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WEATHER AND CIRCULATION OF MAY 1972

Continued Drought in the Southwest

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1. MEAN CIRCULATION

Large circulation changes took place from April to May as the relatively flat, high-latitude flow pattern of April (Wagner 1972) broke down into a highly amplified pattern during May (figs. 1–3). Mean 700-mb Lows moved southward over both northern Asia and the North Pacific Ocean, accompanied by a return of the westerlies to more normal latitudes (fig. 4). Height anomaly changes over the mid-Pacific were especially striking (fig. 3). Here, a mean trough replaced a mean ridge. This reversal markedly shortened the wavelength across the Pacific, quite in keeping with the observed decline of the mid-tropospheric westerlies to near-normal values after the relatively high speeds of April.

To the east of the deepening mid-Pacific trough, a strong ridge developed over western Canada and Alaska, surmounting a fairly active low-latitude trough near California. The pre-existing blocking ridge near Hudson Bay strengthened to the south during May and continued to be a dominant factor in the weather over the United States. South of the blocking ridge, heights were subnormal over much of the southern half of the Nation, and the 700-mb westerlies were observed well south of their normal position. The normal buildup of the upper level continental ridge in late spring was thus delayed. The 700-

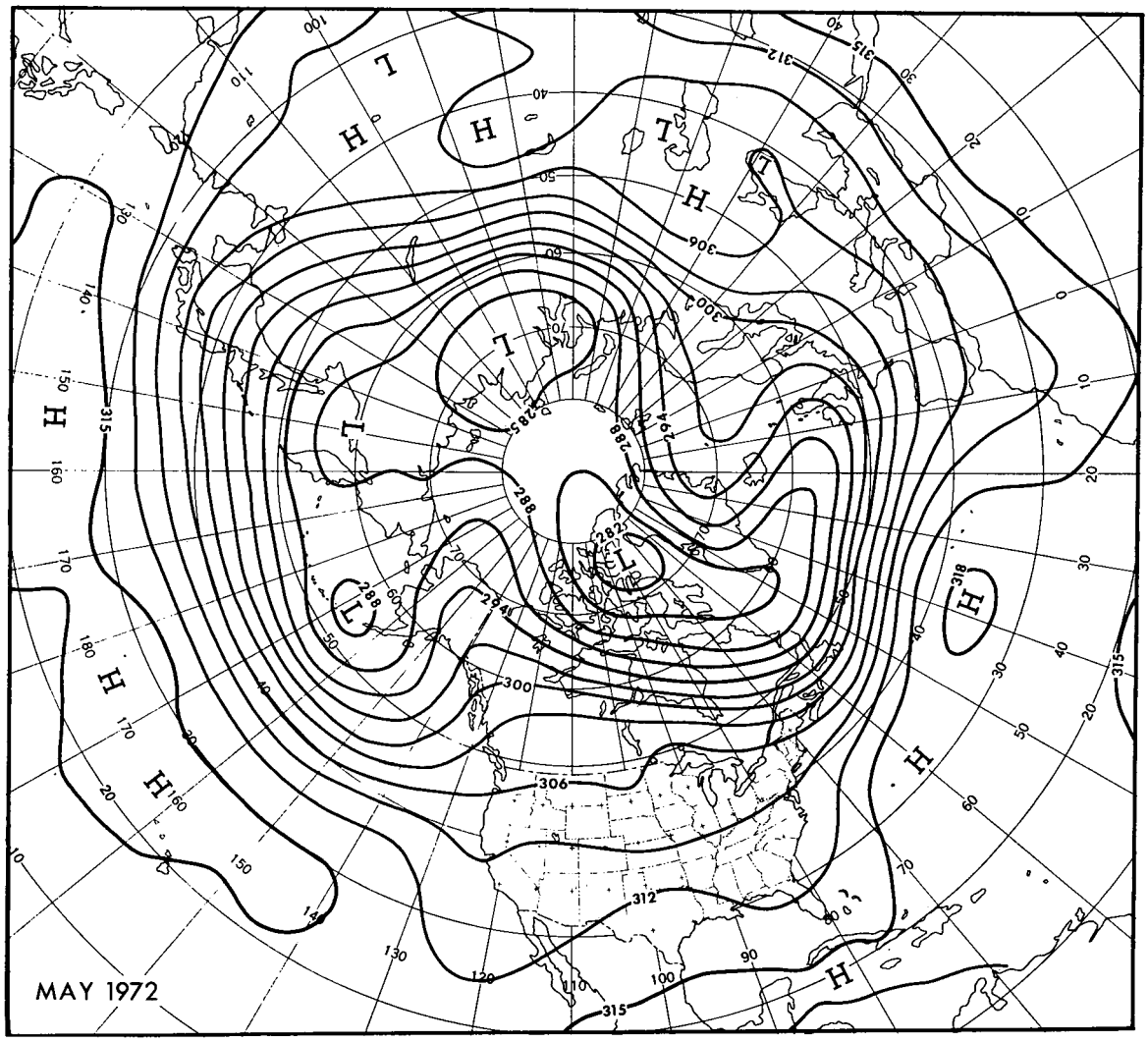


FIGURE 1.—Mean 700-mb contours in dekameters (dam) for May 1972.

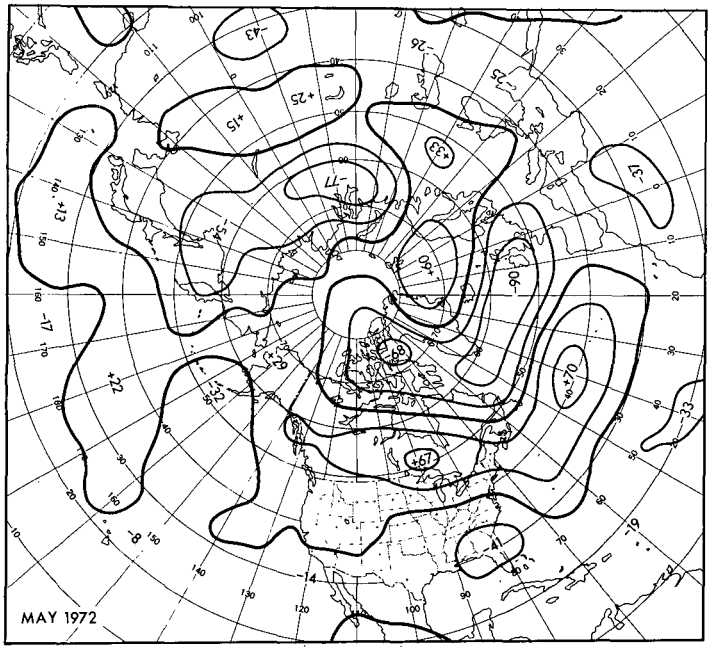


FIGURE 2.—Departure from normal of mean 700-mb height (m) for May 1972.

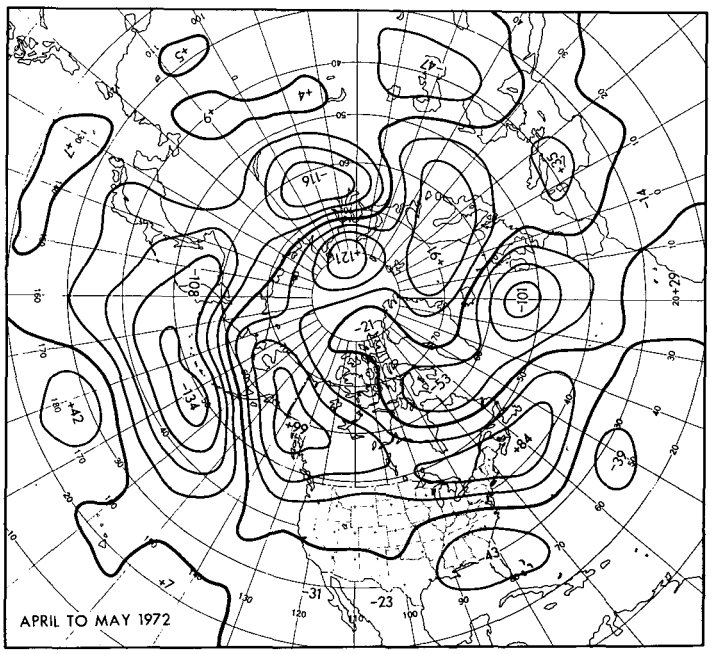


FIGURE 3.—Mean 700-mb height anomaly change (m) from April to May 1972.

mb flow over the United States was weak; the mean flow pattern, rather erratic.

