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WEATHER AND CIRCULATION OF JANUARY 1973

Strong Warming Trend Around Midmonth

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1. MEAN CIRCULATION

A vigorous circulation continued to dominate the Northern Hemisphere during January 1973. Most of the circulation features from Central Asia to North America progressed slightly from their December positions (Taubensee 1973), while the Alaskan blocking ridge collapsed under the combined influence of the progressing northeast Siberian trough and the central Pacific trough (figs. 1–3).

The marked blocking ridge that had developed in Europe during December retrograded slightly and connected with the Azores ridge during January while remaining strong. Related to this was the loss of the area of strong cyclonic curvature that had been in the eastern Atlantic during December (fig. 1 of Taubensee 1973). Progression to the western Atlantic of the midlatitude portion of the trough that had been over North America resulted in one vigorous full-latitude trough extending from the Davis Strait to near Bermuda, while the strong subtropical ridge over the western Atlantic weakened and was displaced southward (figs. 1, 3). The lower latitude

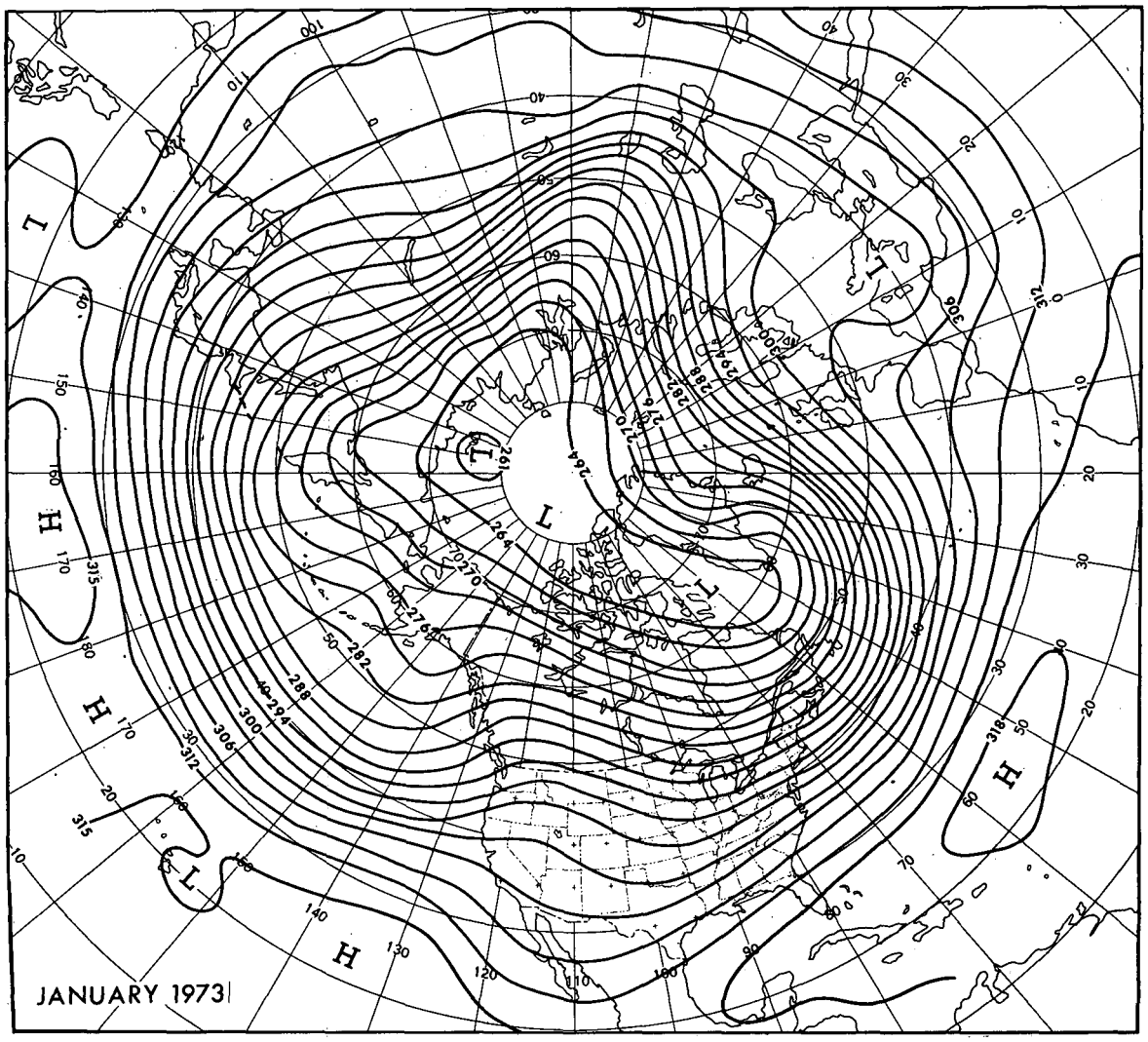


FIGURE 1.—Mean 700-mb contours in decameters (dam) for January 1973.

