

WEATHER AND CIRCULATION OF AUGUST 1973

Continued Drought in the Northwest

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1. MEAN CIRCULATION

The mean circulation at 700 mb during August was highly amplified relative to the normal for this time of year (figs. 1, 2). The wave pattern was considerably simpler than that of July (Wagner 1973); there were four prominent waves at mid-latitudes. A strong circumpolar Low persisted at high latitudes and a girdle of above-normal heights covered the subtropics.

Cold air advection east of strong ridges over central Asia and eastern Canada strengthened baroclinic zones in China and near Newfoundland. Conversion of this available potential energy is evidenced by wind speed

maxima and increasing winds immediately east of these areas (fig. 3).

The relatively flat flow over the Pacific Ocean during July (Wagner 1973) gave way to an amplified flow pattern in August (figs. 1, 2). Mean 700-mb heights over the eastern Pacific increased by as much as 100 m as a strong ridge replaced a deep trough. East of this building ridge, the west coast trough again became active. Farther downstream, the North American ridge progressed from the Rocky Mountains to the Great Plains and the east coast trough moved off the coast and deepened. Over Europe, the blocking pattern of July (Wagner 1973) gave way to fast westerlies in August (figs. 1-3). The resulting height

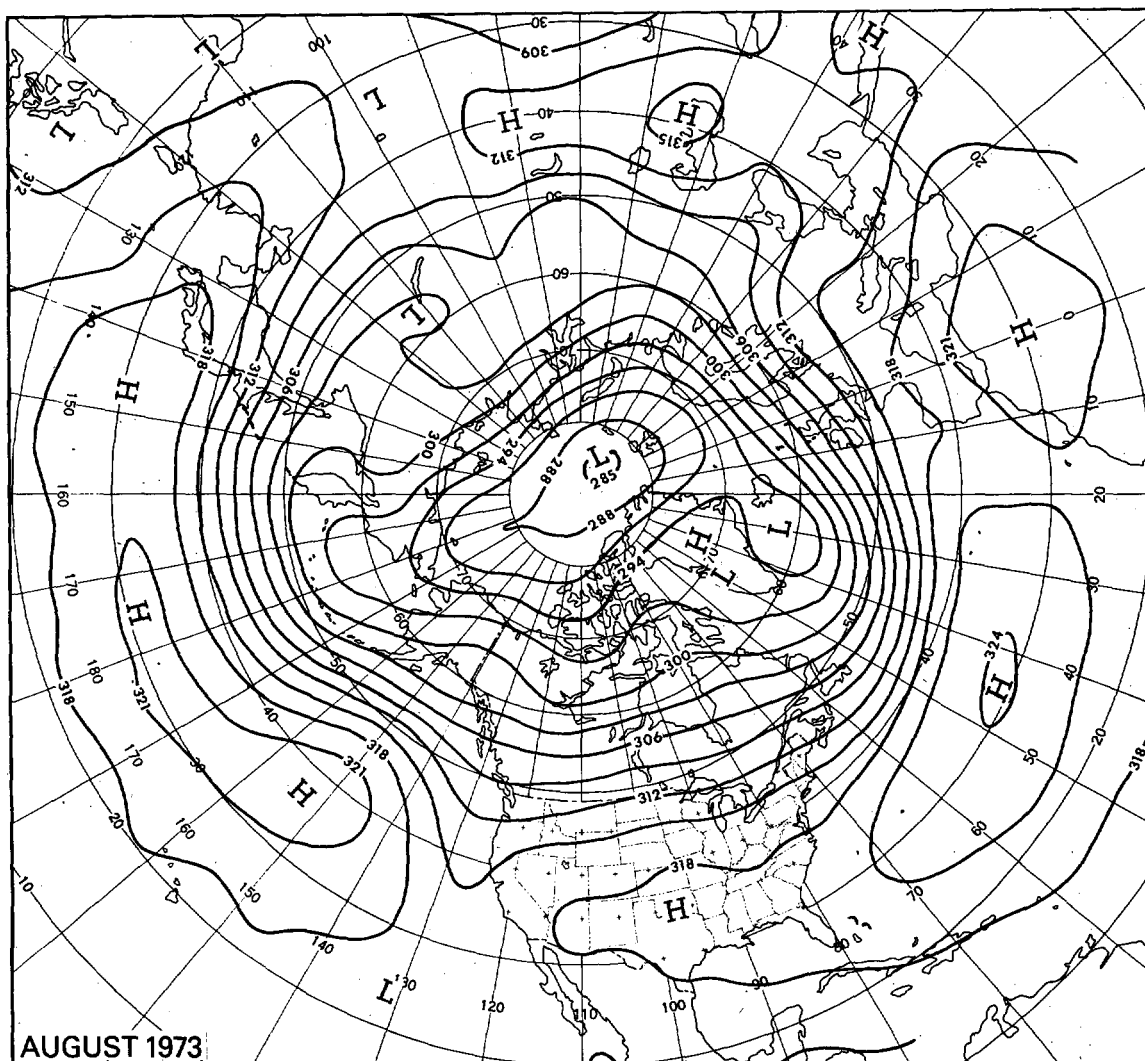


FIGURE 1.—Mean 700-mb contours in dekameters (dam) for August 1973.

