WEATHER AND CIRCULATION OF JANUARY 1975

Predominantly Mild but with a Severe Mid-Month Blizzard

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1. Mean circulation

Stronger than normal westerly flow continued to dominate much of the Northern Hemisphere at middle and high latitudes. A major exception was the Asian sector, where weak blocking prevailed over Siberia (Figs. 1, 2, and 3). The zonal westerlies were particularly fast over the Pacific, where they decreased slightly from the previous month, and over the Atlantic, where they increased over the already high December values (Taubensee, 1975). The axis of maximum wind was close to its normal position in most areas, but speeds were around 5 m s^{-1} stronger than normal over the Pacific and averaged nearly 10 m s^{-1} above normal across the Atlantic (Fig. 3), contributing to a pronounced peak in the zonal wind profile (Fig. 4).

The mid-latitude zonal index for the Western Hemisphere averaged 13.3 m s^{-1}, equaling that of February 1974. Only January 1972 had stronger mid-latitude zonal westerlies, with an index of 13.9 m s^{-1}. Compare Figs. 1 through 4 with the corresponding maps and diagrams in the articles by Dickson (1974) and Wagner (1972), relating to those months. Due to strong subtropical 700 mb ridges over both oceans, the lower latitude westerlies were much weaker than normal.

Over the Pacific, where the westerlies decreased slightly from the previous month, some features of the circulation changed little. The principal changes were loss of the deep Aleutian Low and northeastward movement of the eastern lobe of the subtropical high to a location just west of California (Fig. 1). The weakening of the Aleutian Low and decrease in the strength of the westerlies to its south may be due to a marked dimunition of the supply of cold air available over Siberia and eastern Asia for the generation of available potential energy affecting storms crossing the Pacific. (Compare Fig. 5 with Fig. 4 of Taubensee, 1975.)

The principal trough over North America persisted from the Great Lakes to the southern Great Plains, but extended northward to a deepening low over northern Canada that replaced strong blocking in the previous month. The remnant of the blocking moved northeastward to Greenland as 700 mb heights fell rapidly over Hudson Bay. Increasing flow from the Arctic into Canada resulted in a rapid increase in the cold air supply over Canada (Figs. 1, 2, and 5).

This development, along with the building of the subtropical 700 mb ridge east of Florida, led to a rapid increase in the zonal available potential and kinetic energy over the Atlantic as Arctic and tropical airstreams were drawn into close proximity. The fast westerlies spread into Europe, leading to progression of the ridges and troughs over Eurasia and driving relatively mild air of Atlantic origin all the way across Asia to Siberia (Figs. 1, 2, and 5).

2. Temperature

As is generally the case during a month with fast mid-latitude westerlies, temperatures averaged above normal over most of the conterminous United States. Although no monthly records were set, it was the mildest January in over 20 years at Youngstown, Ohio, and Wilmington, Del. Most of the eastern half of the country averaged from 2°F to 6°F above normal, while the greatest positive anomaly of 10°F was located over eastern Montana (Fig. 6). In this area, the strong westerlies crossing the Rocky Mountains caused frequent chinook winds, while Arctic air was contained farther to the north (Figs. 1, 3, and 5). It was quite cold over Canada and Alaska, where January mean temperatures averaged as cold as −27°F at Barter Island (12.6°F below normal).

The greatest negative temperature anomaly over the conterminous United States was at Alamosa, Colo., where January averaged 10.4°F colder than normal. South of the main cyclone path, light northerly anomalous flow (Fig. 2) and generally anticyclonic conditions west of the Continental Divide enhanced nocturnal radiation over the extensive snow cover in the higher elevations of the central and southern Rocky Mountains (Fig. 6). Below normal 700 mb heights were related to coolness in portions of New Mexico east of the Divide. Extensive fog in California's central valley resulted in relatively cool conditions there. Sacramento had a record 13 consecutive days with dense fog.

3. Precipitation

Precipitation was near or above normal over most of the country, with only the far Southwest, small