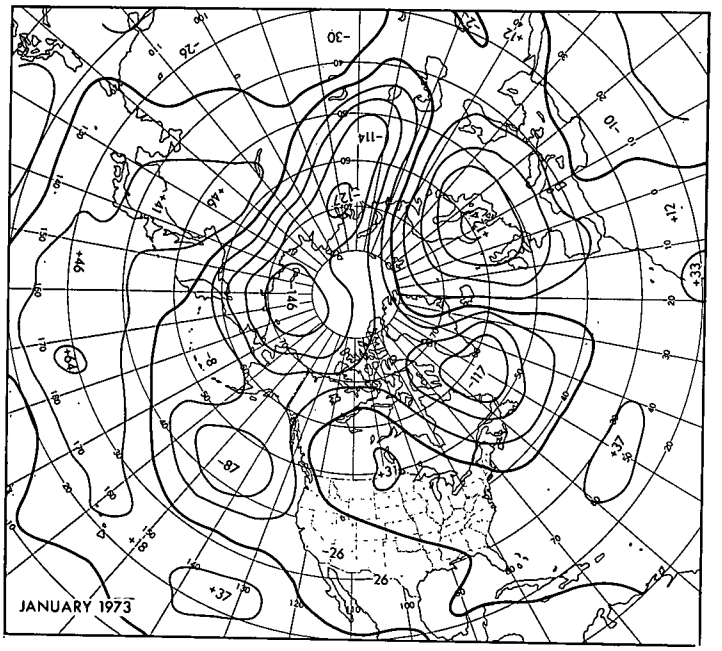


FIGURE 2.—Departure from normal of mean 700-mb height in meters (m) for January 1973.

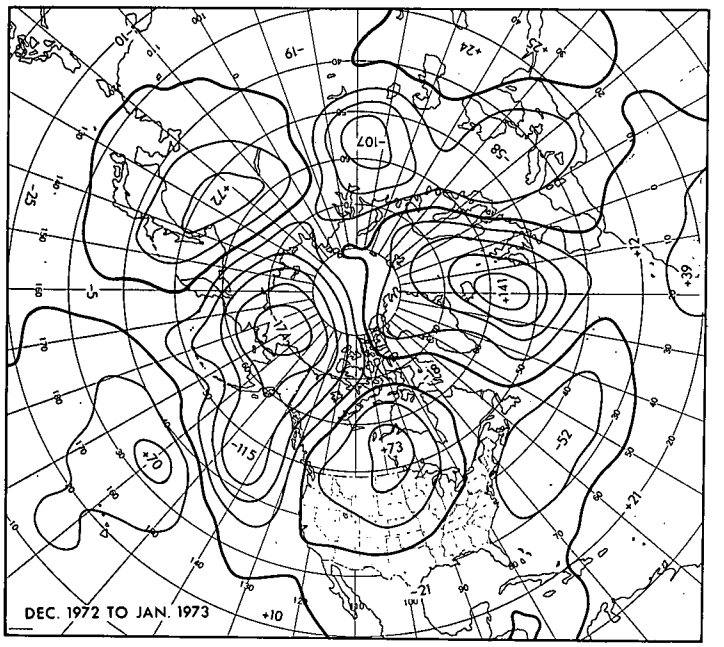


FIGURE 3.—Mean 700-mb height anomaly change (m) from December 1972 to January 1973.

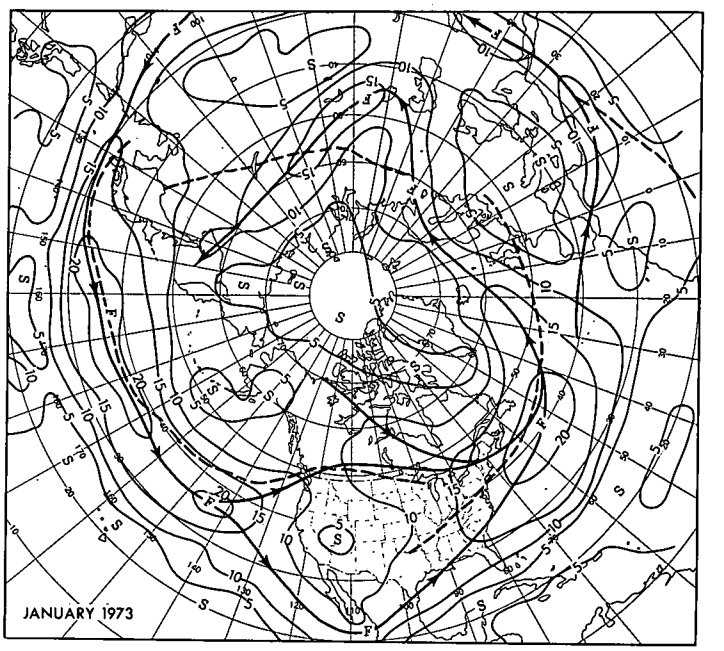


FIGURE 4.—Mean 700-mb geostrophic wind speed (m/s) for January 1973. Solid arrows show the observed axes of maximum wind speed, and dashed lines show the normal.

