

WEATHER AND CIRCULATION OF FEBRUARY 1973

An Active Low-Latitude Storm Track Across the United States

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1. MEAN CIRCULATION

The strong midlatitude westerlies of January slowed markedly in February (fig. 1) as their core moved south of normal in the eastern Pacific Ocean and north of normal over the Atlantic Ocean (fig. 2). The net result was a blunt profile of zonal wind with little variation of mean wind speed from 25° to 60°N (fig. 1). The mean wind speed at 700 mb was weaker than normal from 30° to 45°N and stronger than normal both to the north and south.

February's deep Kamchatka trough brought strengthened northwesterly flow over the Sea of Okhotsk (figs. 3, 4). The intensified thermal gradients over the western Pacific provided an ample source of available potential energy that apparently contributed, through eddy conversion processes, to the stronger than normal westerlies observed from China to the Mexican coast.

The greatest 700-mb wind speed anomaly in the hemisphere was 14 m/s in the eastern Pacific wind maximum, where the westerlies were displaced well south of normal. It appears likely that this wind maximum was at least partially caused by a strengthened eastern Pacific low-latitude meridional cell, in the manner described by Bjerknes (1969) and elucidated by Rowntree (1972). In this connection, tropical eastern Pacific water temperatures have exceeded normal since fall (National Marine Fisheries Service 1972, 1973).

Both the Asiatic coastal trough and the eastern Pacific trough, embedded in the fast westerly flow, shifted eastward from their January positions (Wagner 1973). Falling 700-mb heights over the eastern Pacific were accompanied

by the amplification of the mean ridge over western North America and the progression of a mean trough from the central and southern Great Plains to the east coast. The latter feature moved in a fast, southward-displaced band of westerlies—a continuation of the eastern Pacific wind maximum.

With the change from ridge to trough along the east coast of the United States, the ridge over the Atlantic Ocean grew stronger during February and the westerlies moved north of normal (figs. 2, 3, 4). Vorticity maxima were driven into Europe, replacing the previously persistent mean ridge (Wagner 1973) with a deep mean trough. Over Asia, height anomalies were generally small.

2. TEMPERATURE

In response to the advective field associated with the strong ridge in western North America and the deep troughs over Hudson Bay and the Southeast, cold weather prevailed over the East and South (fig. 5). Below-normal temperatures also were observed in the central and

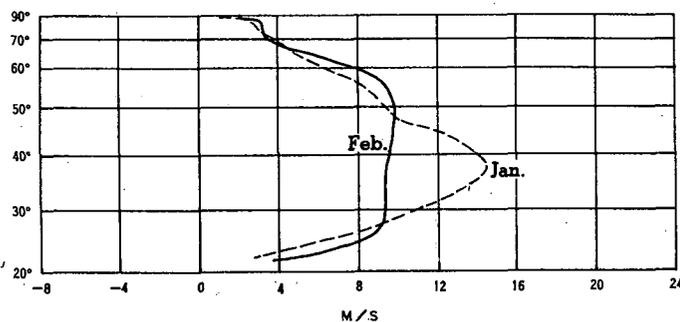


FIGURE 1.—Mean 700-mb geostrophic zonal wind speed profile (m/s) for January (dashed line) and February (solid line) 1973 in the western half of the Northern Hemisphere.

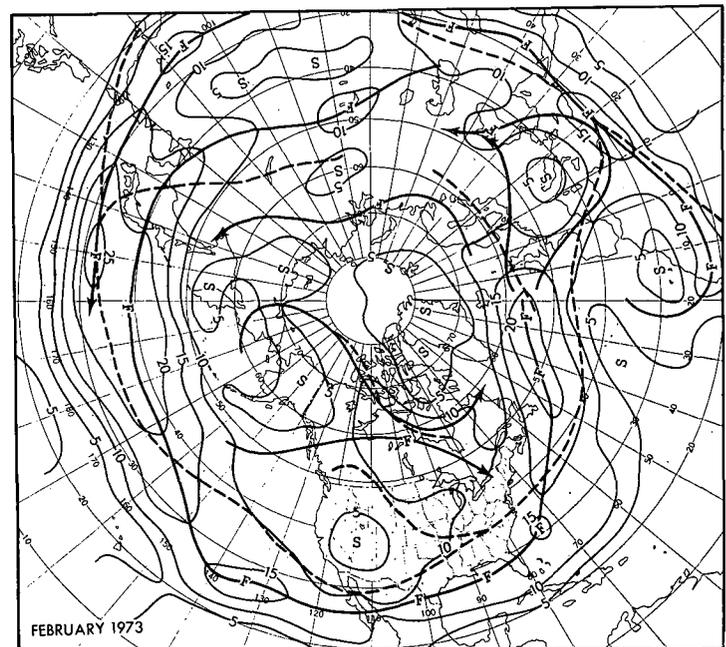


FIGURE 2.—Mean 700-mb geostrophic wind speed (m/s) for February 1973. Solid arrows show the observed axes of maximum wind speed, and dashed lines show the normal.

