972).

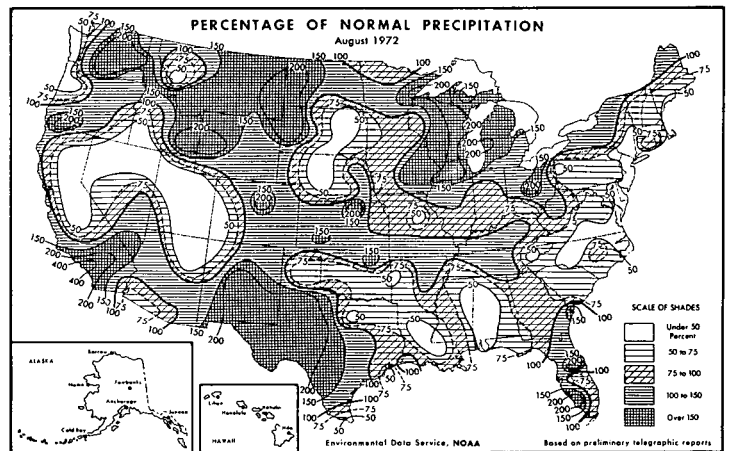


FIGURE 6.—Percentage of normal precipitation for August 1972 (from Environmental Data Service and Statistical Reporting Service 1972).

The amplified ridge over Alaska brought above-normal temperatures to most of that State. Relatively cool weather was confined to the Aleutians, where a deep mean trough was observed.

### 3. PRECIPITATION

Rainfall exceeded normal over much of the Nation from the Rocky Mountains to the Appalachians (fig. 6) as cold fronts and associated Lows traversed the area. At several stations from Parkersburg, W. Va., to Duluth, Minn., this was one of the wettest Augusts of record. Below-normal upper heights in the Southwest coupled with a stronger than normal High over Louisiana (figs. 1, 2) indicate both the occasional occurrence of troughs in the Southwest and the advection of an ample moisture supply over Texas. Large percentages of normal precipitation in parts of the Far West have little practical significance this month because of scant normal precipitation. At Los Angeles, Calif., for example, 0.40 in. of precipitation in August represents more than 400 percent of normal.

Rainfall was subnormal over much of the South in the vicinity of the upper ridge (figs. 1, 2, 6). Situated under a weak mean trough between two upper level Highs, much of Florida received above-normal precipitation. Elsewhere along the east coast to the rear of the mean trough, precipitation was subnormal. Charlotte and Greensboro, N.C., reported the driest August of record and Boston, Mass., the second driest.

The moderately strong, mean ridge over Alaska (figs. 1, 2) favored subnormal precipitation. Greater than normal totals were confined to southeast Alaska, where the 700-mb flow was more southerly than normal, and to Barrow, affected by perturbations in the westerlies (figs. 1, 2).

### 4. VARIABILITY WITHIN THE MONTH

Weekly distributions of temperature and precipitation accompanied by appropriate 5-day mean 700-mb maps are shown in figures 7–11. Although the continuity is at times unclear, it is apparent that midlatitude troughs and ridges were generally progressive during August. A good example is the trough-ridge pair that overlay the eastern Pacific Ocean and the west coast early in the month (fig. 7) and subsequently moved across the United States (figs. 8–10). By the end of the month, however, notable retrogression was evident over North America and the Pacific Ocean (figs. 10, 11).

Circulation features over the Arctic were also mobile. A deep Low on the Asiatic side of the pole early in the month (fig. 7) moved north of Alaska (fig. 8) and then southward to Baffin Bay (figs. 9, 10) where it had a strong impact upon the circulation over the Atlantic Ocean. One of the few circulation features that persisted throughout most of the month was the strong upper ridge north of the Black and Caspian Seas.