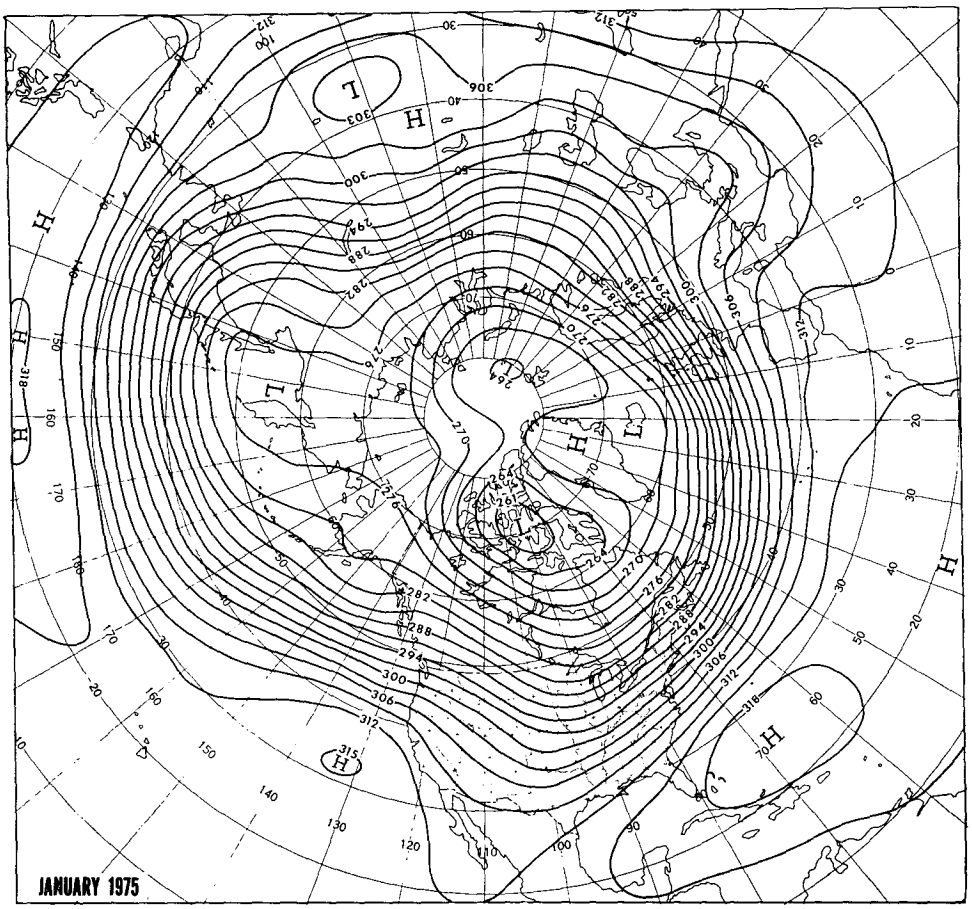


FIG. 1. Mean 700 mb height contours (dekameters) for January 1975.

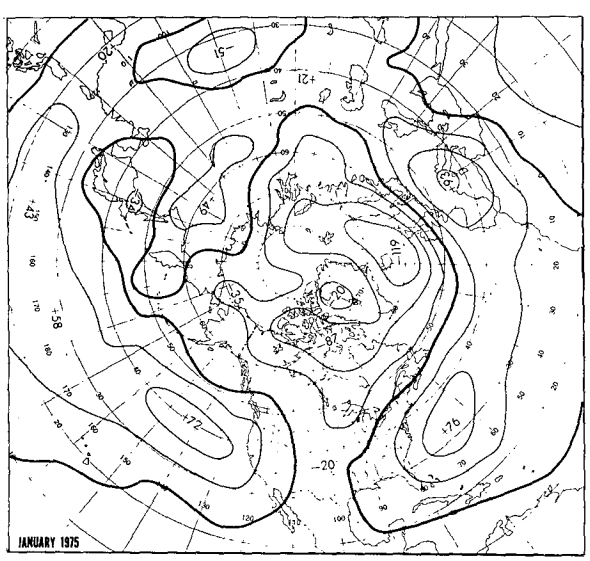


FIG. 2. Departure from normal of mean 700 mb height (m) for January 1975.

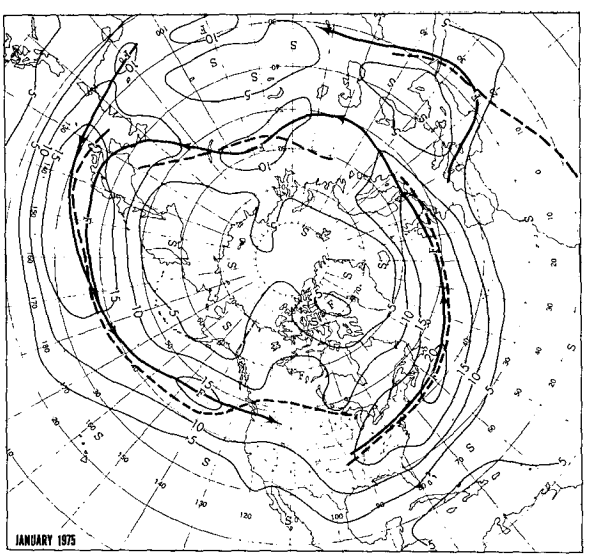


FIG. 3. Mean 700 mb geostrophic wind speed (m s^{-1}) for January 1975. Solid arrows show the observed axes of maximum wind, and dashed lines show the normal.