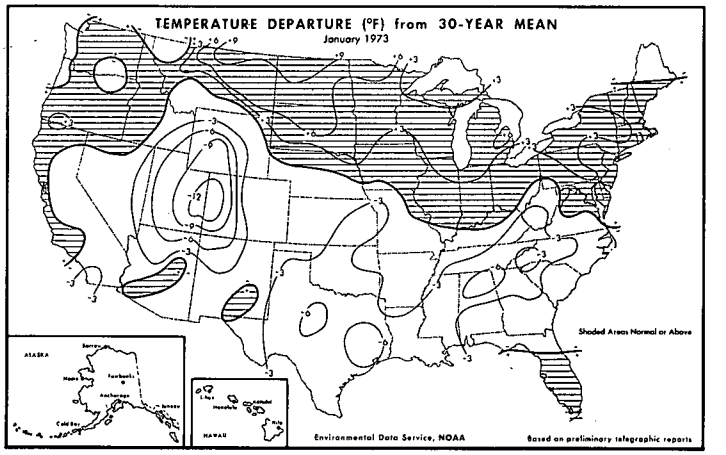


FIGURE 5.—Departure from normal of average surface temperature (°F) for January 1973 (from Environmental Data Service and Statistical Reporting Service 1973).

portion of the North American trough remained nearly stationary over the Southern Plains and Mexico.

The configuration of the 700-mb wind maximum during January was similar to that of the previous month. (Compare fig. 4 with fig. 4 of Taubensee 1973.) Maximum 700-mb wind speeds were south of and stronger than normal over the central and eastern Pacific and very strong but near the normal position over the western Atlantic. Principal changes were a sharpening of the wind maximum around the deep trough east of the Caspian Sea and considerable southward displacement of the southern branch of the wind maximum over the United States, consistent with the progression of the trough and weakening of the subtropical ridge in that area.

2. TEMPERATURE

The principal warm and cold areas were similar to the main features of the mean height anomaly pattern (fig. 2). January was generally milder than normal across the northern third of the Nation from Montana to southern New England, with the largest anomaly of more than 9°F above normal located in the Northern Plains (fig. 5). Strong Chinook winds frequently swept across this area, and Rapid City, S. Dak., reported a record 6 days with maximum temperatures over 60°F.

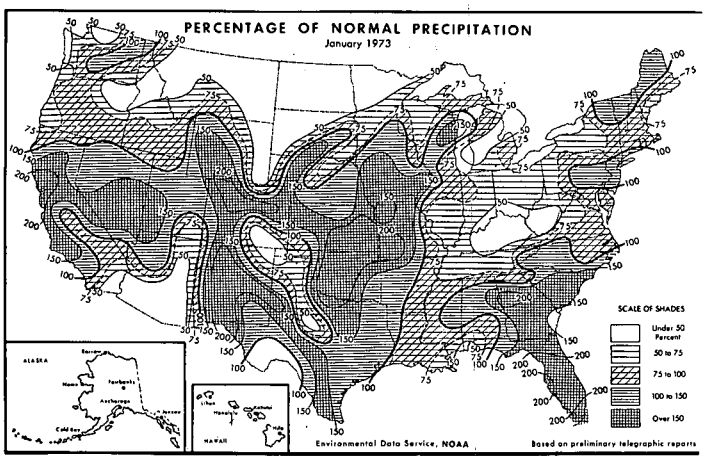


FIGURE 6.—Percentage of normal precipitation for January 1973 (from Environmental Data Service and Statistical Reporting Service 1973).

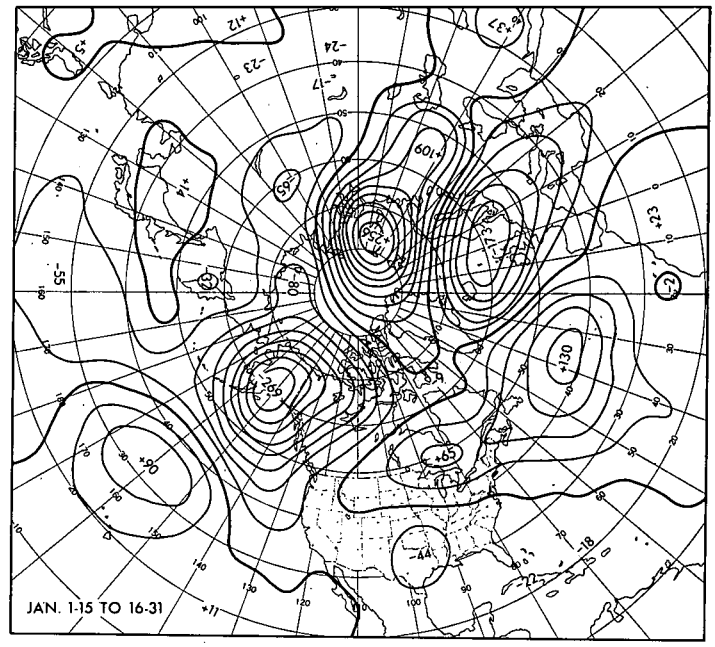


FIGURE 7.—Change in 700-mb height (m) between the first and second halves of January 1973.