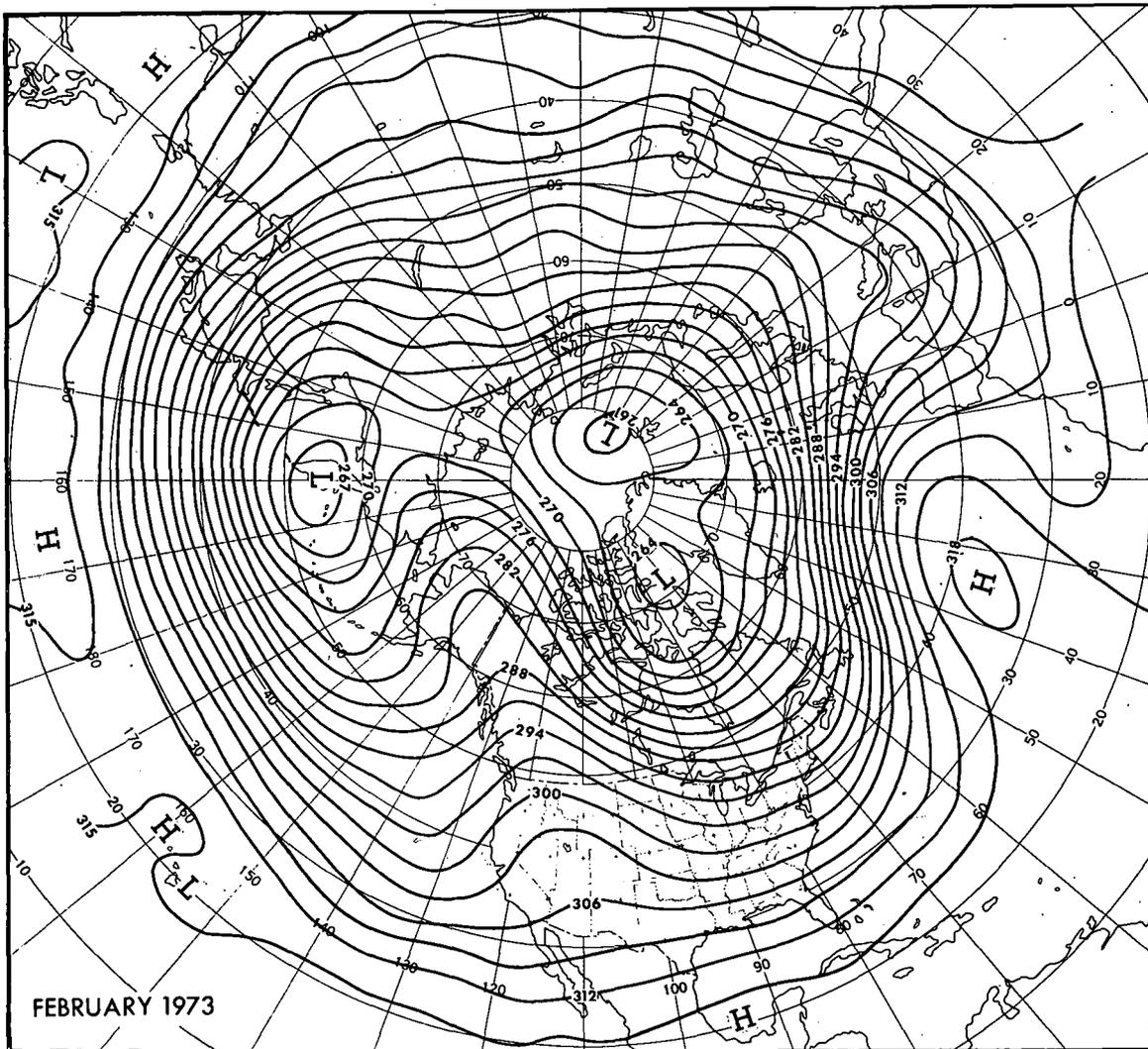


FIGURE 3.—Mean 700-mb contours in dekameters (dam) for February 1973.

southern Rocky Mountains, an area of anomalous snow cover during much of the month. In advance of the deep eastern Pacific mean trough, strong southerly flow brought mild temperatures to the Far West. Temperatures also exceeded normal over the northern and central Great Plains, where mean 700-mb heights were above normal.