Between the deep trough that persisted over the Canadian archipelago and the strengthening blocking ridge to the south, a vigorous northwesterly flow developed (fig. 4). In confluence with the southwesterly flow off the east coast, it contributed to strong midlatitude westerlies across the Atlantic, which drove vorticity maxima to the British Isles. The mean trough over Europe extended from this area southeastward to a pre-existing mean trough over the Mediterranean. To the east, a strong ridge was observed from the Caspian Sea to the Greenland Sea.

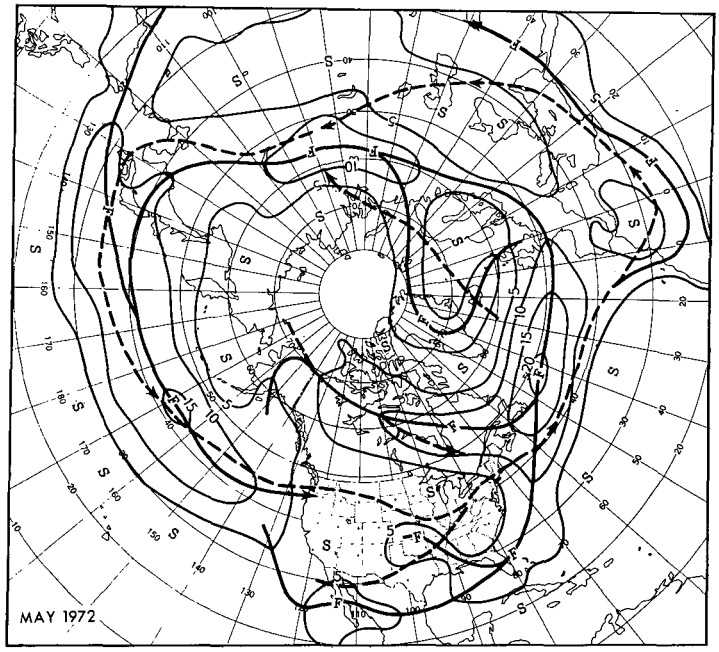


FIGURE 4.—Mean 700-mb geostrophic wind speed (m/s) for May 1972. Solid arrows show the observed axes of maximum wind speed, the dashed lines show the normal.

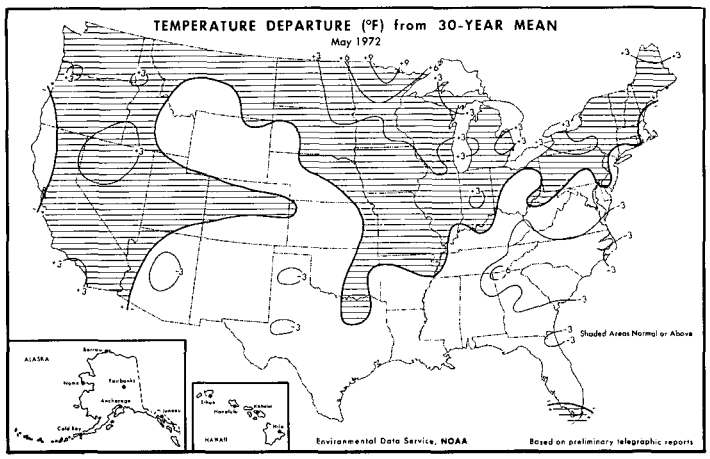


FIGURE 5.—Departure from normal of average surface temperature (°F) for May 1972 (from Environmental Data Service and Statistical Reporting Service 1972).

2. TEMPERATURE

The temperature anomaly pattern during May (fig. 5) was, to a large extent, the reverse of that during April (Wagner 1972). Above-normal mean temperatures over much of the West and in an area centered on the Great Lakes occurred largely in conjunction with above-normal upper level heights (fig. 2).

Temperatures generally averaged below normal in the area of subnormal 700-mb heights from eastern Arizona across the southern Plains to the east coast. This area was affected by the southward penetration of cool air masses to the east of the strong ridge as well as by widespread cloudiness from disturbances crossing the Nation in the westerlies at low latitudes. Along the Eastern Seaboard, slow-moving Lows trapped to the southeast of the blocking