The southern half of the country was colder than normal, with the strongest anomalies over the Southern Plains and the eastern portions of the central Plateau area. The persistent and extreme cold in the latter area, with monthly mean temperatures as much as 12°F below normal, was largely due to strong nocturnal cooling over an abnormally deep snow cover laid down in December and early January (Taubensee 1973). Grand Junction, Colo., reported a monthly mean temperature of 11.5°F. This was the coldest January in a 74-yr record, and 14 days with below-zero temperatures was the greatest number there in 48 yr. Milford, Utah, recorded the coldest January in 24 yr with a mean of only 14.3°F, 10.3°F below normal. Near urban centers, pollution trapped by the strong inversion contributed to persistent morning fogs, which further added to the cold by suppressing maximum temperatures. Salt Lake City, Utah, reported heavy fog on 11 days, the most there in January since 1942.

3. PRECIPITATION

The precipitation pattern (fig. 6) also was correlated with the height and temperature anomalies (figs. 2, 5). The Northern Plains was dry, receiving less than half its normal precipitation. Havre, Mont., reported only a trace for the driest January on record, and Williston, N. Dak., had its driest January since 1908, with only 0.03 in. Other small areas with less than half normal precipitation were located in southern Arizona, southeastern Colorado, and the Ohio Valley.

Heaviest precipitation relative to normal was observed across the southern half of the country, with central California and portions of the southern and central Rocky Mountains and Great Plains receiving more than twice the normal. Much of the precipitation in the South occurred with overrunning of the cold air that prevailed there, especially during the first half of the month.

Albuquerque, N. Mex., reported 9.5 in. of snow, the sum of several storms and a new record January total. Lander, Wyo., which had its snowiest December (Taubensee 1973), reported its second snowiest January with 25.7 in. more. The 13.5 in. recorded at Topeka, Kans., was the third greatest January snowfall total there in records going back to 1888.

Several stations reported unusually light monthly snowfall totals as well. Milwaukee, Wis., had only 0.2 in. snow all month. This was the least ever recorded there during January. There were 28 days in a row without snow at Trenton, N.J., and the 1.8 in. of snow at New York's Central Park Observatory on the 29th was the latest first measurable snow of the season in a century-long record there. New York City, N.Y., Providence, R.I., and Boston, Mass., all reported record 2-week long periods this January without measurable precipitation, although storms at the beginning and end of the month brought the totals up to near normal.

4. VARIABILITY WITHIN THE MONTH

The weather was variable during January, with the first 2 weeks being bitterly cold over most of the country, followed by a pronounced January "thaw" that persisted until nearly the end of the month in some places. The rapid warming was related to a major circulation change that occurred shortly before the middle of the month. Strong cyclogenesis in the Gulf of Alaska (fig. 7) effectively cut off the supply of arctic air and flooded the northern half of the United States and most of southern Canada with mild air of Pacific origin. The weakening of the midlatitude portions of the trough off the east coast of North America (figs. 1, 2, 7) was related to the warmth sweeping all the way across to New England.

The most rapid warming occurred in the northwestern portion of the country, however, with temperature rises within the second week of the month of 67°F (0° to 67°F) at Walla Walla, Wash., 78°F (−18° to 60°F) at Great Falls, Mont., and 83°F (−25° to 58°F) at Sheridan, Wyo.

January 1–7

Although the first day of 1973 had unusually mild weather along the Atlantic coastal area, most of the country was dominated by bitterly cold arctic air that had swept down into the West the previous week. Troughs continued to plunge into the West, bringing fresh outbreaks of Canadian air that by the middle and end of the week gradually overspread all but the Florida Peninsula, where a strong 700-mb ridge persisted (figs. 8A, 8B).

Temperatures averaged as much as 25°F below normal over the Northern Rocky Mountains, with most of the western half of the Nation more than 10°F below normal. Nearly a third of the area of the conterminous States reported a weekly minimum of zero or below. Mild weather along the Atlantic Coast was mainly a reflection of early extreme warmth, with temperatures remaining warm only in Florida, where the week averaged as much as 12°F above normal.

Precipitation was generally only a few tenths of an inch in the area dominated by the cold air (figs. 8B, 8C), although a damaging ice storm struck parts of the central Mississippi Valley around midweek. Heaviest weekly totals were observed across the South, with as much as 4 in. in some places. Much of this occurred as overrunning of the cold air by moisture from the Gulf of Mexico. A second severe ice storm began in Texas and Louisiana on the weekend. It was the worst ice storm in 25 yr near Shreveport, La.