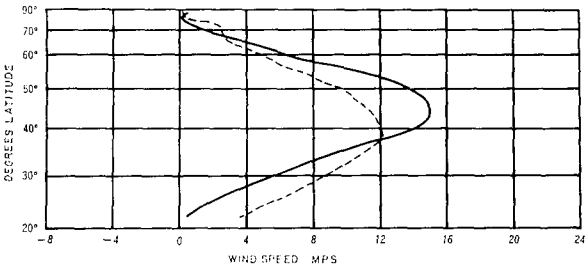


FIG. 4. Mean 700 mb geostrophic zonal wind profile for the Western Hemisphere for January 1975 (solid line); dashed line is the normal.

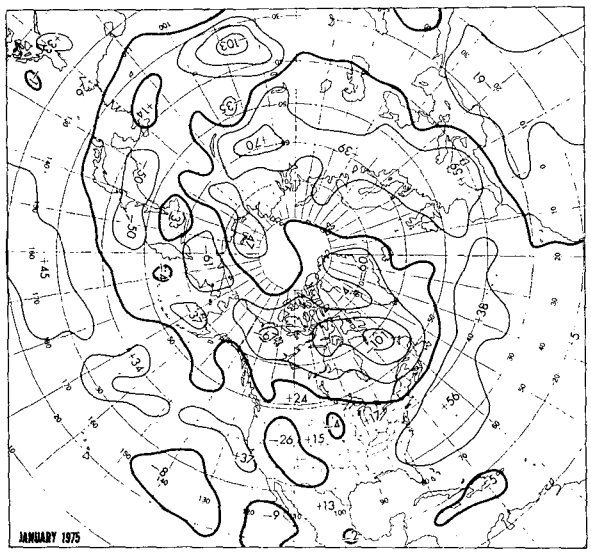


FIG. 5. Departure from normal of mean 1000 to 700 mb thickness (m) for January 1975.

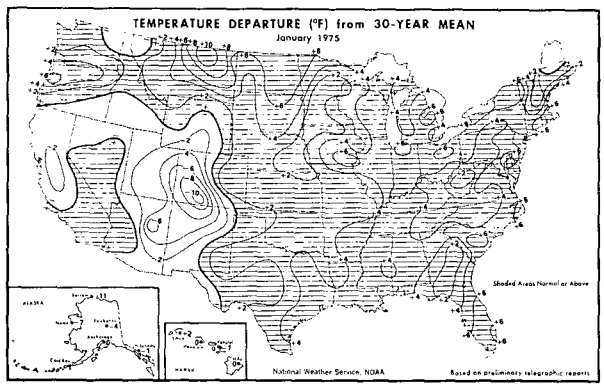


FIG. 6. Departure from normal of average surface temperature (°F) for January 1975 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1975).

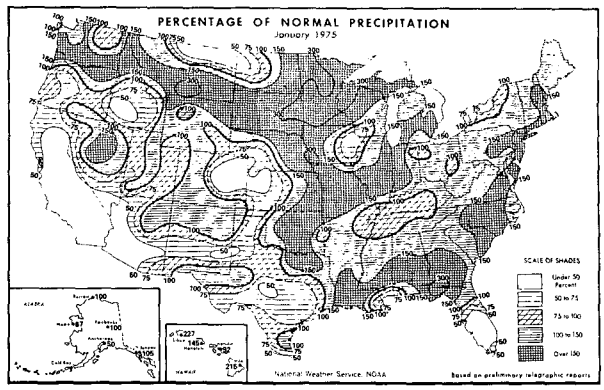


FIG. 7. Percentage of normal precipitation for January 1975 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1975).

areas of the Great Plains, and southern Florida having less than half the normal amounts (Fig. 7). Greatest totals of around 12 inches fell along the northern Pacific Coast and over the Florida Panhandle, where Tallahassee had the wettest January on record (Table 1). A large portion of the northern Mississippi River Valley had more than three times the normal January precipitation, mainly as a result of a major blizzard during the second week of the month. A number of cities in that region reported one of their snowiest or wettest Januarys on record. Several disturbances entering the country near the Columbia River Valley and crossing the Rocky Mountains and Great Plains into the Mississippi River Valley produced the widespread precipitation observed in these regions.

While precipitation over Alaska averaged close to normal, rather heavy amounts fell in Hawaii. The latter was due to enhanced trade winds caused by the northward displaced strong subtropical 700 mb ridge (Fig. 2). Hilo had nearly 20 inches of rain, over twice the normal January total.