Strong southerly flow over western Alaska brought warm weather to western and northern portions of that State, but good radiation conditions and relative cold prevailed to the east under the amplified ridge (figs. 3, 4).

3. PRECIPITATION

As implied by the upper level height and wind fields (figs. 2-4), the storm track across the southern half of the country was unusually active this month. Lows and upper troughs moving in the southern branch of the westerlies produced more precipitation than normal from California to Texas and in the Southeast (fig. 6). Coastal storms and cold fronts combined to extend the wet area northward along the Atlantic coast. Elsewhere, most to the northern half of the Nation experienced less storminess

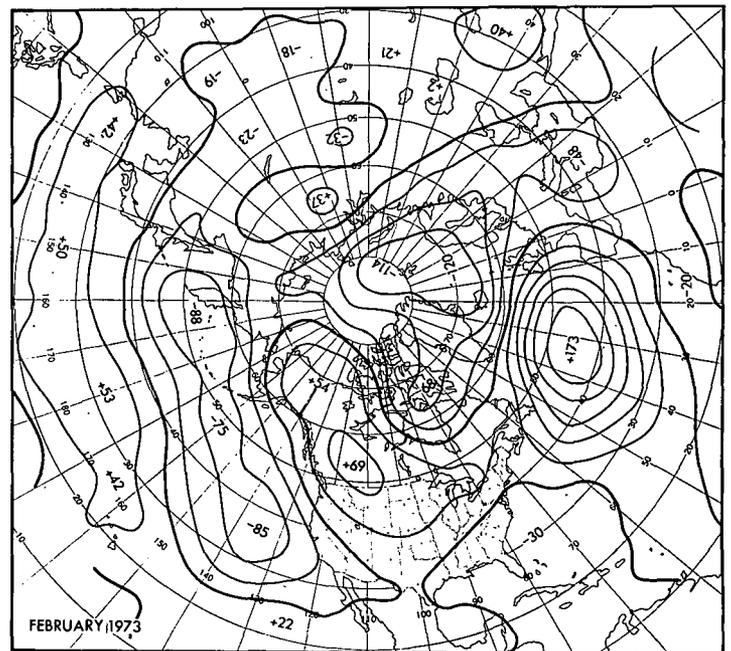


FIGURE 4.—Departure from normal of mean 700-mb height in meters (m) for February 1973.

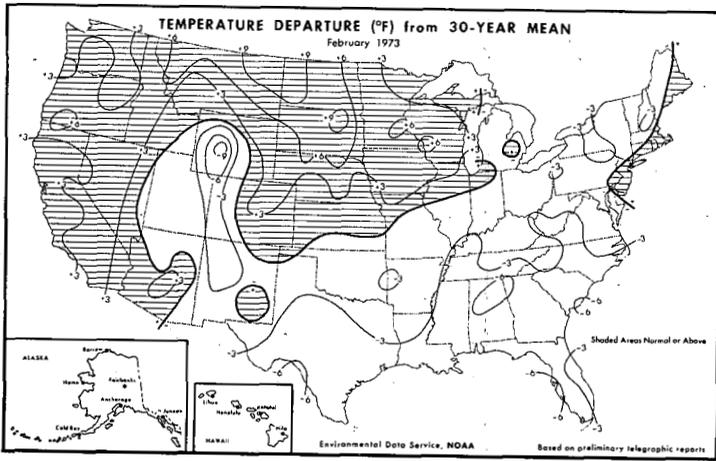


FIGURE 5.—Departure from normal of average surface temperature (°F) for February 1973 (from Environmental Data Service and Statistical Reporting Service 1973).