January 8–14

Northwesterly flow from a strong ridge in western Canada and a broad area of cyclonic curvature with below-normal heights over the eastern and central United States led to a continuation of the cold weather over all but the Far West and extreme Northern Plains (figs. 9A, 9B). Temperatures were 12°F or more below normal over most of the southeastern quadrant of the country, as well as along the western slopes of the central Rocky Mountains. Under the influence of increasing flow from the Pacific, mild weather moved into the west coast and western portions of the Great Basin.

The strong flow from the Pacific, which was associated with a depressed center of cyclonic activity south of the Gulf of Alaska, also brought heavy rains to the Pacific Coast and inland valleys (figs. 9A, 9C). Precipitation, much of it in the form of snow even in the valleys, was heaviest relative to normal in central California, where over 2 in. fell. The low-latitude storm track was active in the Gulf of Mexico, and two storms produced wintry weather across the South.

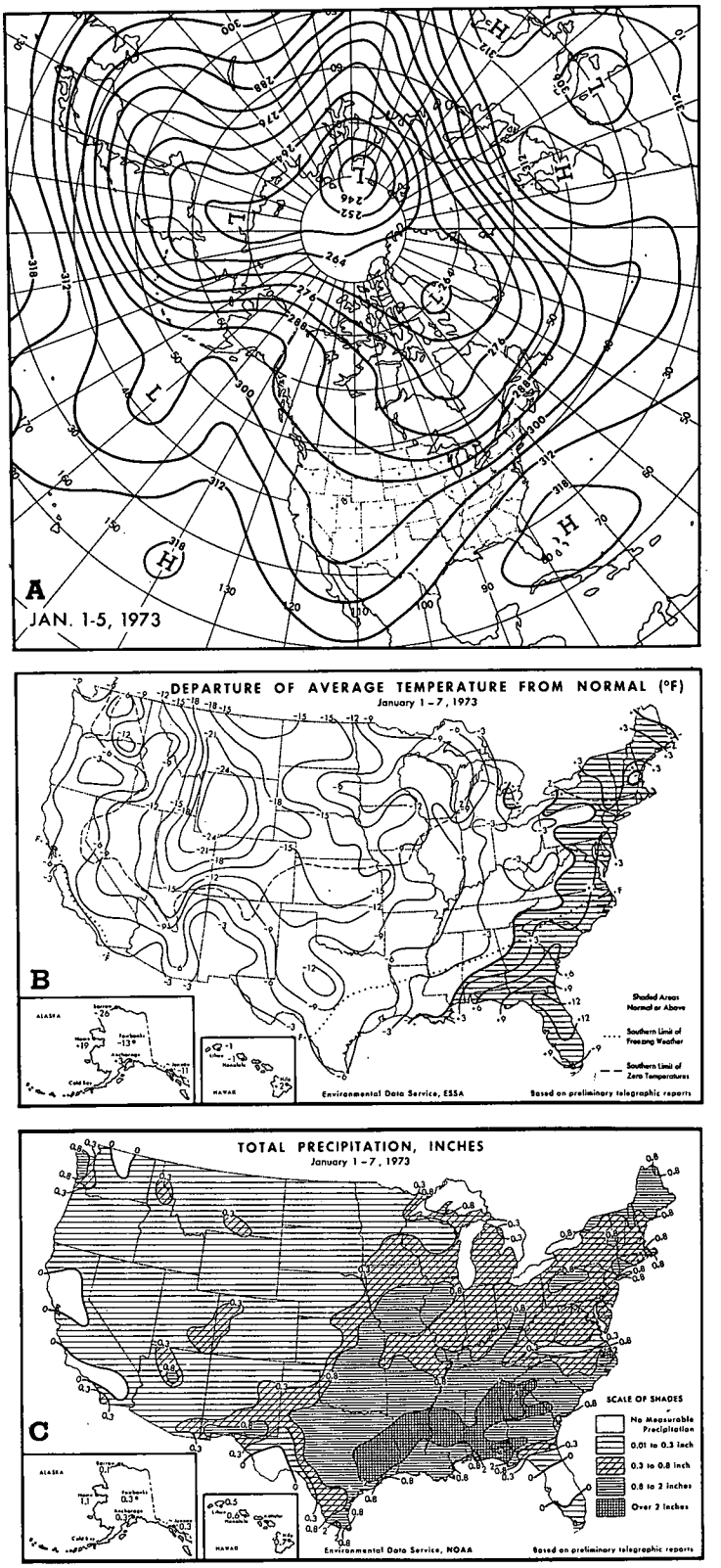
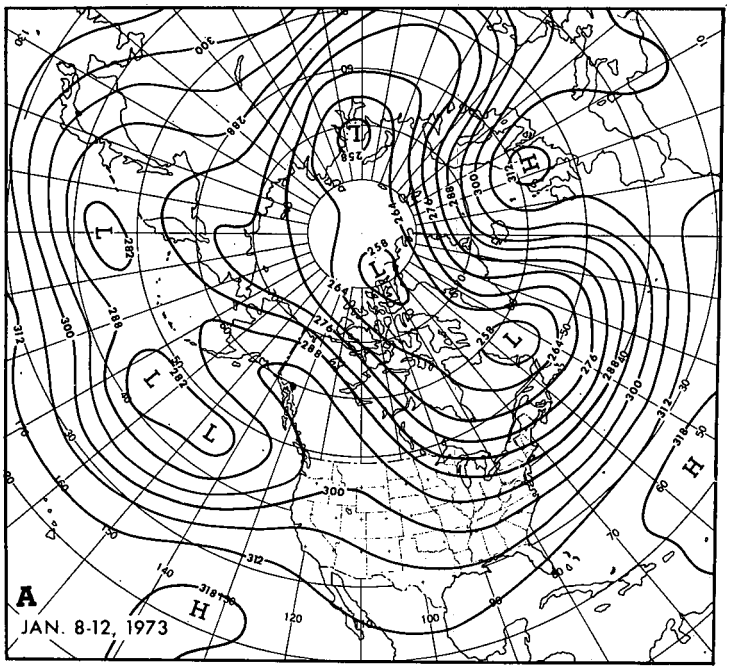
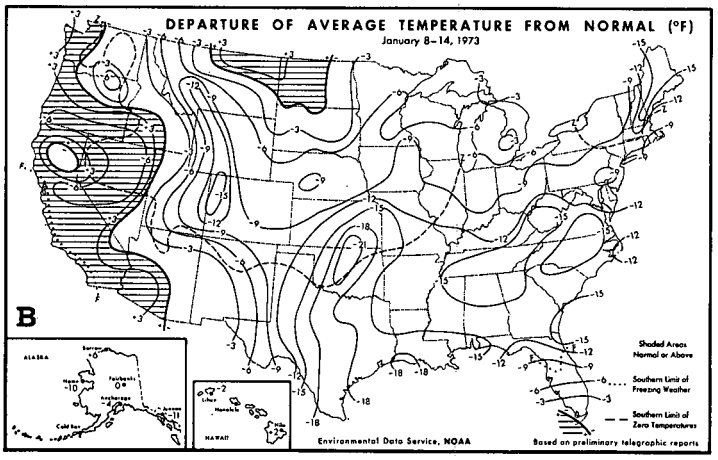