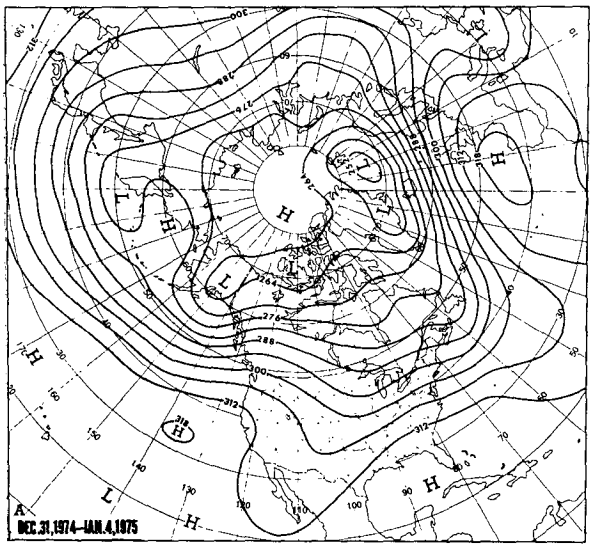
4. Weekly variability

a. December 30–January 5

At the beginning of the month, fast westerlies across the Pacific swept a series of rapidly-moving

TABLE 1. Record and near-record monthly precipitation observed during January 1975.

Station	Amount (Inches)	Anomaly (Inches)	Remarks
Yakutat, Alaska	75.5		Record Jan. snowfall
Tallahassee, Fla.	11.68	+7.94	Wettest Jan.
Pendleton, Oreg.	3.53	+1.91	2nd wettest Jan. since 1935
Sioux City, Iowa	18.2		3rd snowiest Jan.
	1.66	+1.01	4th wettest Jan.
Omaha, Neb.	22.7		3rd snowiest Jan.
Minneapolis, Minn.	27.4		3rd snowiest Jan.
Duluth, Minn.	32.7		3rd snowiest Jan.
Providence, R. I.	6.78	+3.26	5th wettest Jan.



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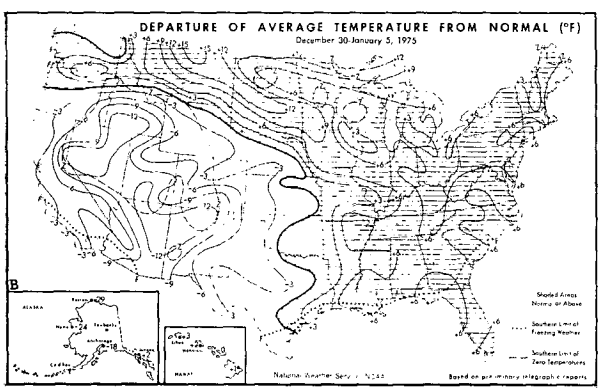

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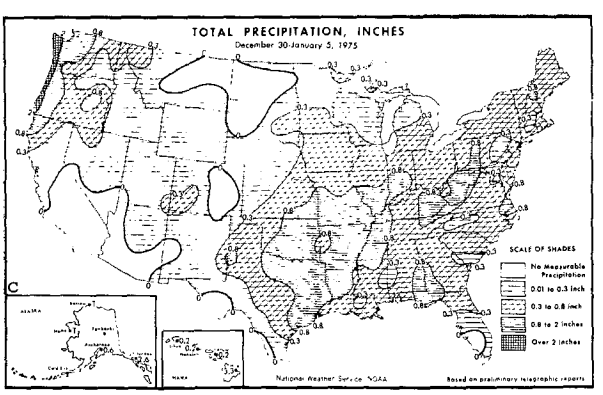
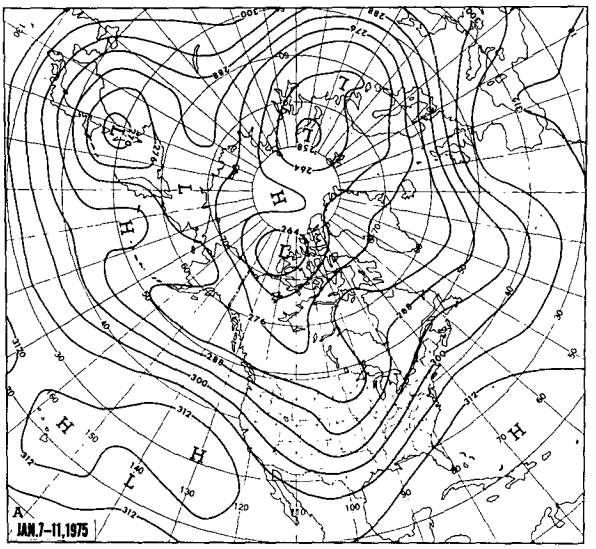


(C)

FIG. 8. (A) Mean 700 mb contours (dam) for 31 December 1974–4 January 1975; (B) departure from normal of average surface temperature (°F); and (C) total precipitation (inches) for week of 30 December 1974–5 January 1975 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1975).