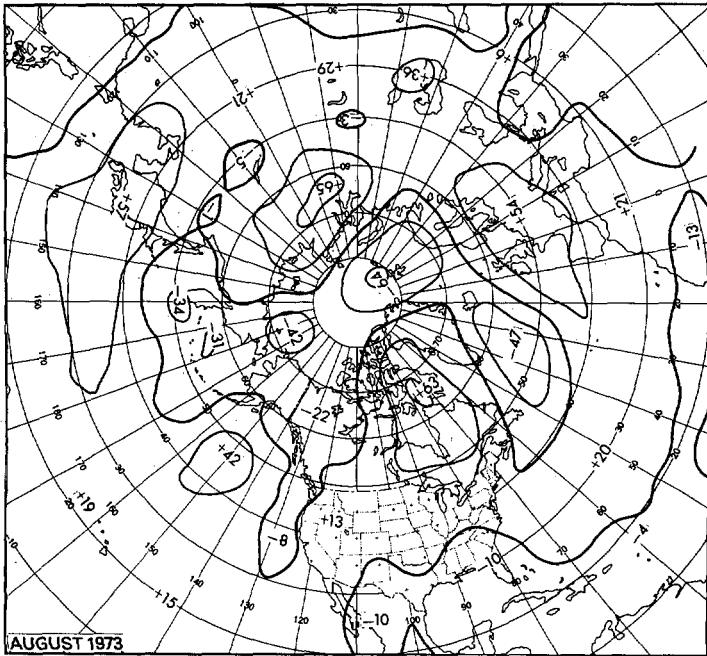


FIGURE 2.—Departure from normal of mean 700-mb height in meters (m) for August 1973.

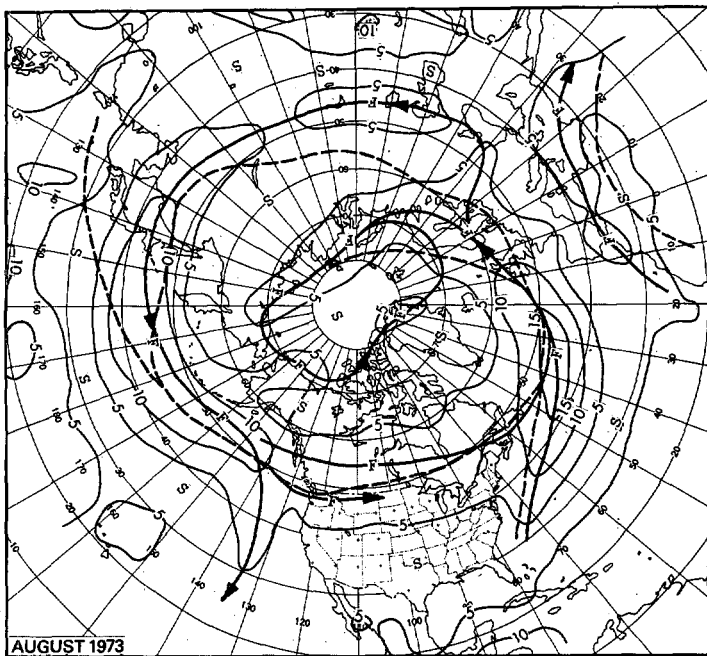


FIGURE 3.—Mean 700-mb geostrophic wind speed (m/s) for August 1973. Solid arrows show the observed axes of maximum wind speed, and dashed lines show the normal.

anomaly pattern was, to a large extent, a reversal from that of July.

2. TEMPERATURE

Anomalies of mean 700-mb height and mean surface temperature were well correlated this month (figs. 2, 4). The intense surface High over the east Pacific Ocean, implied by the upper level height distribution (figs. 1, 2),

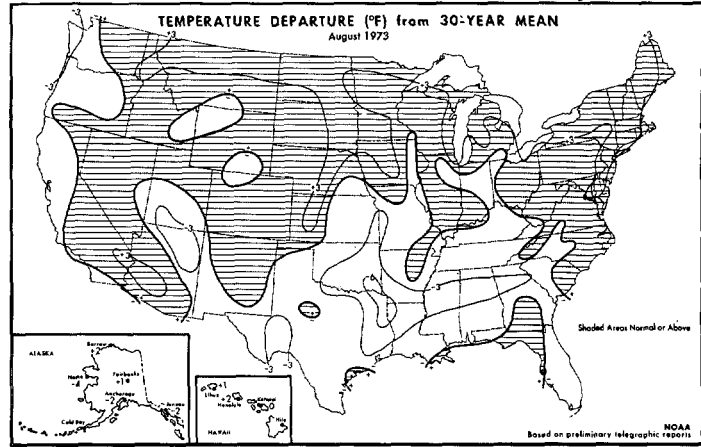


FIGURE 4.—Departure from normal of average surface temperature ($^{\circ}$ F) for August 1973 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service 1973).

