

WEATHER AND CIRCULATION OF FEBRUARY 1976

Extreme Warmth Over the Eastern Two-Thirds of the United States

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1. Mean circulation

After displaying a rather amplified wave pattern at the 700 mb level during January (Wagner, 1976), the mean circulation reverted to a fast, generally westerly flow at middle latitudes in February (Figs. 1, 2, and 3). The temperate latitude westerlies (35°N to 55°N) in the Western Hemisphere averaged 12.9 m s^{-1} —second highest February value since tabulations began in 1948. Accompanying this concentration of kinetic energy at middle latitudes, the polar westerlies also exceeded

normal, while the subtropical westerlies averaged 4.2 m s^{-1} —a record low for February. The axes of the mean 700 mb westerlies were shifted a few degrees north of normal throughout most of the Northern Hemisphere (Fig. 3).

The main transport of cold air to low latitudes was in eastern Europe and western Asia (Fig. 4), east of a strong European ridge. Elsewhere, below normal thicknesses were largely confined to the 45° to 75° north latitude belt giving a strong mid-latitude baroclinic zone.

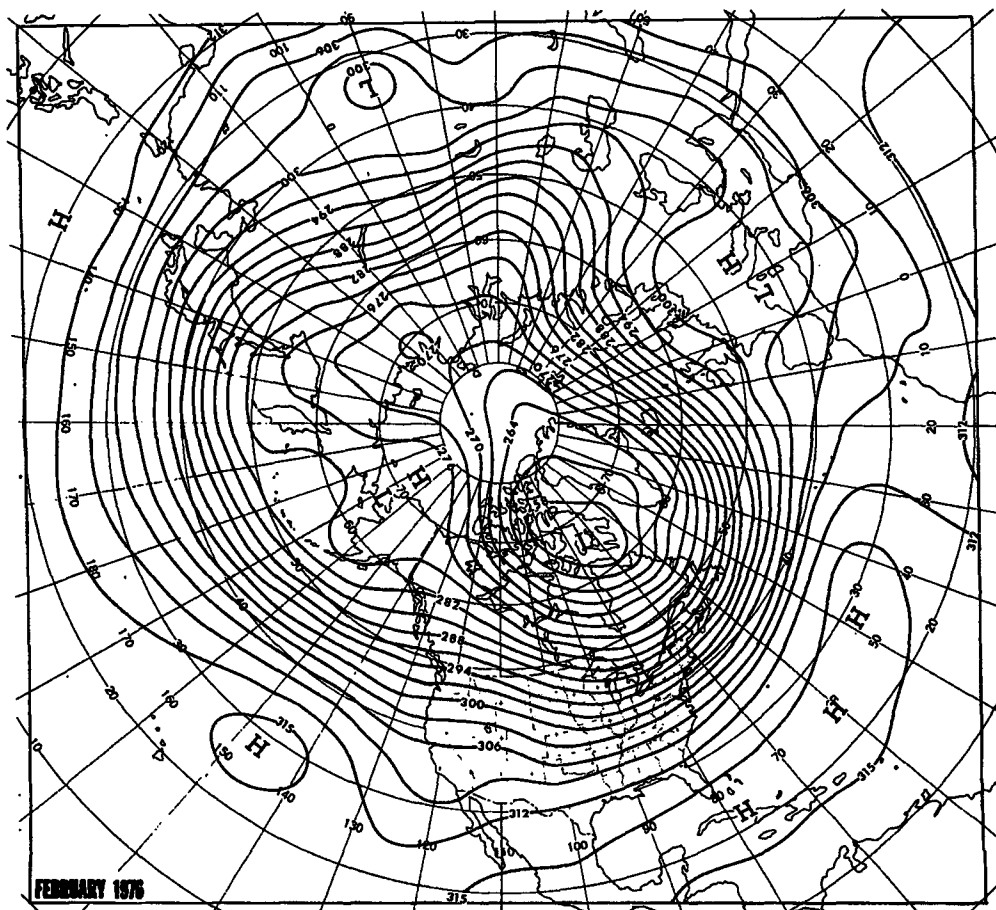


FIG. 1. Mean 700 mb height contours (dekameters) for February 1976.