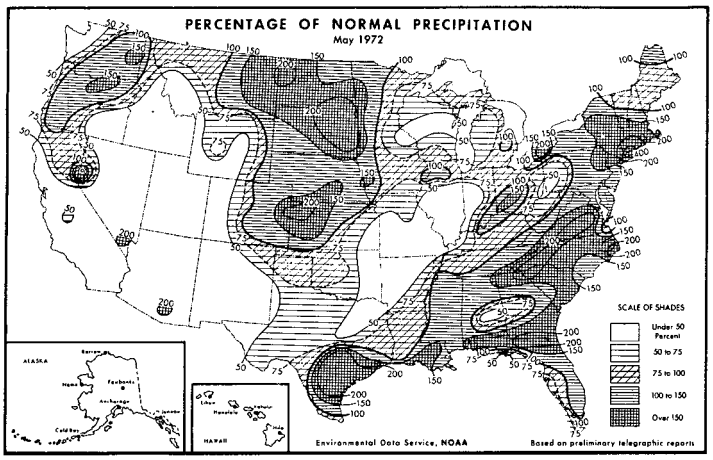


FIGURE 6.—Percentage of normal precipitation for May 1972 (from Environmental Data Service and Statistical Reporting Service 1972).

ridge brought persistent cloudiness and easterly flow. Both of these factors contributed to the low temperatures that were observed.

Temperatures over much of the northern half of Alaska rose to above normal under a strong mean ridge (figs. 1, 2). Southern portions of the State remained cool, however, in the cloudy, southerly flow that prevailed.

3. PRECIPITATION

Precipitation exceeded normal in the vicinity of mean troughs over the Northern Great Plains and east coast (figs. 1, 6) in connection with slow moving, blocked Lows. In the East, record high precipitation totals for May were observed at Syracuse, N.Y., Hartford, Conn., Lynchburg, Va., Greensboro, N.C., and Greenville-Spartanburg, S.C. The strip of above-normal precipitation along the Gulf Coast occurred to a large extent with weak storms embedded in the westerlies there and, thus, also was associated, indirectly, with the blocking. The mean flow, however, fails to account for the above-normal precipitation in Washington and Oregon.

Precipitation was subnormal, however, in much of the West, where a moderately strong upper ridge prevailed (figs. 1, 2, 6). This was the fifth consecutive dry month from California to the Rocky Mountains and the seventeenth such month at San Francisco. Phoenix, Tucson, and Yuma, Ariz., for which records date back to 1876, 1868, and 1850, respectively, experienced the driest January–May ever.

Precipitation exceeded normal on the borders of the Gulf of Alaska from Juneau to King Salmon in response to increased southerly wind components aloft (figs. 1, 2). Elsewhere in Alaska, under the influence of the strong mean ridge, subnormal amounts fell.