The temperature regime over the United States responded to the progression of the ridge-trough complex described above. Early in the month, temperatures were

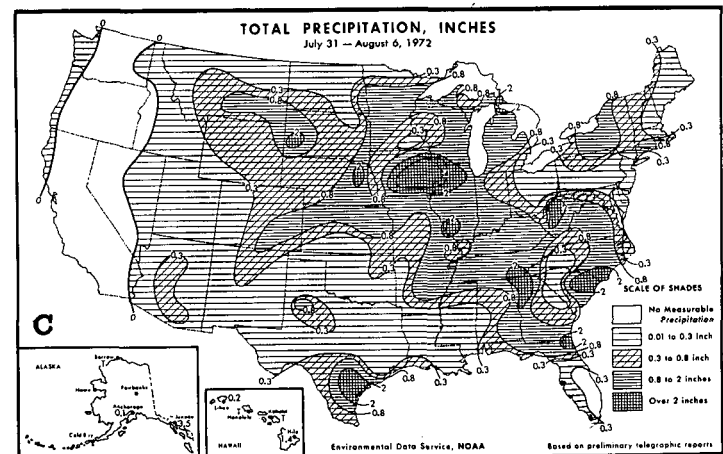
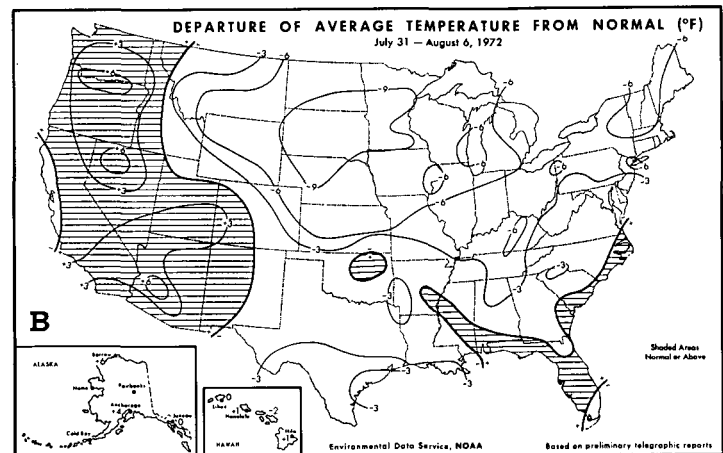
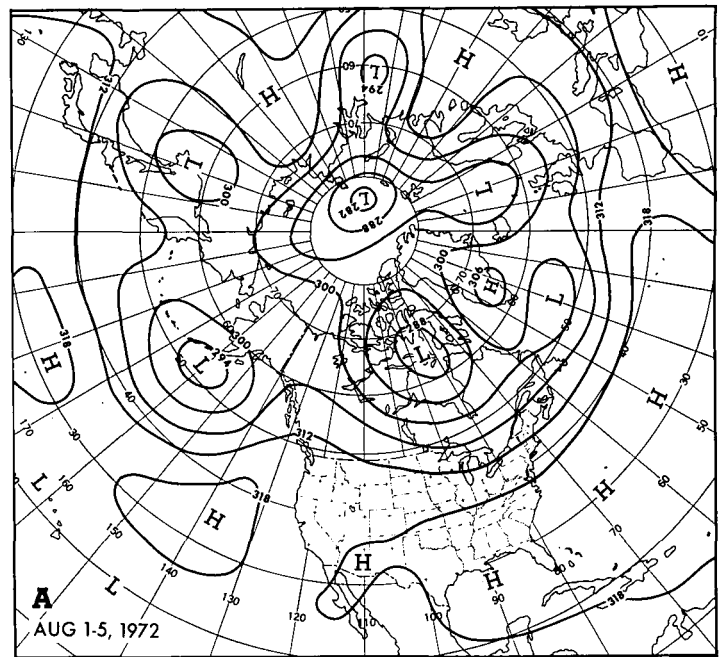


FIGURE 7.—(A) mean 700-mb contours (dam) for Aug. 1–5, 1972; (B) departure from normal of average surface temperature ( $^{\circ}\text{F}$ ) and (C) total precipitation (in.) for week of July 31–Aug. 6, 1972 (from Environmental Data Service and Statistical Reporting Service 1972).

warm in the vicinity of the western ridge and cool to its east (fig. 7). As the ridge progressed, the warm air spread eastward (figs. 8–10). Similarly, the cooling influence of the following trough and associated advective field is