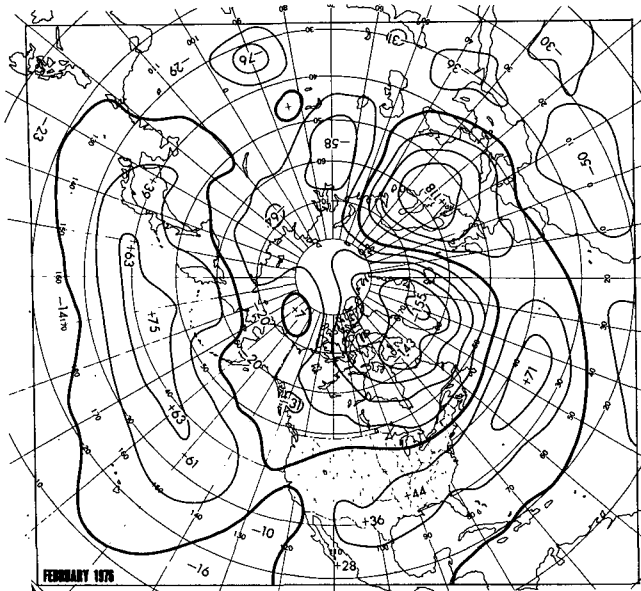


FIG. 2. Departure from normal of mean 700 mb height (m) for February 1976.

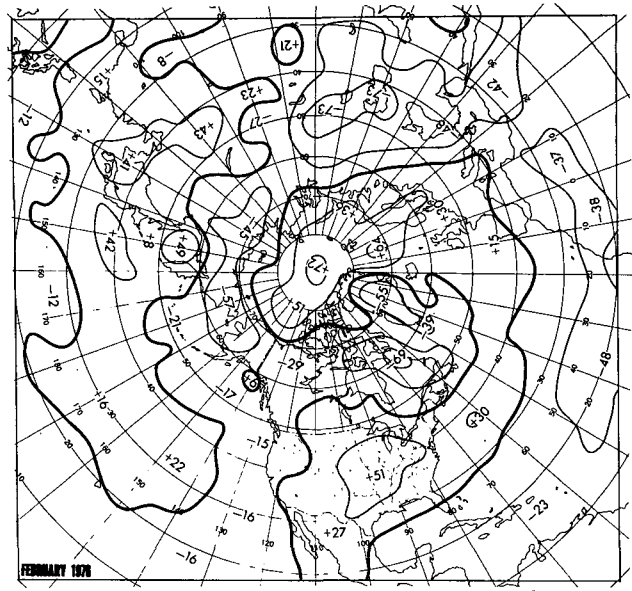


FIG. 4. Departure from normal of mean 1000 to 700 mb thickness (m) for February 1976.

The flattening and accelerating mid-latitude flow was associated with progression of mean circulation features around much of the Hemisphere. Progression of a mean trough to western Asia brought relatively warm air to the east coast of Asia. The resultant weakening of the coastal baroclinic zone greatly reduced west Pacific cyclogenesis and led to a marked filling of the previously intense mean trough over the central and western Pacific. As the flow flattened over the Pacific and North America, mean troughs moved to both the west coast and the east coast of the United States, and an intense

low moved over Baffin Island. To the east of this deep low, the mean ridge amplified and progressed to Scandinavia.

2. Temperature

In consonance with the flat, fast flow pattern over North America, the transport of cold air from Canada to the United States was greatly limited and warm maritime air masses predominated over most of the country (Fig. 5). Monthly mean temperatures were near records highs for February over much of the eastern two-thirds of the United States and in parts of the Southwest (Table 1). Persistence of the fast westerly flow over North America during the last three weeks of the month was a major factor in the development of these extreme mean temperatures. Over much of the area of record or near record warmth, February

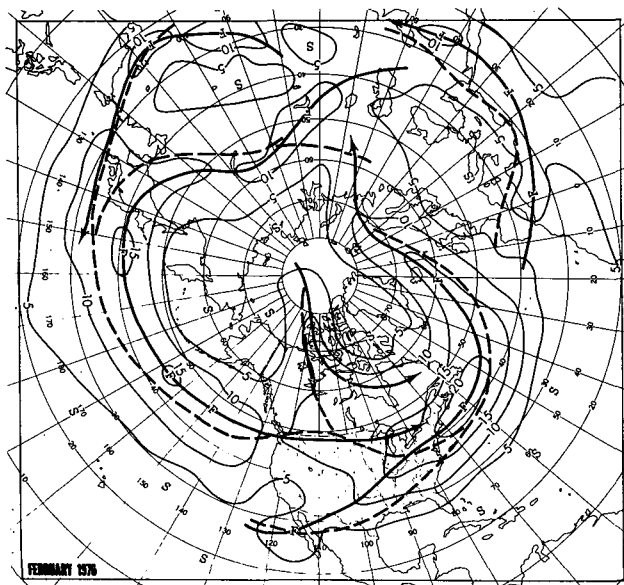


FIG. 3. Mean 700 mb geostrophic wind speed ($m s^{-1}$) for February 1976. Solid arrows indicate observed axes of maximum wind speed and dashed lines, the normal.