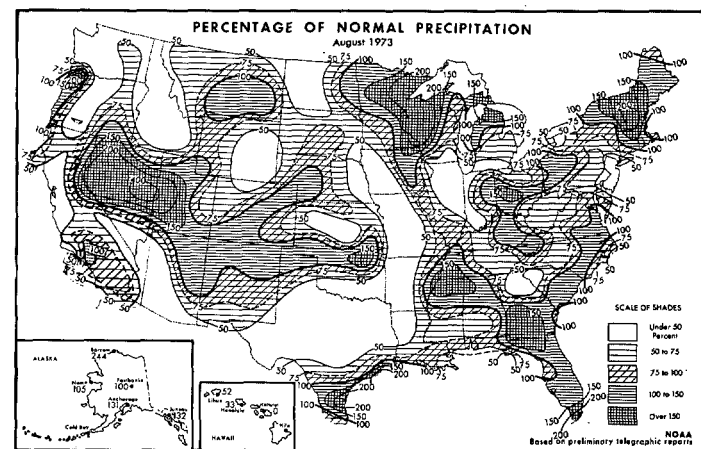


FIGURE 5.—Percentage of normal precipitation for August 1973 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service 1973).

resulted in strong coastal upwelling and low surface-water temperatures along the west coast (National Marine Fisheries Service 1973). This contributed to the low surface-air temperatures observed along the middle and north Pacific coast.

Progression of the upper ridge to the Great Plains spread warm air eastward; over the Northern Great Plains, below-normal temperatures in July gave way to above-normal values in August. Above-normal temperatures extended through the Great Lakes to the Northeast—symptomatic of the weak northwest Canada ridge (figs. 1, 2). This was the warmest August of record at Boston, Mass., and Hartford, Conn., and one of the warmest elsewhere in New England and in New Jersey. At Phoenix, Ariz., this was the second hottest August of record with temperatures exceeding 100° F on every day of the month. Below-normal temperatures were observed over much of the South (fig. 4). This was, in part, a response to cold air advection east of transient, strong ridges at higher latitudes. The deep, upper level trough over the Bering Strait (figs. 1, 2) brought subnormal temperatures to most of Alaska in August.

3. PRECIPITATION

Despite intensification of the west coast trough to near-normal depth in August, the westerlies in that area remained weak (figs. 1, 2), and little moisture penetrated the drought-stricken Northwest (fig. 5). This continued a dry regime that, in some parts of the Northwest, had begun in the fall of 1972.

January to August precipitation was the second lowest of record at Yakima, Wash., and totaled only one-half of normal at Walla Walla, Wash. Furthermore, this was the 12th consecutive month with subnormal precipitation at Helena, Mont., and the fourth at Great Falls, Mont. At the end of the month, the Palmer Index indicated moderate to extreme drought over Washington, Oregon, North Dakota, and the western half of Montana (NOAA and Statistical Reporting Service 1973).

Elsewhere in the West, a band of above-normal precipitation stretched from the Central Intermountain Region (where Ely, Nev., had the wettest August of record) to northern New Mexico. Farther to the south, Phoenix reported the driest August of record.

Scattered areas of above-normal precipitation occurred from the Upper Mississippi Valley through the Midwest to the Northeast. These occurred with slow-moving weather producers—Lows, fronts, squall lines, and troughs aloft—embedded in the southern fringe of the weak upper level westerlies (figs. 1–3). Concord, N.H., had its wettest August since 1892. Above-normal precipitation in parts of the South occurred alternatively with cold front penetrations and subsequent increasing easterly flow.

As is often the case in summer, the above-normal monthly precipitation totals at several locations resulted mainly from a few days with heavy rainfall. Examples are International Falls, Minn., and Concord, N.H., where over half the monthly rainfall occurred on a single day, August 5 and August 2, respectively. At intervening dry areas, such as Chicago, Ill., and Buffalo, N.Y., the joint occurrence on a daily time scale of favorable conditions of moisture, stability, and divergence was lacking, and major rain storms did not materialize.

Precipitation exceeded normal in northwest Alaska in advance of the deep mean trough (figs. 1, 2) as well as along parts of the eastern coast of the Gulf of Alaska. The latter was a region of more than normal cyclonic curvature aloft located north of the 700-mb wind maximum (figs. 1–3). Westward displacement of the normal mid-Pacific trough brought anticyclonic curvature and subnormal precipitation to the Aleutian Islands.