FIGURE 8.—(A) mean 700-mb contours (dam) for Jan. 1–5, 1973; (B) departure from normal of average surface temperature (°F) and (C) total precipitation (in.) for week of Jan. 1–7, 1973 (from Environmental Data Service and Statistical Reporting Service 1973).

The first gave damaging glaze conditions in a belt from the Atlanta, Ga., area to the coast of North Carolina, where Wilmington had one of its worst ice storms in a





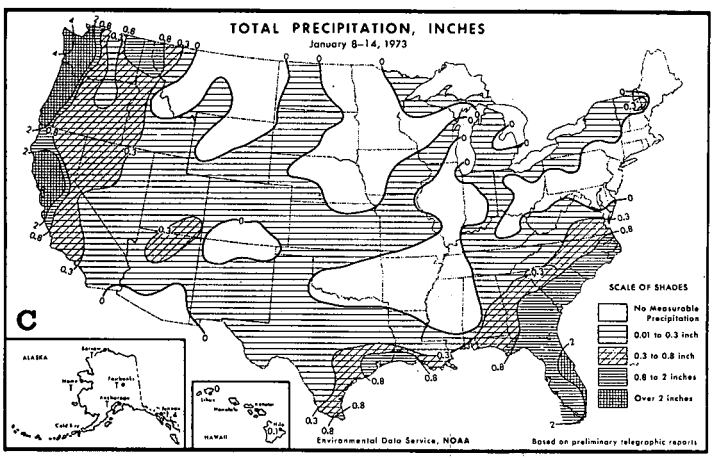
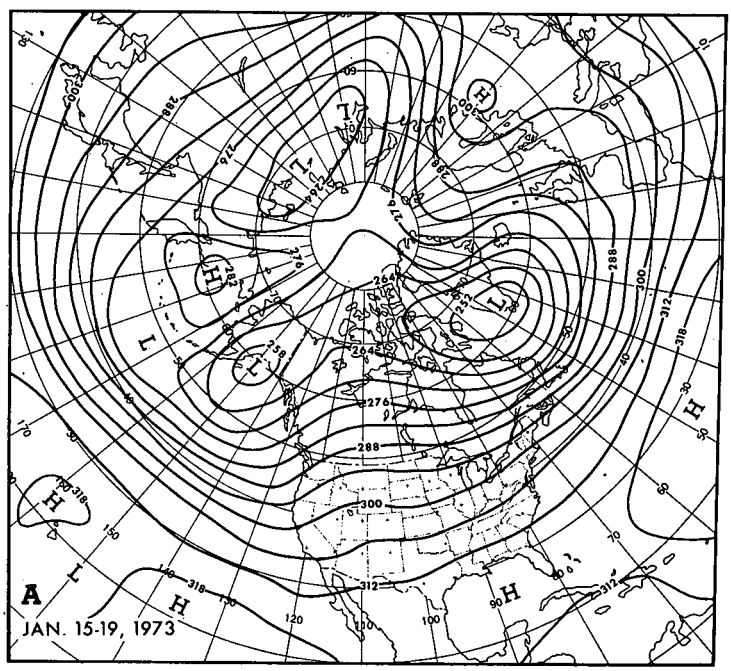
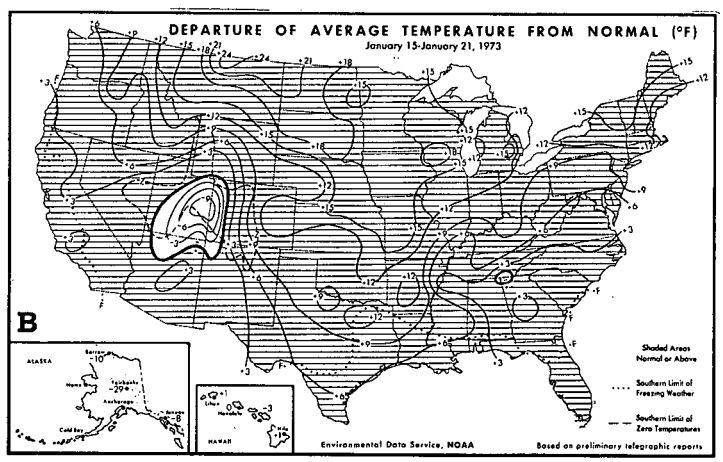