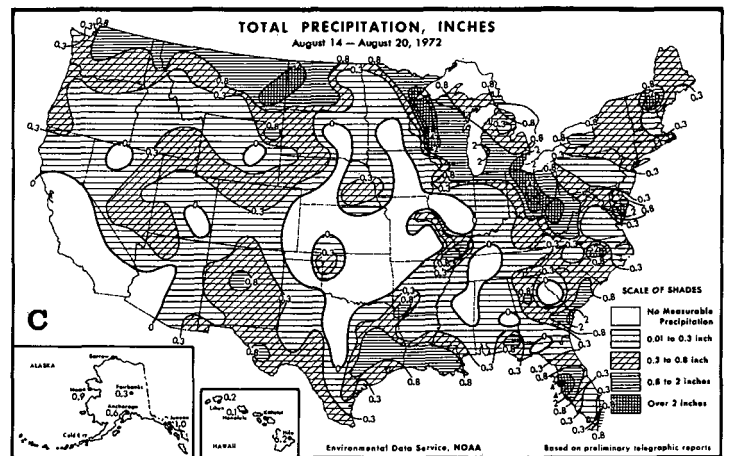
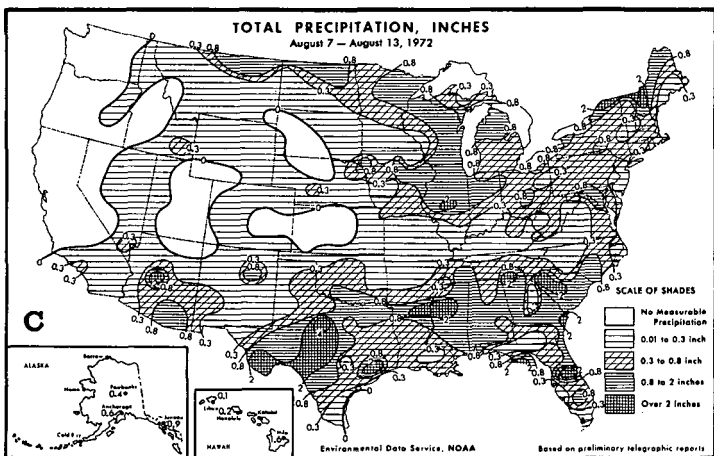
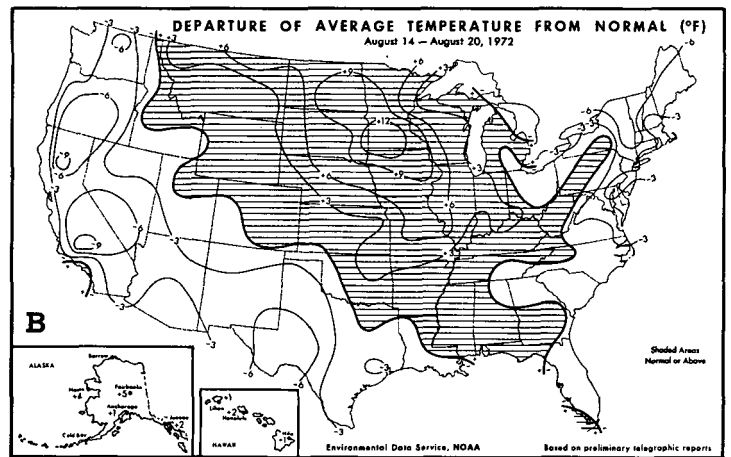