Available reports from full-time Weather Service Offices in the Hawaiian Islands indicate widespread subnormal rainfall. Record-low August precipitation was observed at Hilo, and drought conditions were prevalent on most of the island of Hawaii. This lack of precipitation in the Hawaiian Islands appears related to the relatively low surface water temperatures and the lack of tropical storms over the southeast North Pacific Ocean, discussed in the final section of this report.

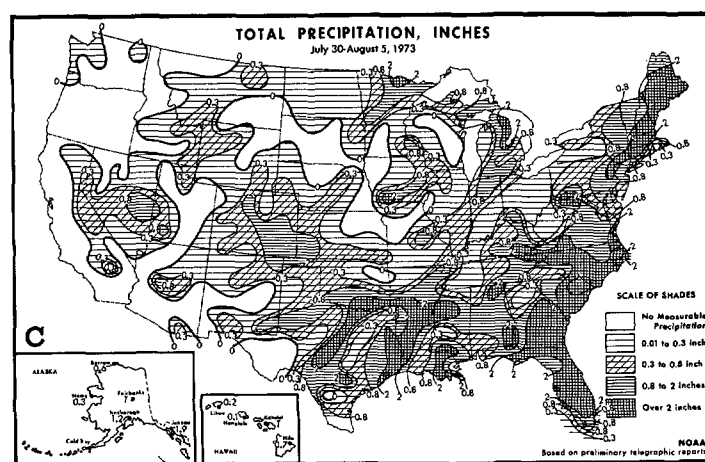
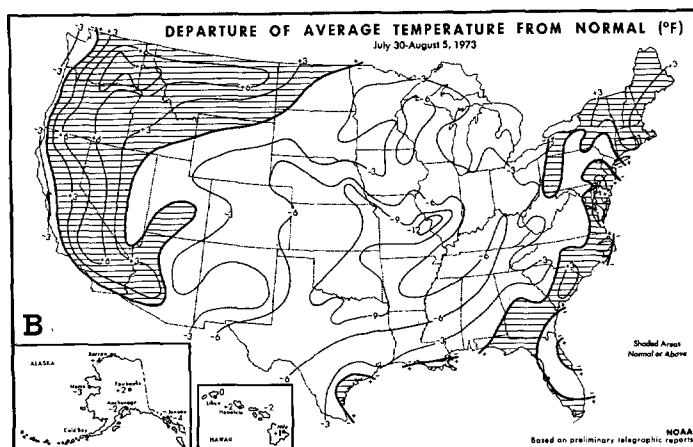
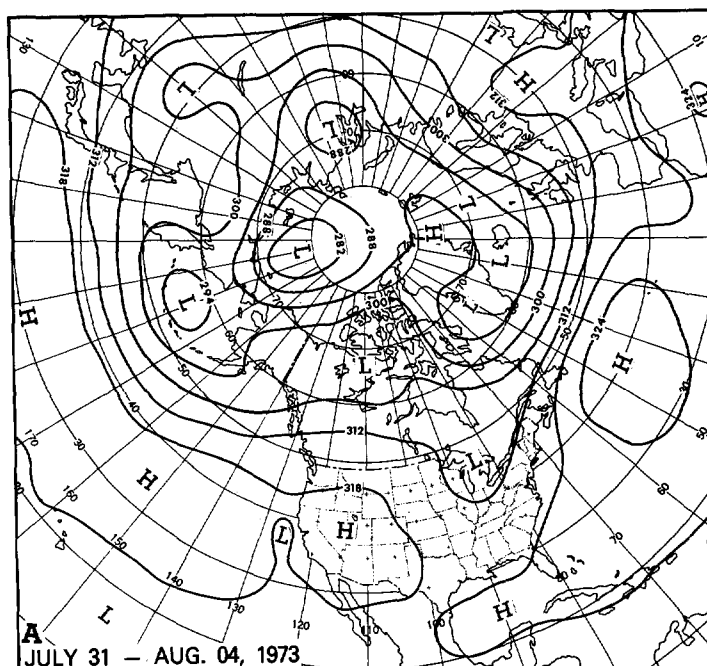


FIGURE 6.—(A) mean 700-mb contours (dam) for July 31–August 4, 1973; (B) departure from normal of average surface temperature ($^{\circ}$ F) and (C) total precipitation (in.) for week of July 30–Aug. 5, 1973 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service 1973).