frontal systems into the western United States (Fig. 8A). The lack of an amplified 700 mb ridge over western Canada or a strong trough near the Atlantic coast allowed generally mild air of Pacific origin to



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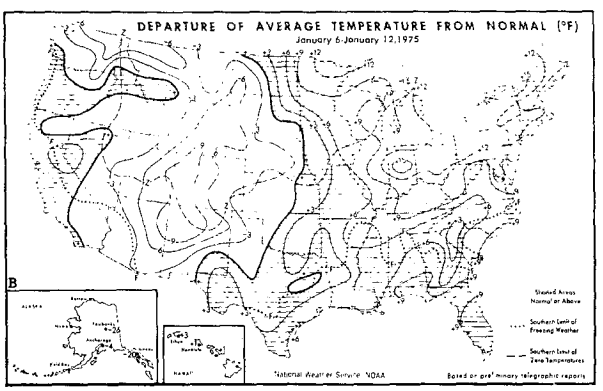

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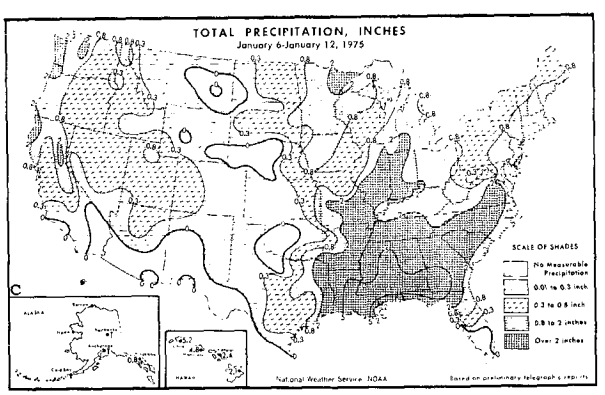


(C)

FIG. 9. Same as Fig. 8, (A) for 7–11 January 1975, (B) and (C) for week of 6–12 January 1975.

TABLE 2. Unusual events during storm of 10–11 January 1975.

Station	Event	Remarks
Williston, N. D.	−80°F	Windchill equivalent temperature
Bismark, N. D.	56 mph	New Jan. record fastest mile
Aberdeen, S. D.	—	Worst blizzard in decades
Rochester, Minn.	28.67 inches	Lowest sea-level pressure on record
Duluth, Minn.	28.55 inches	Lowest sea-level pressure on record
	1.74 inches	Greatest Jan. 24 h precip.
		Rare January thunderstorm
Rockford, Ill.	28.87 inches	Lowest sea-level pressure on record
Milwaukee, Wisc.	28.86 inches	2nd lowest sea-level pressure
	37°F	Highest daily min. temp.
	66 mph	Peak wind gust
Chicago, Ill.	60°F	Highest daily max. temp.
		Thunderstorms with damaging winds
Montomery, Ala.	72 mph	New all-time record fastest mile
Louisville, Ky.	66°F	Highest daily max. temp.
Evansville, Ind.	—	Severe tstm; 4 small tornadoes in area
Ft. Wayne, Ind.	69 mph	Peak wind gust
Marquette, Mich.	46°F	Highest daily max. temp. 0200 LST
Lansing, Mich.	55°F	Highest daily max. temp.
Rochester, N. Y.	63°F	Highest daily max. temp.
New York, N. Y.	63°F	Highest daily max. temp.
Trenton, N. J.	65°F	Highest daily max. temp.
Newark, N. J.	66°F	Highest daily max. temp.
Burlington, Vt.	52°F	Highest daily max. temp.
Providence, R. I.	61°F	Highest daily max. temp.
Washington, D. C.	75°F	Highest daily max. temp.

cross the United States while keeping out most of the Arctic air. As a result, temperatures were relatively warm over the eastern half of the country and across the northern border states (Fig. 8B). Only a few localities in these areas had subzero temperature.

The coldest weather in the conterminuous United States, both in an absolute sense and relative to normal, was observed over the Great Basin and central and southern Rocky Mountains. Extensive snow cover led to strong nocturnal cooling in the Pacific highs which entered the West between the frontal systems. Temperatures plunged to −28°F at Alamosa, Colo., and to −26°F at Winnemucca, Nev.

Bitter cold was observed in Alaska under a substantial portion of the Polar Low (Fig. 8A). The Arctic Coast averaged as much as 29°F below normal for the week, and an all-time record of −46°F was observed on the 3rd at King Salmon near the coast of the normally less cold southwestern part of the state.

Precipitation was distributed across most of the country in moderate amounts (Fig. 8C). There were no excessively heavy amounts or unusual storms, and portions of the northern Great Plains and the Southwest had no precipitation.

b. January 6–12

Much of the cyclonic activity that had been over the Gulf of Alaska the previous week moved eastward over Canada in response to ridging over the eastern Pacific (Figs. 8A and 9A). The trough over the Great Plains amplified while a ridge built off the Atlantic Coast, forcing the trough which had been there the previous week farther eastward.