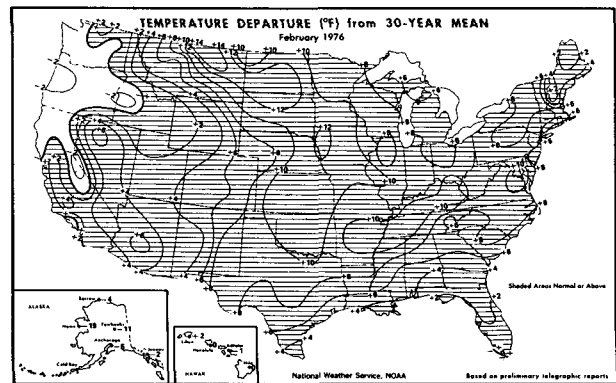


FIG. 5. Departure from normal of average surface air temperature ($^{\circ}F$) for February 1976 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1976).

TABLE 1. Record and near-record mean temperatures observed in February 1976.

Station	Temperature (°F)	Anomaly (°F)	Remarks
Oklahoma City, Okla.	52.2	+10.9	Warmest February
Roswell, N. Mex.	53.3	+10.4	"
Washington, D.C.	46.9	+9.6	"
Cairo, Ill.	49.0	+9.3	"
South Bend, Ind.	35.3	+9.0	"
Greensboro, N. C.	49.3	+8.7	"
Youngstown, Ohio	34.6	+7.9	"
Rockford, Ill.	30.8	+6.8	"
Tulsa, Okla.	51.1	+9.9	Second warmest February
Richmond, Va.	48.5	+9.1	"
Columbia, Mo.	42.6	+9.0	" (Tied)
Rapid City, S. Dak. (Apt.)	34.6	+8.8	"
Shreveport, La.	59.2	+8.7	"
Trenton, N. J.	41.4	+8.0	"
Minneapolis, Minn.	27.7	+11.2	Third warmest February
Topeka, Kan.	42.7	+9.3	"
Amarillo, Texas	47.8	+8.1	"
Wilkes Barre-Scranton, Pa.	35.0	+7.7	"
Worcester, Mass.	31.2	+6.1	"
Rochester, Minn.	28.2	+11.3	Fourth warmest February
Sioux City, Ia.	33.5	+10.1	"
Omaha, Neb.	37.5	+9.5	"
Phoenix, Ariz.	60.7	+5.6	"

mean temperatures even exceeded the normal values for March. Oklahoma City was an extreme example of this with a February mean temperature of 52.2°F—4°F warmer than the March normal.

With diminished cyclogenesis over the north central Pacific, eddy transport of heat northward over Alaska was reduced and mean temperatures averaged below normal. Temperatures in Hawaii averaged within one or two degrees of normal.

3. Precipitation

Development of a mean trough along the West Coast, coupled with relatively fast westerlies across North America, kept both the Alberta storm track and that emanating from the Great Basin active this month. These storm systems gave greater than normal precipitation to most of the West and to the northeastern quarter of the nation (Fig. 6). The substantial pre-

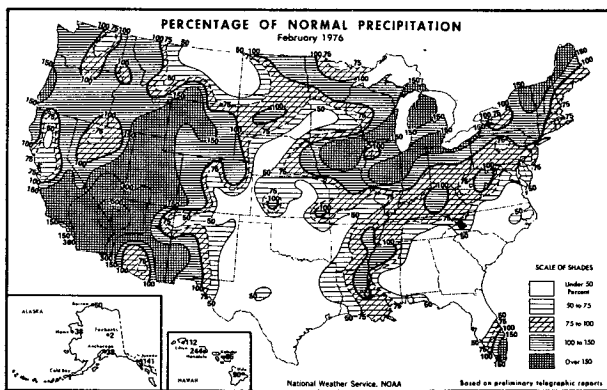


FIG. 6. Percentage of normal precipitation for February 1976 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1976).

cipitation in southern California alleviated a long-standing drought (Wagner, 1976). Elsewhere in the West, it was the wettest February of record at Flagstaff, Ariz., and the wettest since 1912 at Milford, Utah. In the