4. VARIABILITY WITHIN THE MONTH

Weekly distributions of temperature and precipitation accompanied by appropriate 5-day mean 700-mb maps

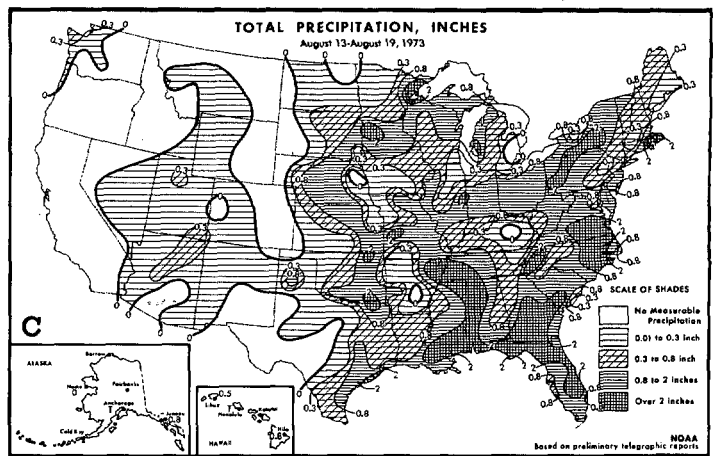
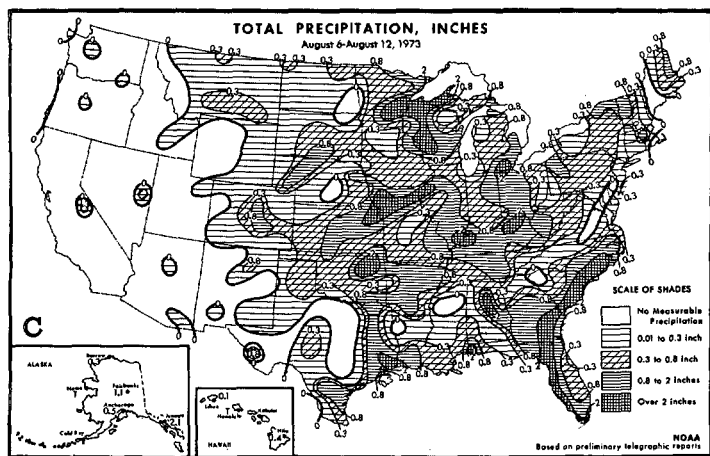
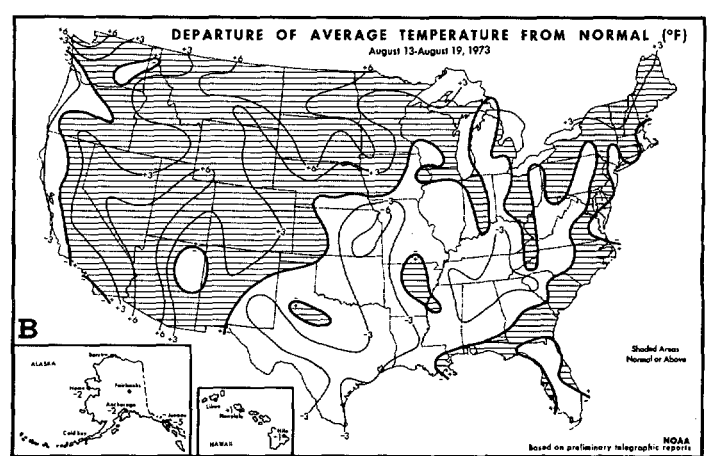
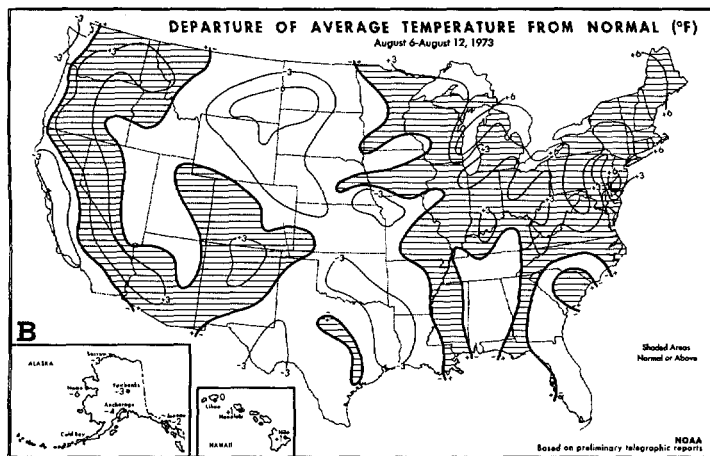
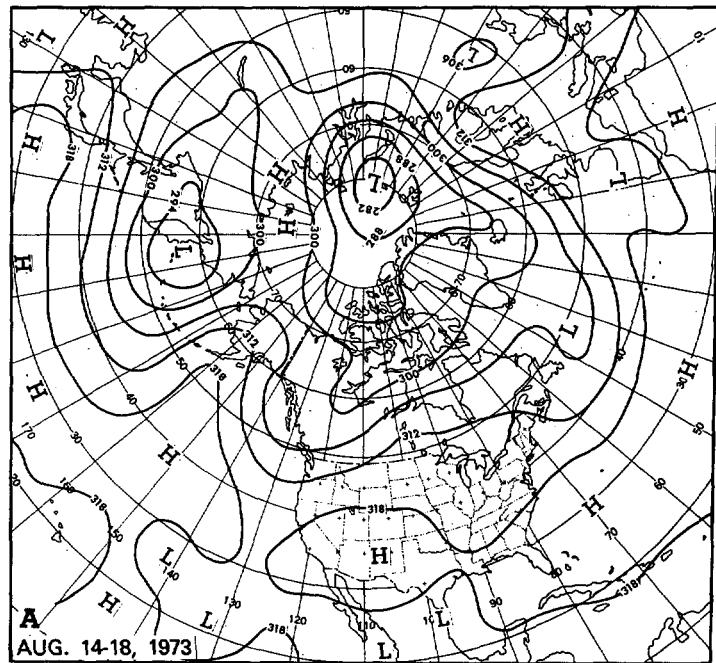
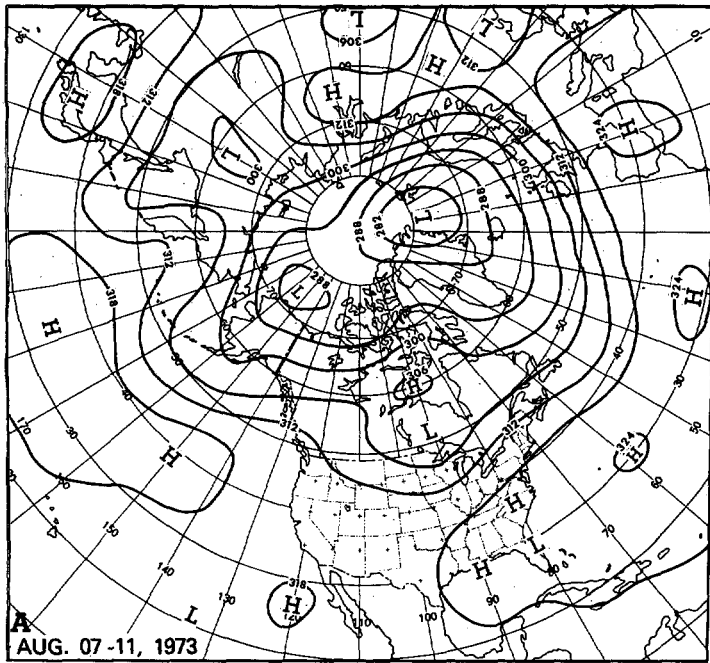