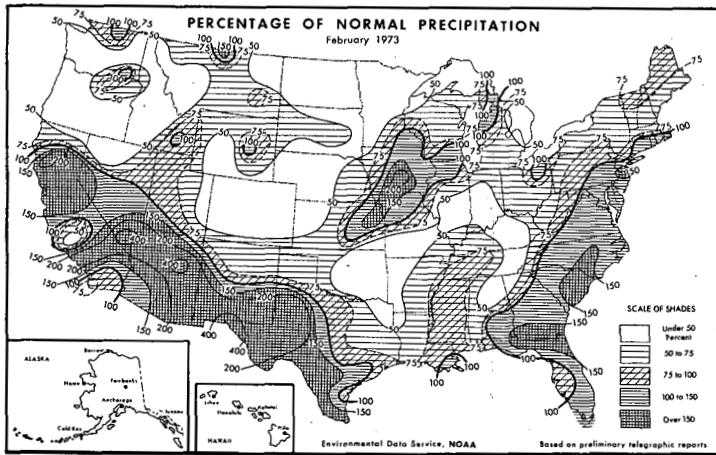


FIGURE 6.—Percentage of normal precipitation for February 1973 (from Environmental Data Service and Statistical Reporting Service 1973).

and precipitation than usual. It was one of the driest Februaries of record in the Northwest, one of the wettest in the Southwest.

Situated under a strong upper level ridge, most of Alaska had less precipitation than normal. Precipitation was also generally light in the vicinity of the Hawaiian Islands where heights exceeded normal.

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. The relatively fast westerlies, both to the north and to the south of the temperate latitudes in the Western Hemisphere, were accompanied by changeable conditions. A succession of troughs crossed the United States at low latitudes while the Northwest Canada-Alaska ridge oscillated from very strong to very weak with a period of about 2 weeks (figs. 7–10). At mid-latitudes, conditions were less variable. Ridges prevailed

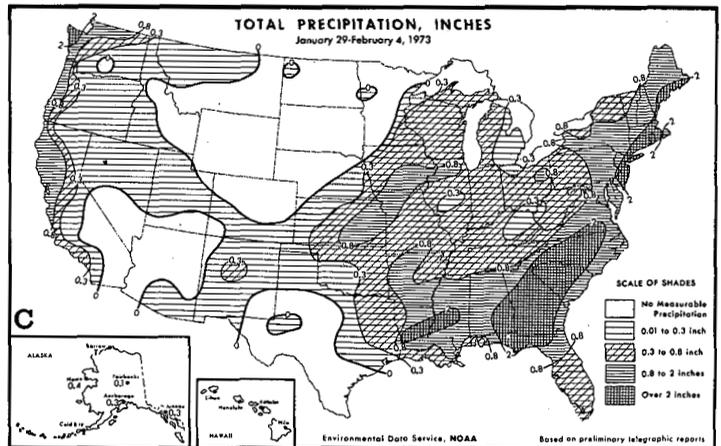
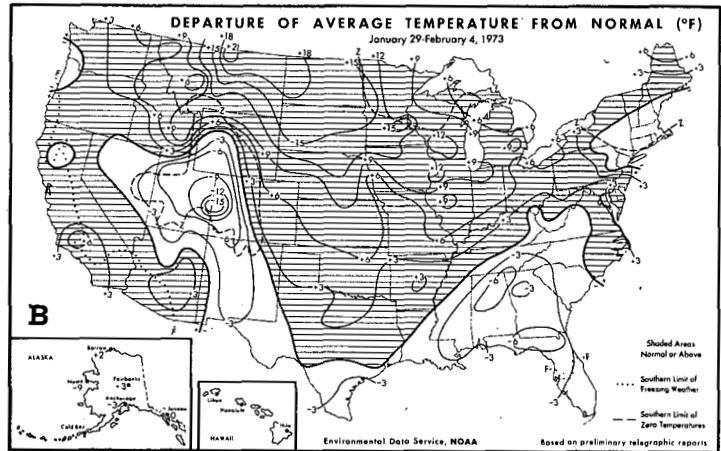
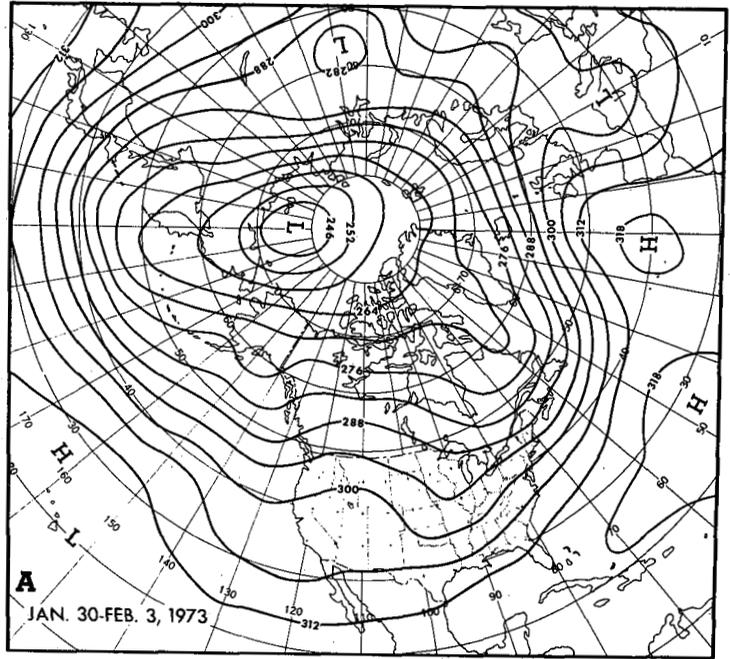