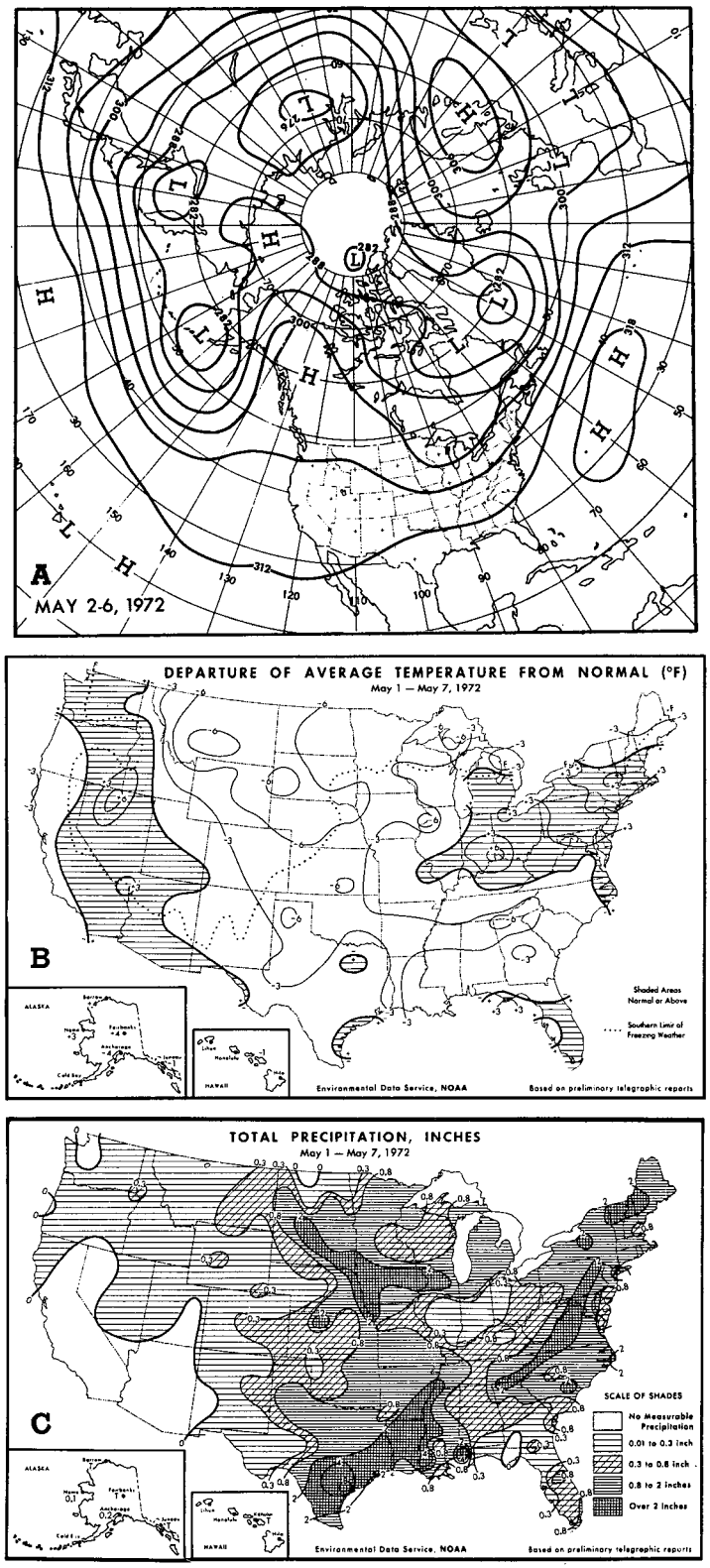
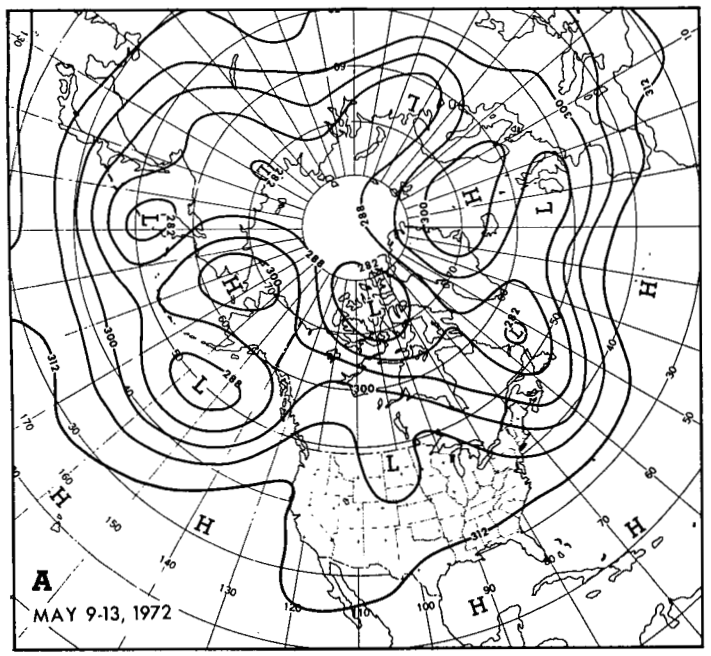
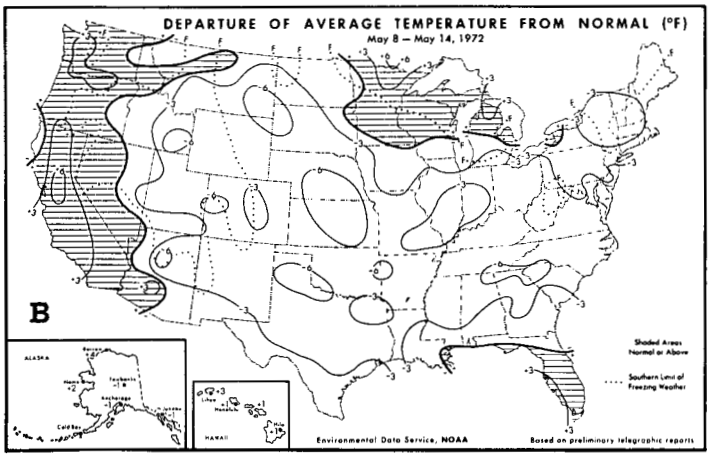


FIGURE 7.—(A) mean 700-mb contours in dekameters (dam) for May 2–6, 1972; (B) departure from normal of average surface temperature (°F) and (C) total precipitation (in.) for week of May 1–7, 1972 (from Environmental Data Service and Statistical Reporting Service 1972).