FIGURE 7.—Same as figure 6, (A) for Aug. 7-11, 1973; (B) and (C) for week of Aug. 6-12, 1973.

FIGURE 8.—Same as figure 6, (A) for Aug. 14-18, 1973; (B) and (C) for week of Aug. 13-19, 1973.

are shown in figures 6-10. The mid-latitude wave train was generally progressive this month with a succession of troughs and ridges passing over the United States (figs. 6-10). As might be expected from the weak mean winds at lower latitudes (figs. 1, 3), the southern portions

of these troughs frequently sheared from northern portions. Winds far to the north were also weak, and a moderately strong mean ridge was observed near Hudson Bay during most of the month (figs. 6, 7, 8, 10).

Early in the month a mean ridge moved off the coast

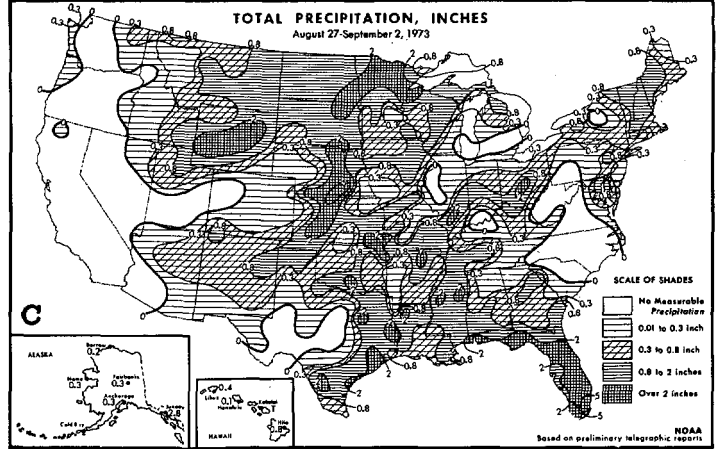
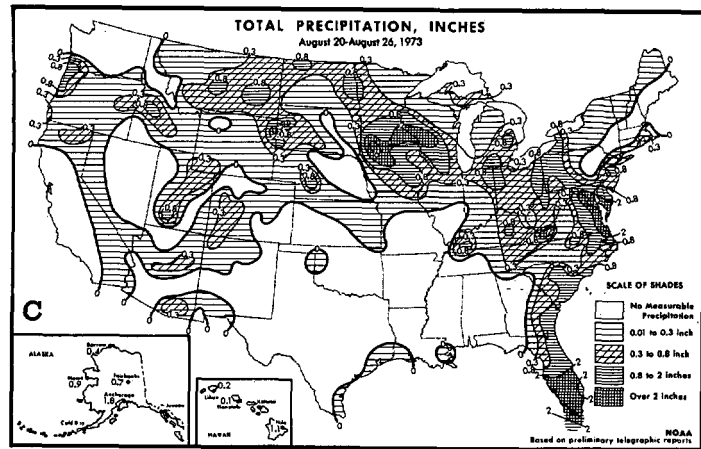
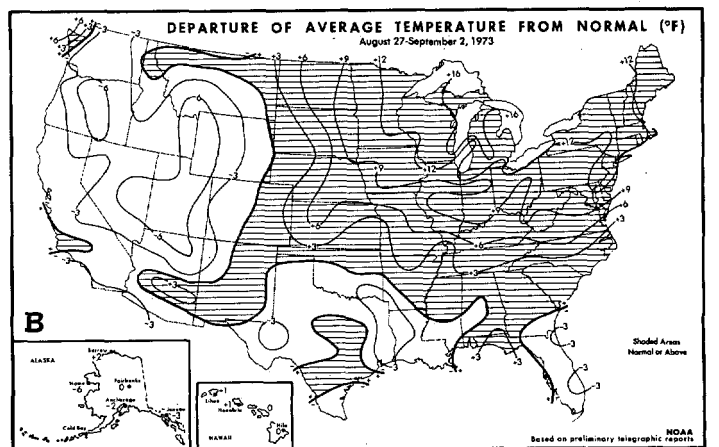
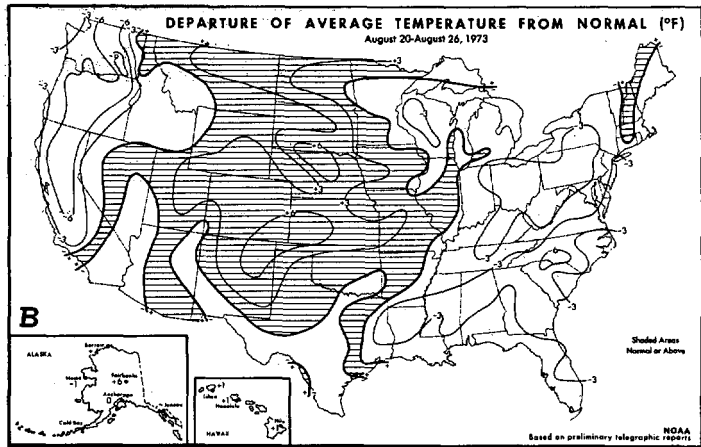
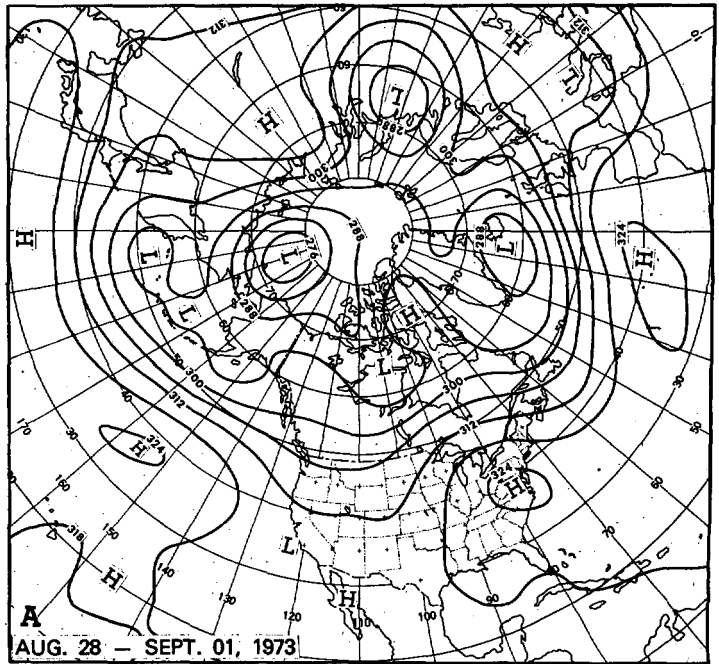
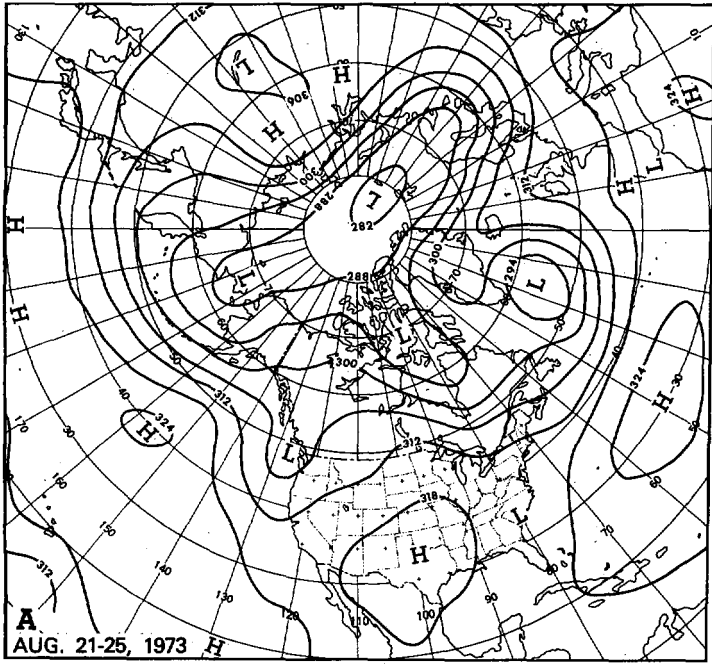