The principal change in the temperature pattern occurred over the northern Rocky Mountains and northern Great Plains, where Arctic air began filtering in toward the end of the week in response to 700 mb height rises over Alaska, and temperatures fell to 3°F to 6°F below normal (Fig. 9B). It remained cold over the remainder of the Rocky Mountains, while strengthened southwesterly flow from the Gulf of Mexico increased temperatures over the eastern half of the country to as much as 12°F to 15°F above normal over the Northeast.

The precipitation pattern was similar to that of the previous week also (Fig. 9C), except that amounts in the Southeast and the Mississippi River Valley were much higher due to the increased flow from the Gulf of Mexico and to the occurrence of the major storm of the month.

This storm, which brought damaging gales to the Pacific Northwest on Wednesday 8 January, redeveloped east of the Continental Divide two days later as the associated trough in the upper atmosphere amplified strongly. Large quantities of moisture-laden tropical air were drawn northward east of the storm, while Arctic air moved into the circulation from the northern Great Plains. The result was one of the worst blizzards in recent decades as the central pressure fell to record depths (Table 2).

Severe thunderstorms and several damaging tornadoes broke out in Louisiana, Mississippi, and Alabama, with tornadic activity observed as far north as southern

Indiana and thunder occurring as far west and north as Minneapolis and Duluth, Minn. In the strong warm sector, record warmth for 10 and 11 January was noted over a wide area of the Midwest and Northeast (Table 2). Damaging winds occurred over an extensive area, both from severe thunderstorms and from the intense pressure gradient developed by the rapidly deepening storm.

c. January 13–19

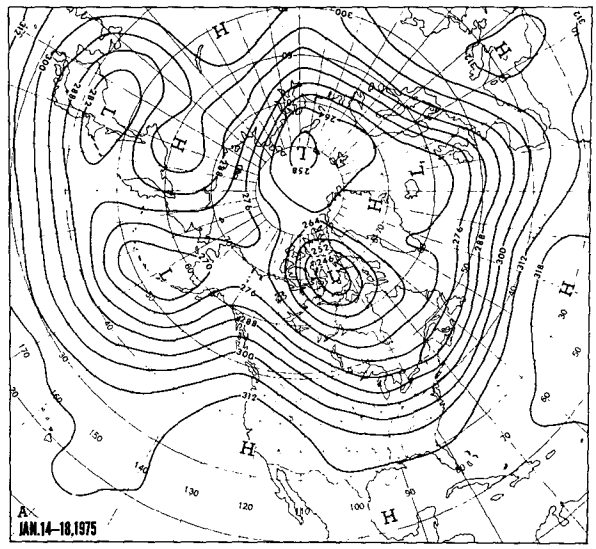
Strong cyclogenesis over the Aleutians led to amplification and progression of the 700 mb ridge to the west coast of North America (Fig. 10A). The Polar Low deepened and moved southeastwards to a position just north of Hudson Bay while the full-latitude trough to its south progressed to the eastern United States. The ridge east of the trough was displaced to the central Atlantic while the next trough progressed to a position just west of Portugal and the British Isles. A broad southwesterly flow brought mild air into most of Europe.

The temperature pattern over the United States in its large-scale aspects was almost exactly the reverse of what it had been the previous two weeks. Most of the East was cooler than normal, with the greatest negative anomaly located over the central Appalachian Mountains (Fig. 10B). Except for small portions of the central Rocky Mountains and the California Valley, where inversions still trapped cold air at the surface, the West warmed rapidly, to as much as 18°F above normal for the week in Montana.

A strong drying trend accompanied the moderation of temperatures over the West in response to the ridging near the West Coast. Nearly the entire southwestern quarter of the country had no precipitation at all, while amounts over the remainder of the Nation were for the most part considerably lighter than the previous week due to the generally northwesterly flow and the absence of appreciable Gulf moisture. Only the Pacific Northwest and portions of the Gulf and Atlantic Coast States had substantial amounts of precipitation (Fig. 10C).

d. January 20–26

Even though the trough moved back into the central part of the United States and sharpened somewhat, temperatures remained mild over most of the country (Fig. 11A, B). Cyclonic curvature and low 700 mb heights over the Gulf of Alaska helped to drive air of Pacific origin inland, while the main body of the Polar Low moved eastward over the Davis Strait and strengthened the westerlies over the North Atlantic. Arctic air was able to penetrate only briefly into the northern Great Lakes and northern New England, where temperatures averaged as much as 6°F below normal. Nearly all the remainder of the country enjoyed a pleasant January thaw of extended proportions, with weekly temperatures averaging as much as 18°F above normal in Montana.