FIGURE 7.—(A) mean 700-mb contours (dam) for Jan. 30–Feb. 3, 1973; (B) departure from normal of average surface temperature (°F) and (C) total precipitation (in.) for week of Jan. 29–Feb. 4, 1973 (from Environmental Data Service and Statistical Reporting Service 1973).

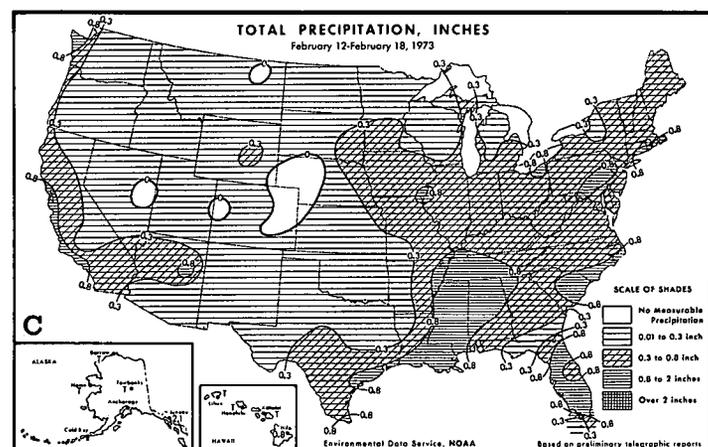