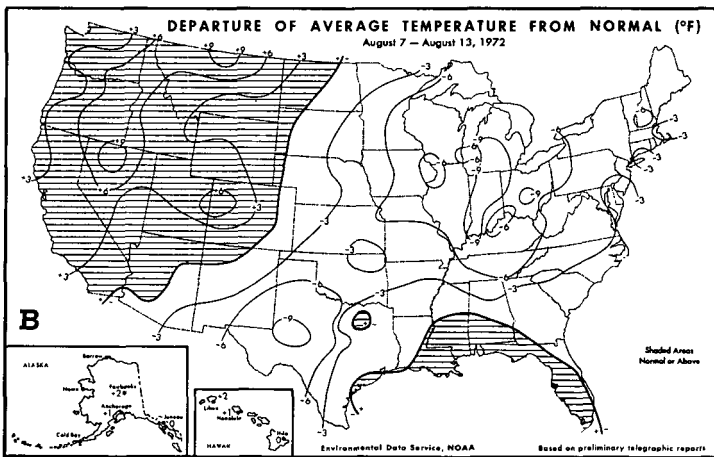
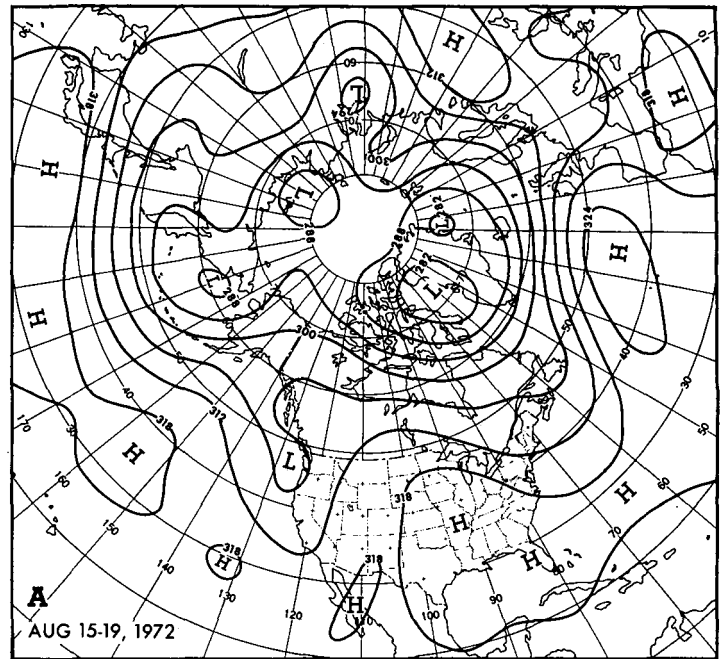
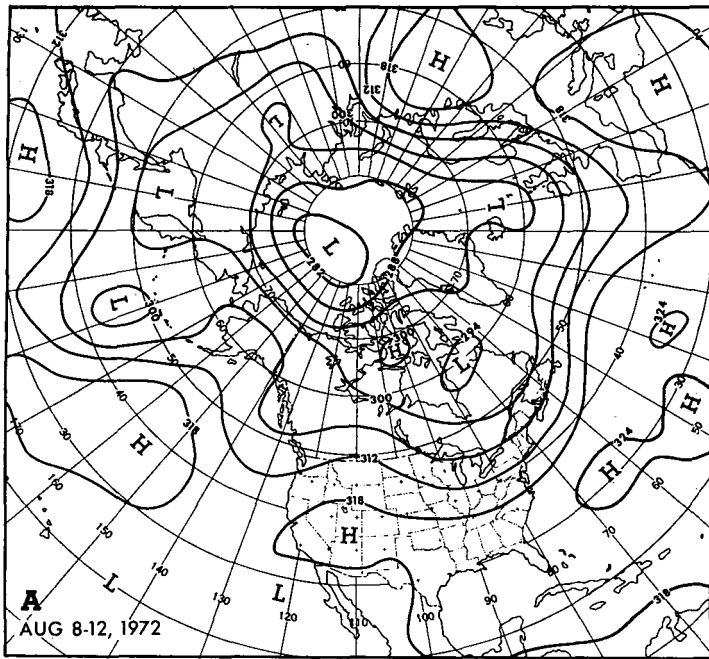