4. VARIABILITY WITHIN THE MONTH

Weekly distributions of temperature and precipitation accompanied by appropriate 5-day mean 700-mb maps are shown in figures 7–10. By the first week in May (fig. 7), 700-mb Lows had already moved southward to near the monthly mean positions over north-central Asia and the North Pacific, and blocking ridges had developed over northwest Canada and Scandinavia. The Canadian ridge then retrograded to near Kamchatka where it merged with the westerlies during the third week of May





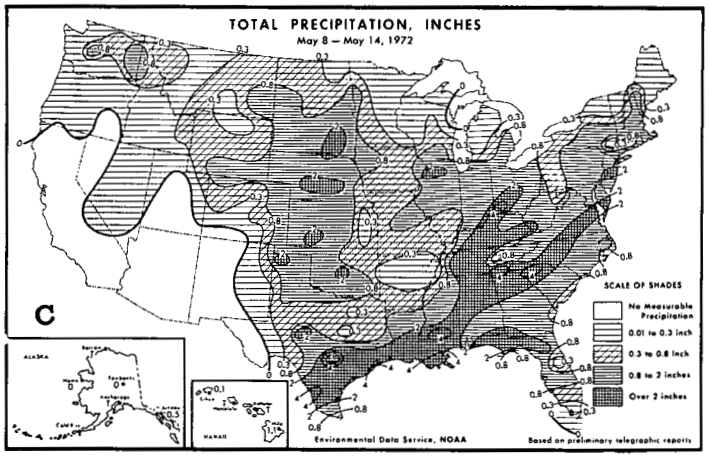
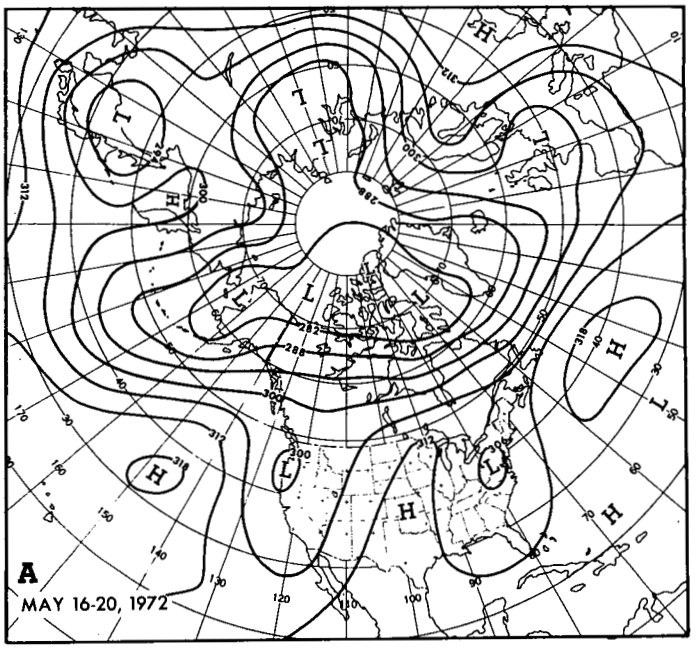
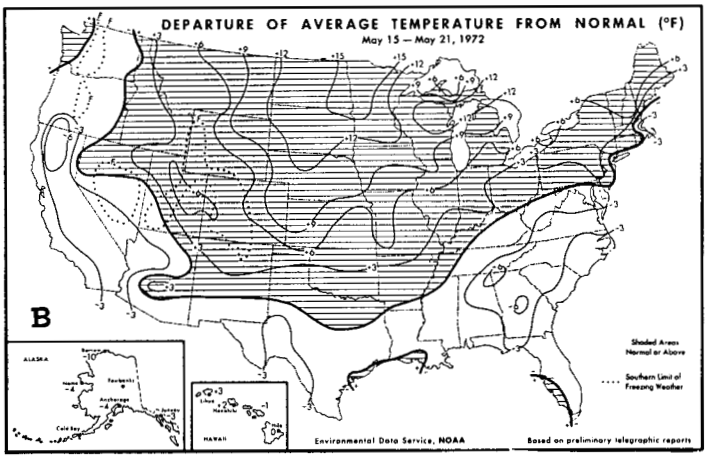


FIGURE 8.—Same as figure 7, (A) for May 9–13, 1972; (B) and (C) for week of May 8–14, 1972.