FIGURE 9.—Same as figure 8, (A) for Jan. 8–12, 1973; (B) and (C) for week of Jan. 8–14, 1973.





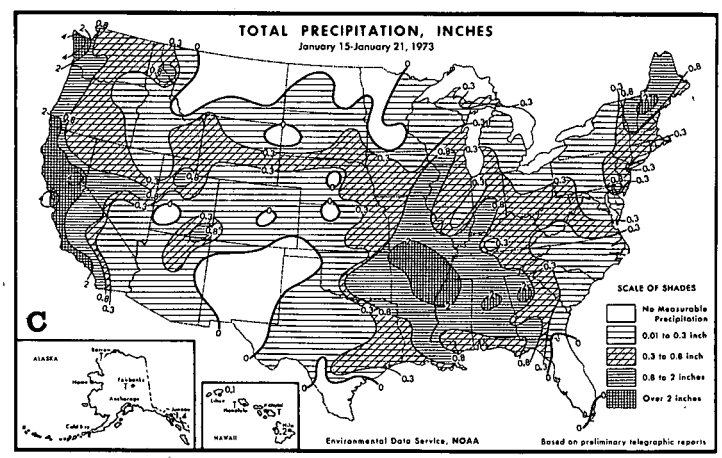


FIGURE 10.—Same as figure 8, (A) for Jan. 15–19, 1973; (B) and (C) for week of Jan. 15–21, 1973.

century. Just to the north, a belt of heavy snow extended from the southern Appalachians across interior North Carolina to southeastern Virginia, where the Norfolk area had 9 in. of snow, the heaviest single snowfall there in over a decade.

The second storm gave several inches of snow to the coast of Texas in the Galveston–Port Arthur area. The 3 in. at Port Arthur was the 2d heaviest in modern records, and the 1.2 in. farther south, but inland, at Victoria was the most January snow since 1940.