FIGURE 8.—Same as figure 7, (A) for Aug. 8-12, 1972; (B) and (C) for week of Aug. 7-13, 1972.

FIGURE 9.—Same as figure 7, (A) for Aug. 15-19, 1972; (B) and (C) for week of Aug. 14-20, 1972.

apparent (figs. 9, 10). Low temperatures persisted over Texas in response to the persistent cloudy, wet weather there. Record or near-record high temperatures for August were observed in western Oregon and northern portions of California and Nevada from August 6 to 9 when the western ridge was strong.

The Northwest was generally dry except for midmonth, when a deep, mean trough lay along the west coast (fig. 9). Precipitation fell in the Southwest during each week of the month. It was most widespread during the August 7-13 period with a strong upper ridge to the north (fig. 8) and a double Low structure to the south, as well as during

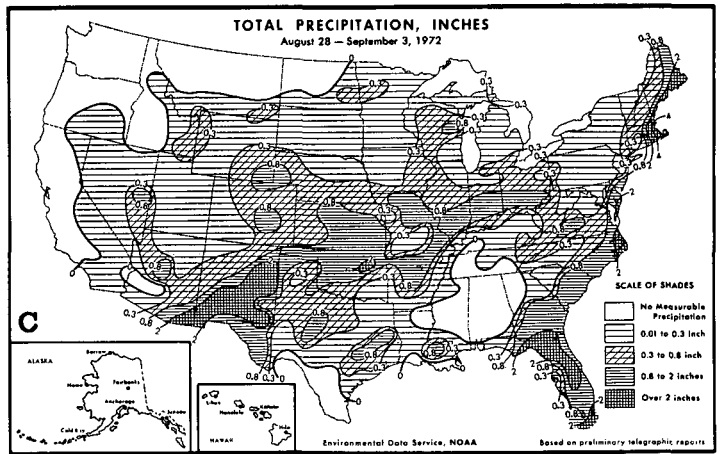
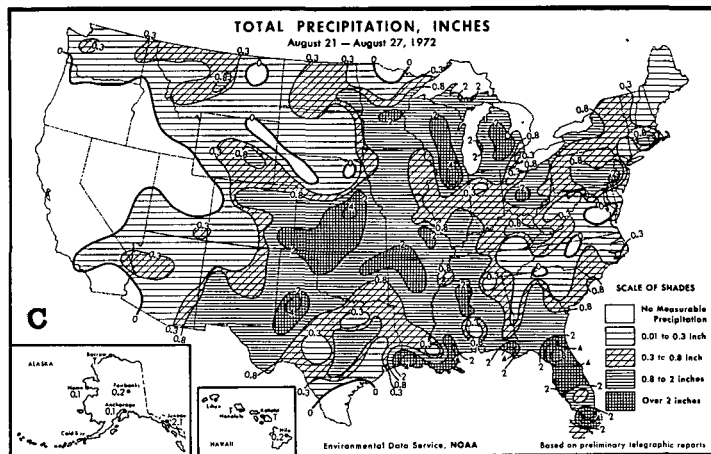
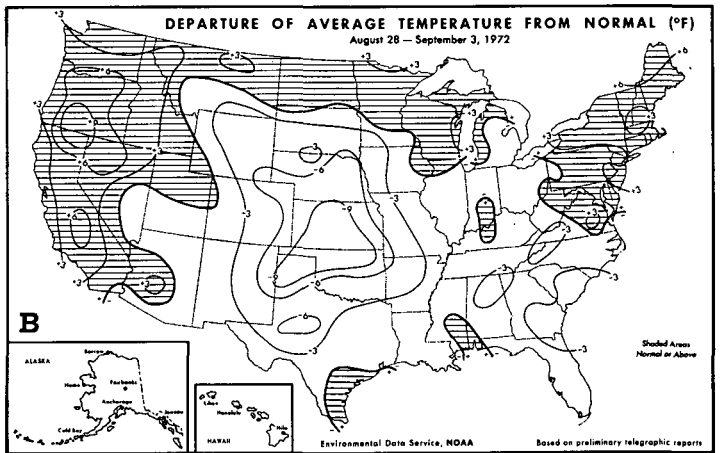
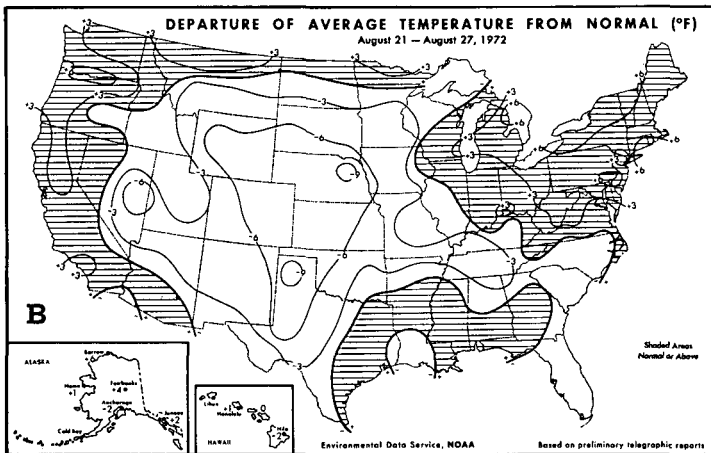
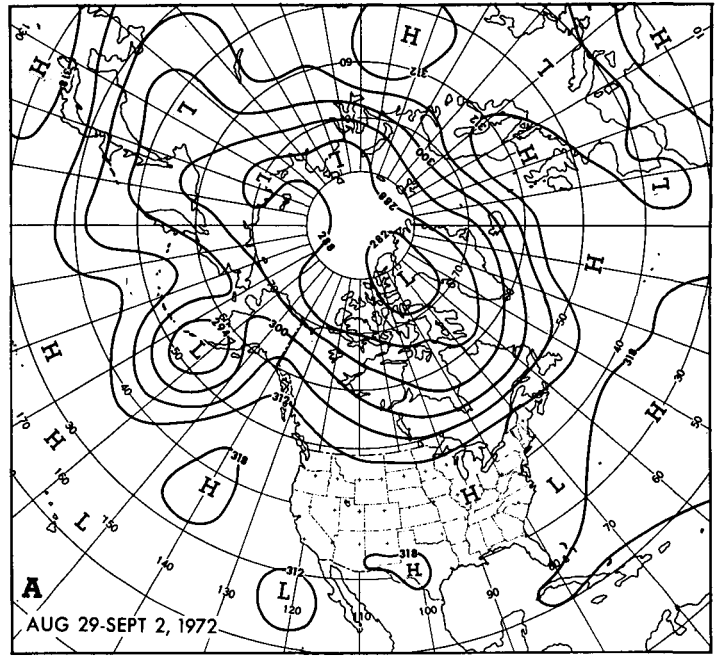
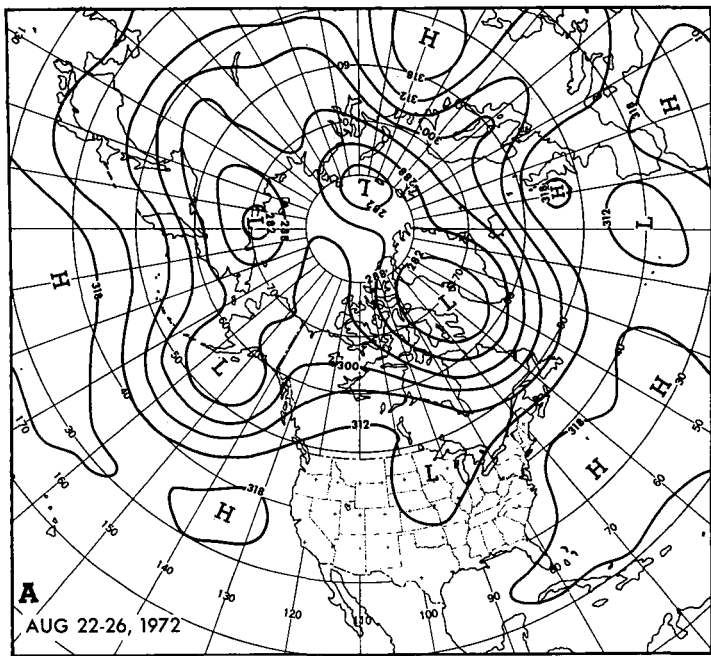