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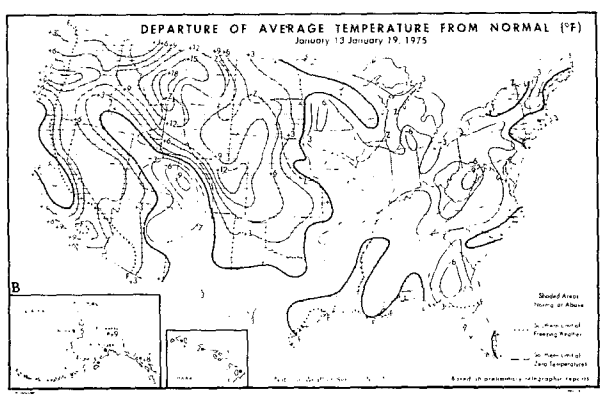

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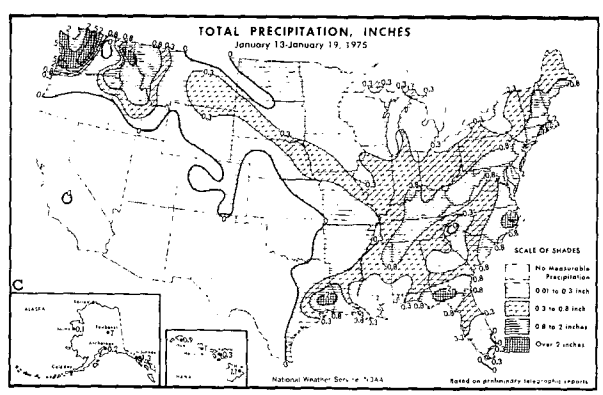

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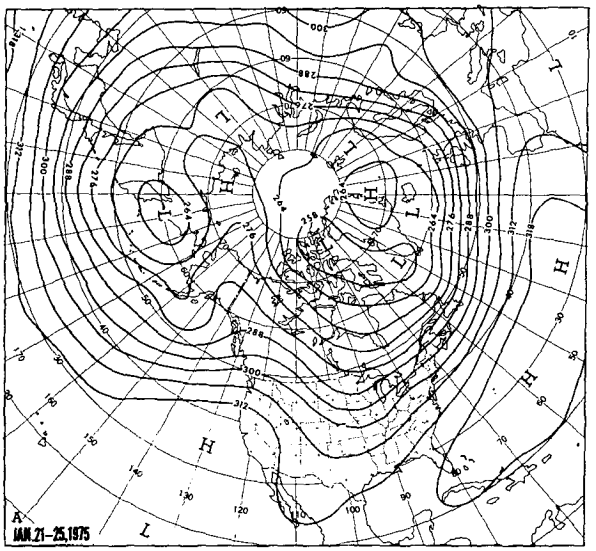
FIG. 10. Same as Fig. 8, (A) for 14–18 January 1975, (B) and (C) for week of 13–19 January 1975.



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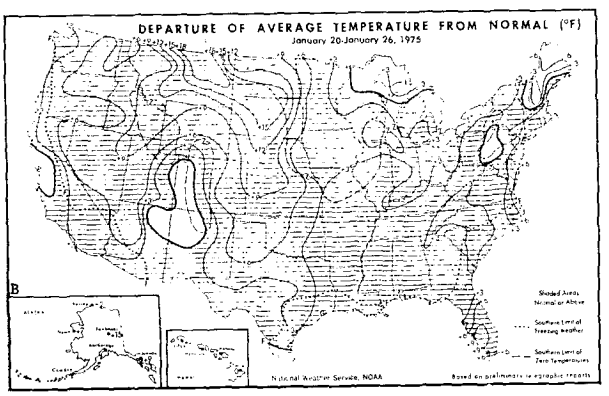

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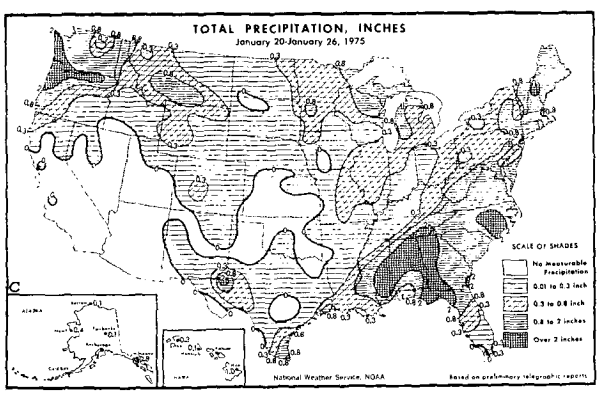