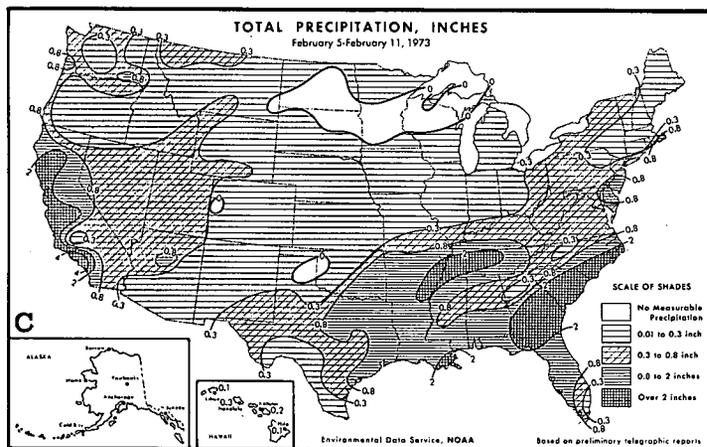
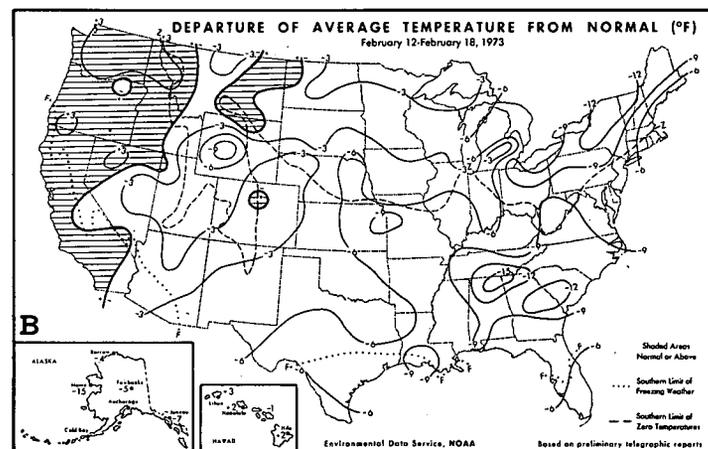
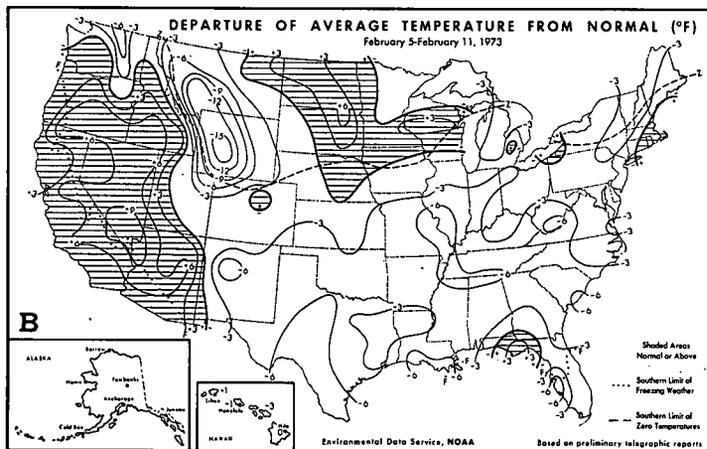
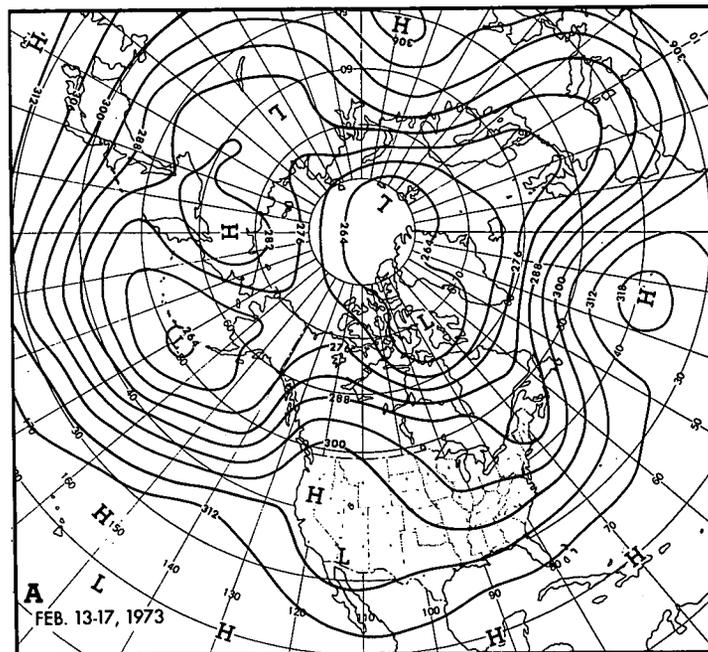
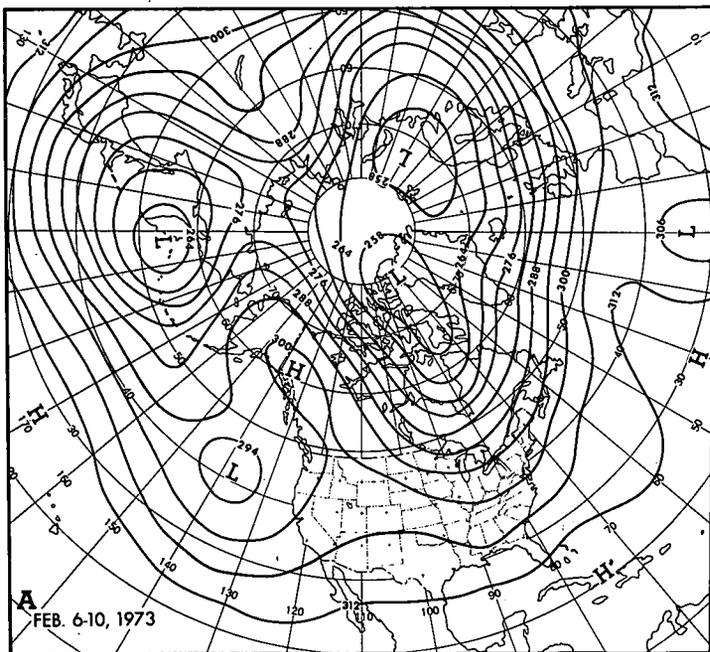


FIGURE 8.—Same as figure 7, (A) for Feb. 6-10, 1973; (B) and (C) for week of Feb. 5-11, 1973.