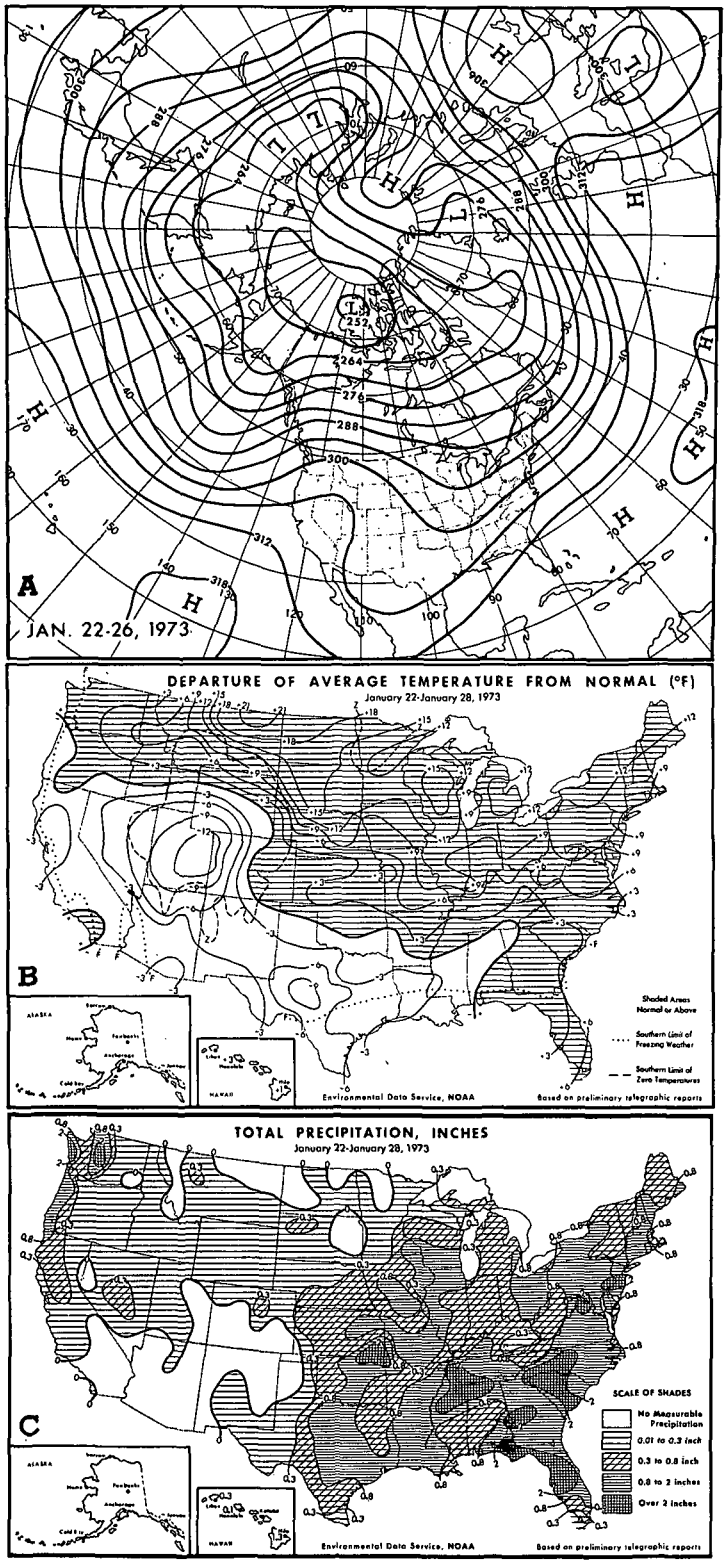


FIGURE 11.—Same as figure 8, (A) for Jan. 22–26, 1973; (B) and (C) for week of Jan. 22–28, 1973.

January 15–21

Strong westerly flow and cyclonic activity dominated most of the Pacific ocean during the third week of January as large 700-mb height falls occurred over the Gulf of Alaska (figs. 7, 10A). Heights also fell over northwest Canada and rose to above-normal values over the eastern two-thirds of the United States.

As a result, mild Pacific air, augmented by gulf air in the East, spread over the entire country. Whereas during the previous week nearly the whole Nation was much colder than normal, temperatures this week were much milder than normal everywhere except in the eastern part of the Great Basin. Here, cold air still lingered in some of the valley stations where the mild air had been unable to penetrate the strong inversion (fig. 10B). Most of the rest of the country failed to report any subzero temperatures for the first time in several weeks. The Great Plains were warmest relative to normal, with weekly mean temperatures as much as 24°F above normal in Montana. A maximum of 45°F on the 18th was the warmest January temperature since 1932 at Sault Ste. Marie, Mich., and the 4th warmest on record.

The strong onshore flow continued to produce heavy precipitation along the west coast, especially in California where some rivers and streams approached flood stage (fig. 10C). Heavy precipitation also occurred over the central Mississippi Valley and northern New England. The extreme northern and southern Great Plains were dry, with some areas having no precipitation.

January 22–28

Continued cyclonic activity in the Gulf of Alaska and below-normal 700–mb heights across northern Canada kept most Arctic air out of the United States, but repeated troughing in the Southwest lowered temperatures in that area (figs. 11A, 11B). The strengthening ridge over the central Rocky Mountains enhanced radiational cooling over the lingering snow cover in the Great Basin, and weekly mean temperatures were once again much below normal. Mild air continued to prevail across the northern half of the Nation and along the east coast. Much of the snow cover had been removed from the Northern Plains and the maximum temperature of 48°F observed at International Falls, Minn., on the 24th equaled the highest ever observed in January.

Precipitation lessened along the west coast due to weakening of the onshore flow component (figs. 11A, 11C). Heaviest amounts were observed in the Southeast, where southerly flow ahead of the storms generated by the trough in Texas produced frequent rains. The Northern Plains and portions of the Southwest remained dry.

Blizzard conditions were observed over limited areas of the Central Plains twice during the week, and, in the closing days of the month, cold air returned to much of the eastern half of the country on the heels of a heavy snowstorm in New England.

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. 60, Nos. 2–5, Jan. 8, 15, 22, 29, and No. 7, Feb. 12, **1973**.

Taubensee, Robert E., "Weather and Circulation of December 1972—Record Cold in the West," *Monthly Weather Review*, Vol. 101, No. 3, Mar. **1973**, pp. 281–286

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