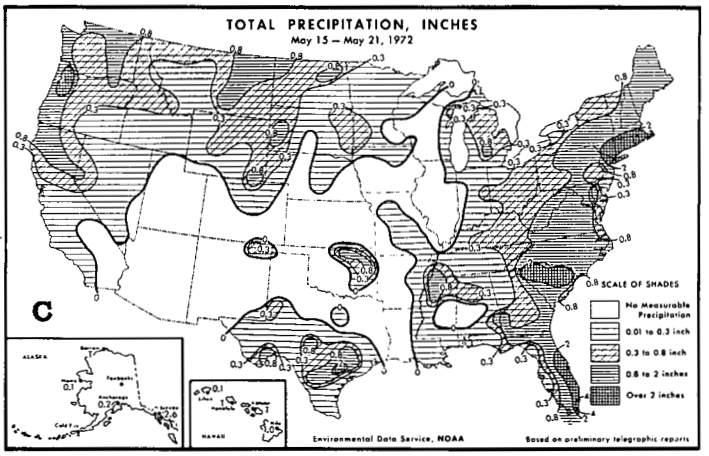


FIGURE 9.—Same as figure 7, (A) for May 16–20, 1972; (B) and (C) for week of May 15–21, 1972.

(fig. 9). This change again disrupted the westerlies, leading to an amplifying wave pattern over the Pacific and a rebuilding of the ridge over northwest Canada and Alaska (fig. 10). Thus, the initial wave of blocking, proceeding through its life cycle on a time scale of weeks, appears to have contributed to the perpetuation of blocking over Alaska on a monthly time scale.

Throughout the month, fast westerlies and progressive waves dominated the circulation over both the Atlantic and Pacific Oceans (figs. 7–10). Over southern Canada and the United States, however , the upper level flow remained weak. The blocking ridge, which had been strong at the end of April near Hudson Bay (Wagner 1972), was swept away early in the month (fig. 7), but reappeared quickly