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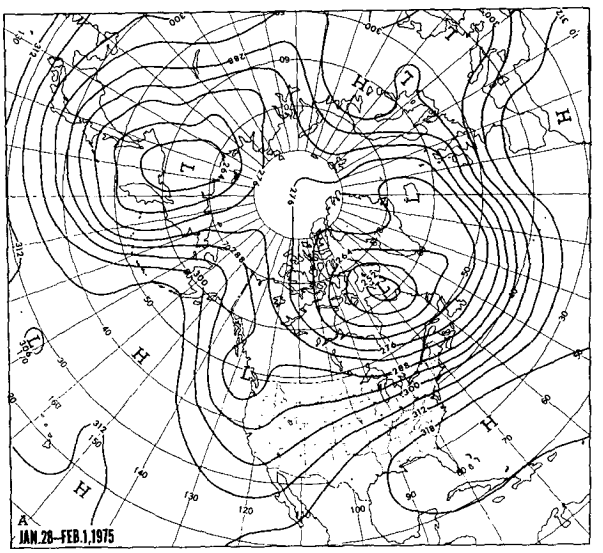
FIG. 11. Same as Fig. 8, (A) for 21–25 January 1975, (B) and (C) for week of 20–26 January 1975.

Due to the sharpening of the trough over the middle of the country and increased southwesterly flow to its east, precipitation amounts increased over much of the Nation. Nevertheless, portions of the Southwest still remained dry.

The only area of the country to have severe winter weather was the northern Great Lakes region, which



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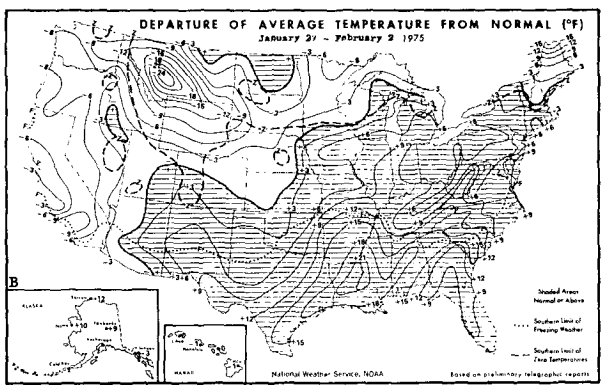

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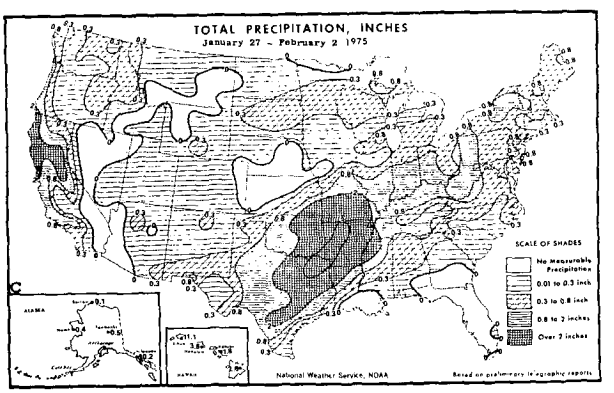

(C)

FIG. 12. Same as Fig. 8, (A) for 28 January–1 February 1975, (B) and (C) for week of 27 January–2 February 1975.

had two storms producing blizzard conditions. These storms were much less severe and covered a much smaller area than the major one a couple of weeks previous, however.

e. January 27–February 2

A major amplification of the western Pacific 700 mb trough led to downstream building of a strong ridge northward to the Aleutians and the formation of a new trough near the west coast of the United States (Fig. 12A). Strong confluence developed in the flow pattern over North America between the Arctic air moving south from northwestern Canada and mild southwesterly flow around a strengthened Bermuda High.

The strongest temperature contrast of the winter developed over the United States as temperatures in the Arctic air over Montana averaged as much as 24°F below normal for the week, while averages were as much as 21°F above normal in tropical air that prevailed across the Gulf Coast states most of the week (Fig. 12B). It was also bitterly cold in northern New England.

Precipitation became lighter over the Pacific Northwest but increased in California as the prevailing storm path moved southward in response to the deepening trough along the West Coast (Fig. 12C). Heavy rains, which caused flooding in some places, occurred over Texas and Arkansas in the strong southwesterly flow.

A rapidly-moving storm brought a surge of warm air as far north as the Ohio Valley and middle Atlantic States on 29 January. Many cities from Little Rock, Ark., and Louisville, Ky., eastward to the Atlantic Coast set record highs in the 60's and 70's for that date. Several localities in the Southeast, which remained in the warm air for several days, set daily records in the upper 70's on 2 or 3 days. Columbia, S.C., equalled its warmest January temperature with 84°F on the last day of the month, and Wilmington, N.C., broke its record with 82°F the same day.

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