Figure 9.—Same as figure 7, (A) for Feb. 13-17, 1973; (B) and (C) for week of Feb. 12-18, 1973.

over southwestern Canada and the central Atlantic Ocean, and a trough generally occurred over the northeastern United States.

The antecedent blocking ridge over Europe was already gone at the month's beginning (fig. 7), soon to be replaced by a deep mean trough (figs. 8-10).

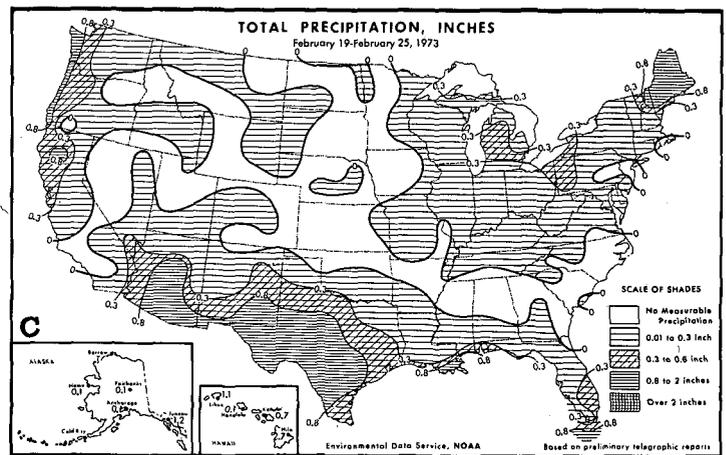
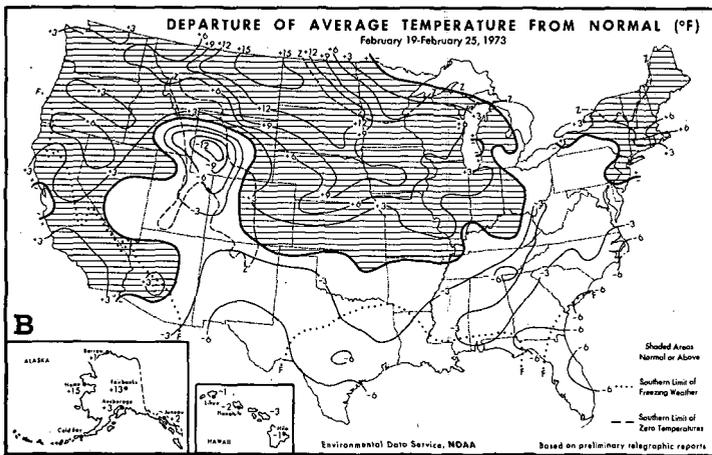
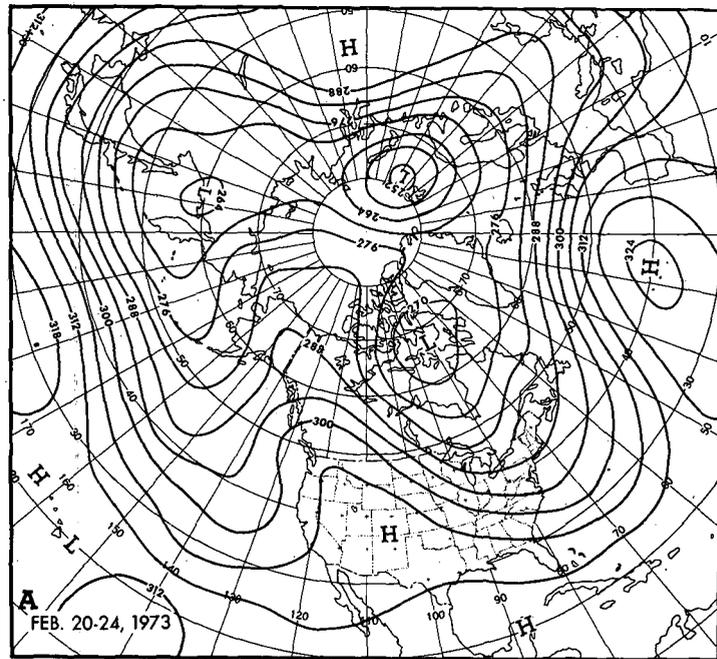


FIGURE 10.—Same as figure 7, (A) for Feb. 20-24, 1973; (B) and (C) for week of Feb. 19-25, 1973.