FIGURE 9.—Same as figure 6, (A) for Aug. 21-25, 1973; (B) and (C) for week of Aug. 20-26, 1973.

FIGURE 10.—Same as figure 6, (A) for Aug. 28-Sept. 1, 1973; (B) and (C) for week of Aug. 27-Sept. 2, 1973.

of Asia, amplifying as it moved to Alaska by mid-month (figs. 6-8). The mean trough to its east progressed to the west coast of North America by mid-month, driving a mean ridge to the Great Plains. At about the time that the west coast trough intensified, the Atlantic wave

pattern amplified (fig. 9).

As was the case with the circulation pattern, the temperature distribution was quite changeable this month (figs. 6-10). There was little week-to-week persistence and no recurrent pattern on a weekly time scale.

Most widespread and very low temperatures occurred early in the month (fig. 6) in response to the advective field between a deep Midwest trough and a strong southwest Canada ridge. Temperatures west of the Continental Divide were generally above normal until the deepening of the west coast trough during the last half of the month (fig. 9). The South was coldest during weeks with a trough in the East and a ridge over the western or central United States (figs. 6, 8, 9) and warmest when dominated by an upper level ridge (figs. 7, 10). The Northeast, east of a mean trough, was warm during the first part of the month (figs. 6-8). After a cool week (fig. 9), a strong mean ridge progressed to that region, initiating the most severe hot spell of the summer (fig. 10).

Precipitation, generally associated with progressive 700-mb troughs, was widespread throughout the month (figs. 6-10). Heaviest precipitation was generally observed in the vicinity of a mean trough. Wettest conditions in the droughty Northwest occurred late in the month with the development of the west coast trough; amounts, however, were mostly light. Precipitation in the South was alternately related to disturbances in the westerlies (figs. 6, 8, 9) and to easterly regimes (figs. 7, 10).

5. TROPICAL ACTIVITY

Tropical activity was sparse this month over both the North Atlantic and the North Pacific Oceans. Brenda, first of the Atlantic storms this month, reached tropical storm intensity near the Yucatan Peninsula on August 19, became a hurricane over the Bay of Campeche 3 days later, and made landfall in southern Mexico on the same day. The only other Atlantic tropical storm in August was Christine, which reached tropical storm strength near 10°N, 44°W, on the last day of the month.

Only three tropical storms and no hurricanes were reported over southeastern portions of the North Pacific Ocean this month. Two of these were in existence at the month's beginning. Tropical storm Doreen, downgraded from hurricane status on August 1 in the mid-Pacific, weakened further the following day. Glenda was of tropical storm intensity during the first 5 days of the month

south of Baja California. After a 26-day interlude with no named storms, tropical storm Heather was reported on August 31 just south of the Gulf of Tehuantepec.

The absence of hurricanes in the southeast North Pacific this month was in striking contrast to August 1972 when five storms reached hurricane strength (Dickson 1972). It is of interest to note that, by this July, water temperatures of the equatorial southeast Pacific had fallen below normal over a large area (National Marine Fisheries Service 1973). This, too, was in contrast to last year when July water temperatures in that area were well above normal. Declining surface water temperature anomalies in this region since January 1973 have been attributed to the re-establishment of southeast trades and upwelling along the northwest coast of South America (National Marine Fisheries Service 1973).

This too, was in contrast to last year when July water temperatures in that area were well above normal. Declining surface-water temperature anomalies in this region since January 1973 have been attributed to the re-establishment of southeast trades and upwelling along the northwest coast of South America (National Marine Fisheries Service 1973).

There were only five tropical storms over the west Pacific Ocean this month, namely, Georgia, Hope, Iris, Joan, and Kate. They were scattered throughout the month. Of these, only Iris reached typhoon intensity; it made landfall in Korea on August 17.

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