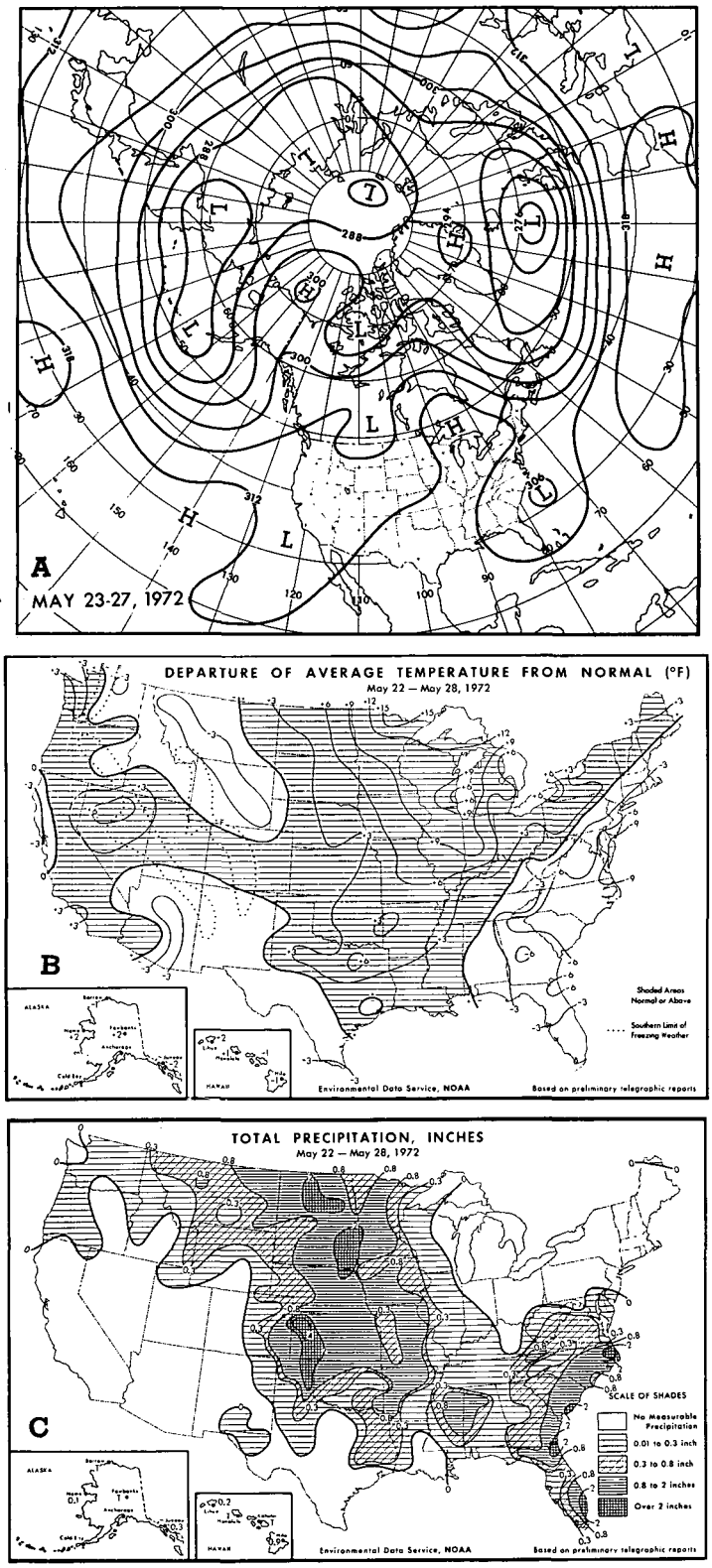


FIGURE 10.—Same as figure 7, (A) for May 23–27, 1972; (B) and (C) for week of May 22–28, 1972.

in response to falling heights in the Gulf of Alaska (fig. 8) and persisted for the remainder of the month. Subsequent deepening of a trough along the west coast further enhanced the blocking ridge to the south (fig. 9). Throughout the month, however, weak troughs progressed across North America. As the wave pattern amplified during the third week of May, one of these formed a cutoff Low along the southeast coast of the United States (fig. 9). Largely secluded from the westerlies and located to the southeast of a blocking ridge, this upper Low persisted for the remainder of the month. An associated surface Low had a rather unusual longevity and track. It originated on May 18 east of Florida, moved to eastern North Carolina by May 22, and wandered erratically east of the Carolinas for a few days before heading southward on May 25. It subsequently crossed northern Florida on May 27 and was last identified off Pensacola.

The blocking ridge over Scandinavia and the Greenland Sea early in May (figs. 7, 8) weakened during the last half of the month as the midlatitude Atlantic westerlies accelerated. This change was accompanied by the filling of the Mediterranean trough during the last week of the month.

Warm and dry weather was observed over much of the far West during the first half-month under the influence of anticyclonic flow and above-normal heights (figs. 7, 8). After a cold, wet spell accompanying the deep trough of the third week (fig. 9), conditions reverted to warm and dry at the end of the month (fig. 10).

Middle portions of the Nation were generally cool and wet during the first half-month, responding to both the mid-Nation trough and the amplified ridge over western North America. Progression of a strong, mean ridge to the Mississippi Valley during the third week brought warmer and drier weather (fig. 9). The temperature change between weeks over the Northern and Central Plains States was especially pronounced. Although temperatures remained high in most of the area during the fourth week of May, substantial precipitation was again observed as a mean trough moved in (fig. 10).

Over the eastern quarter of the Nation, precipitation was widespread throughout the month in response to the presence of a mean trough (figs. 7, 9, 10) or to disturbances in the displaced westerly flow south of the blocking ridge (fig. 8). While temperatures in the cloudy Southeast were generally low, those in the Northeast were more variable. After reaching a high value in advance of a mean trough over the Great Lakes (fig. 7), temperatures there fell below normal during the second week with the change to northwesterly flow (fig. 8). Temperatures moderated during the third week when the flow pattern flattened (fig. 9), only to fall again during the fourth week as northerly flow was reinstated. The air turned quite cool along the middle Atlantic Coast during the fourth week in response to persistent surface flow from the east and northeast (fig. 10).

REFERENCES

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. 19–22 and 24, May 8, 15, 22, and 29 and June 12, **1972**.

Wagner, A. James, "Weather and Circulation of April 1972—Highly Variable Over Central and Eastern United States but Continued Drought in the Southwest," *Monthly Weather Review*, Vol. 100, No. 7, July **1972**, pp. 590–596.

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