Weekly mean temperatures in some parts of the United States were persistent this month. The far western states remained warm throughout the month as a trough (figs. 7, 8, 10) or flat flow (fig. 9) prevailed off the west coast. Anomalous snow cover during much of the month gave persistent cold to the central and southern Rocky Mountains. Finally, much of the south was cold during each week of the month as polar continental and modified Pacific Maritime Highs were driven southward between the ridge over the northern Rocky Mountains and the trough near the east coast.

Over the remainder of the Nation, temperatures were more variable. In the North-Central States, temperatures were highest when the mean ridge over Canada was weakest and farthest east (fig. 7). At midmonth, however, a massive polar High moved southward over the Dakotas, reversing the sign of anomaly there, and ultimately cooling the Northeast.

Surface or upper level troughs traveling in the southwardly displaced westerlies over the United States brought frequent and widespread precipitation to the southern half of the Nation (figs. 7-10). An intensifying Low moving through northern Florida gave record-breaking snowfall from southeastern Alabama to eastern North Carolina on February 9-10. Several locations accumulated over a foot. Precipitation in the Southeast dwindled late in the month when the mean trough moved off the coast and the westerlies across the southern border slowed (fig. 10).

The major precipitation-producing regime in the Southwest occurred late in the month (fig. 10). It appears to have resulted from an interaction between the trough in the westerlies off the west coast and the tropical circulation. The NOAA 2 satellite cloud picture for Feb. 19, 1973 (fig. 11), reveals a striking cloud band stretching from near the Equator (5°N, 140°W) to southern Texas.

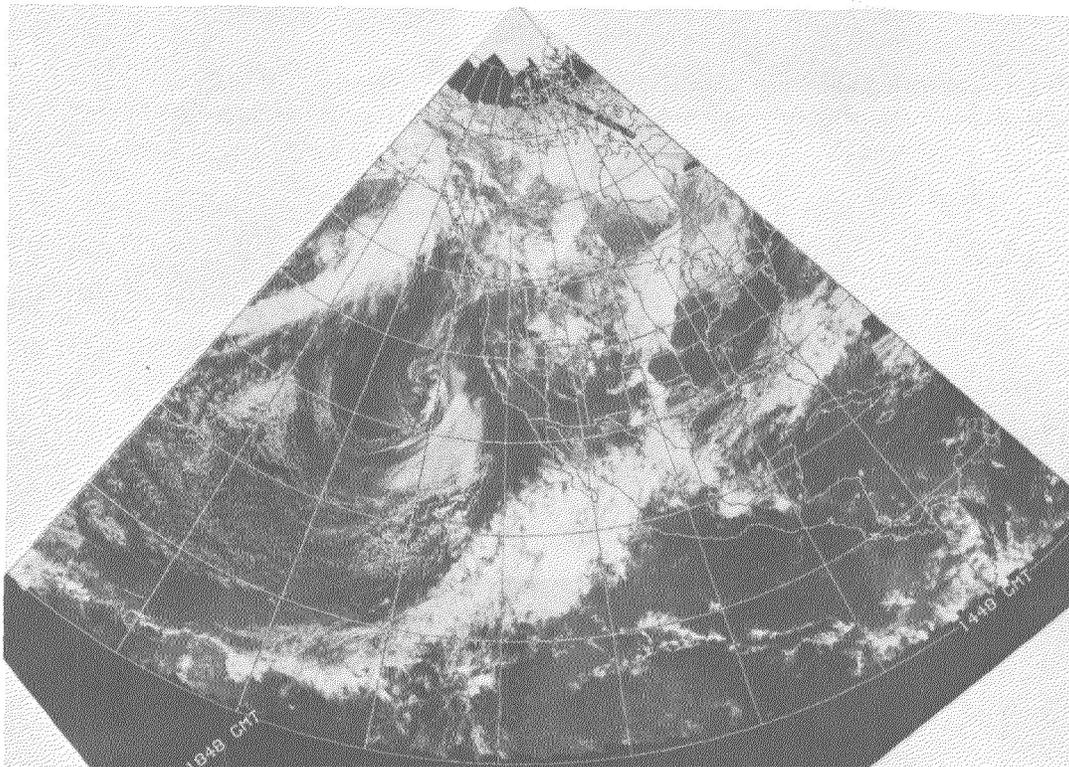


FIGURE 11.—NOAA 2 satellite cloud photograph; Feb. 19, 1973.

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