FIGURE 10.—Same as figure 7, (A) for Aug. 22-26, 1972; (B) and (C) for week of Aug. 21-27, 1972.

FIGURE 11.—Same as figure 7, (A) for Aug. 29-Sept. 2, 1972; (B) and (C) for week of Aug. 28-Sept. 3, 1972.

the final 2 weeks of the month (figs. 10, 11) when an upper Low was cut off from the westerlies near southern California. During the last week of the month, tropical storm Gwen, moving northward off lower California, provided an enhanced source of moisture for parts of the far South-

west. On August 3, a tropical disturbance moved over the Corpus Christi, Tex., area bringing substantial precipitation amounts (fig. 7C).

Rainfall occurred weekly in most areas east of the Rocky Mountains, generally in connection with transient

Lows, upper level troughs, and frontal systems. Driest conditions in the central United States occurred with the approach and passage of the mean upper ridge (figs. 8, 9).

## 5. TROPICAL ACTIVITY

In the tropical Atlantic, August was an uneventful month. The only hurricane, Betty, formed on August 29 near 41°N, 42.5°W, from neutercane Bravo, which was identified 5 days earlier in the fringe of the upper level westerlies at 37.5°N, 54.5°W. Its initial large-scale environment was a weakening mean upper trough dislodged from the east coast of the United States by progressive upstream waves (figs. 9, 10).

Tropical storm Carrie formed on the last day of the month off the southeastern coast of the United States in a region of very weak midtropospheric flow (fig. 11).

The Atlantic subtropical High at 700 mb was somewhat stronger than normal during August (figs. 1, 2), as was the August mean sea-level High in that area. However, sea-surface temperature analyses for the August 1-24 period (prepared by the U.S. Navy Fleet Numerical Weather Facility, Monterey, Calif.) reveal below-normal water temperatures along 15°N latitude from the African coast to 35°W. As suggested by Carlson (1971), this may have been a deterrent to the development of disturbances coming off the west coast of Africa.

In contrast to the Atlantic, the southeast North Pacific Ocean experienced five storms of hurricane intensity, plus a tropical storm at the end of the month. They were scattered throughout the month; map analyses indicated first attainment of tropical storm intensity as follows: Celeste, 8/7; Diana, 8/11; Estella, 8/16; Fernanda, 8/20; Gwen, 8/23; and Hyacinth, 8/30.

Two of the storms, Diana and Fernanda, passed just north of the Hawaiian Islands while of tropical storm intensity. They remained far enough to the north, however, that Hilo, for example, received less than normal precipitation for the month. Gwen moved northwestward to just west of lower California before dissipating at the end of the month.

The southeast North Pacific storms reached tropical storm intensity from 10° to 13°N between 100° and 121°W. This was the location in July of a tongue of warm surface water where temperatures exceeded 83°F. Furthermore, while July water temperatures were only slightly above normal in the region of subsequent tropical storm formation, they exceeded normal by 6°-8°F along the Equator from 112°W to the coast of South America (National Marine Fisheries Service 1972). This anomalous warming was apparently related to a weakening of the eastern South Pacific subtropical High and the consequent reduction of upwelling along the northwest coast of South America and in the equatorial southeast North Pacific (National Marine Fisheries Service 1972). Thus, the frequent occurrence of intense storms in the southeast region of the North Pacific during August appears related to an augmented latent heat supply which, itself, occurred in response to large-scale atmospheric circulation changes.

In addition to three tropical storms, there were two typhoons, Alice and Betty, in the western North Pacific during August. Both formed south of the strong western Pacific 700-mb High (figs. 1, 2). Alice moved east of Japan on August 7, but Betty followed a more southerly track, making landfall in eastern China on August 17.

## REFERENCES

- Carlson, Toby N., "Weather Note—An Apparent Relationship Between the Sea-Surface Temperature of the Tropical Atlantic and the Development of African Disturbances Into Tropical Storms," *Monthly Weather Review*, Vol. 99, No. 4, Apr. 1971, pp. 309-310.
- Environmental Data Service, NOAA, U.S. Department of Commerce, and Statistical Reporting Service, U.S. Department of Agriculture, *Weekly Weather and Crop Bulletin*, Vol. 59, Nos. 32-36, Aug. 7, 14, 21, 28 and Sept. 4, 1972.
- National Marine Fisheries Service, NOAA, U.S. Department of Commerce, *Fishing Information*, No. 7, July 1972, 16 pp.
- Taubensee, Robert E., Weather and Circulation of July 1972—Record Cold in the Northern Great Plains and Northern Rocky Mountains, *Monthly Weather Review*, Vol. 100, No. 10, Oct. 1972, pp. 751-756.

## CORRECTION NOTICE

Vol. 100, No. 6, June 1972, p. 421, left col: eq (12) should read

$$m_g = \frac{\pi \times 10^6}{6} (0.4483D_r)^3 \quad (g). \quad (12)$$

Vol. 100, No. 9, Sept. 1972, p. 698, right col. line 5: the sentence is to be read "Only the central Great Basin, Southern Great Plains, and northern Maine had average temperatures substantially above normal for the week."