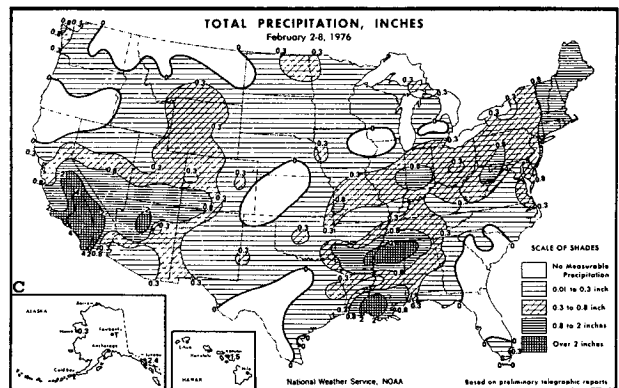
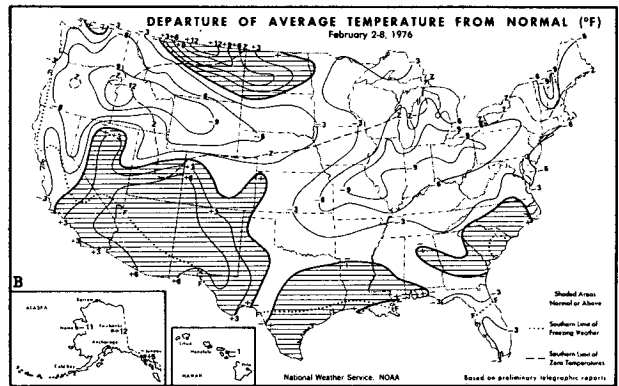
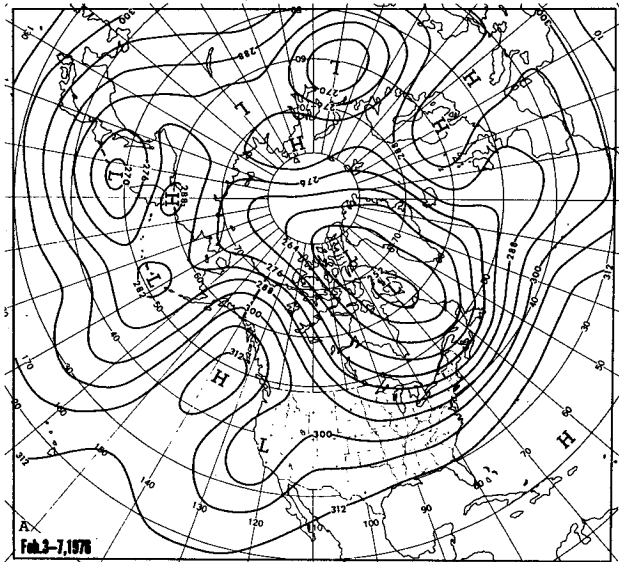


FIG. 7. (A) Mean 700 mb contours (dam) for 3-7 February 1976; (B) departure from normal of average surface temperature (°F), and (C) total precipitation (inches) for week of 2-8 February 1976 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service, 1976).

East, Erie, Pa., reported the wettest February since 1893.

There was a notable lack of precipitation just east of the Rocky Mountains—typical of months with fast westerlies near the northern border of the United States. This dryness further deteriorated the Great Plains' winter wheat crop. By the end of the month, local wind erosion had occurred in the Oklahoma pan-

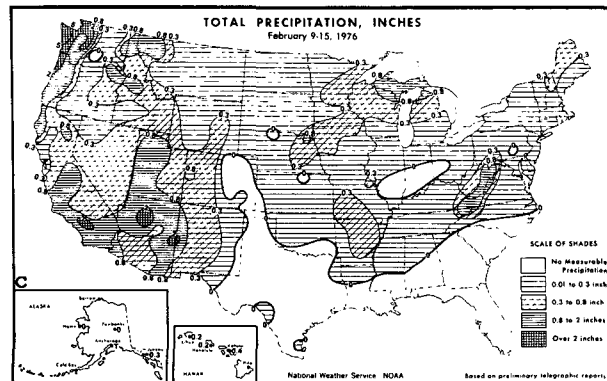
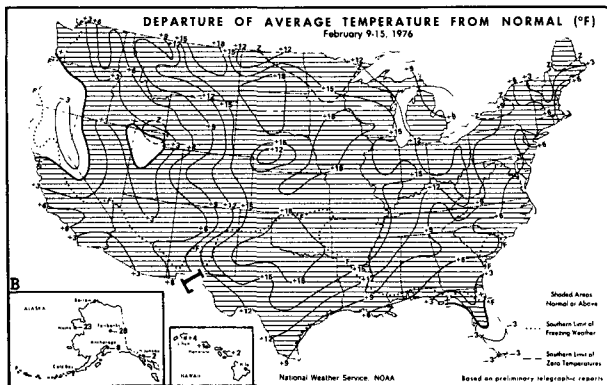
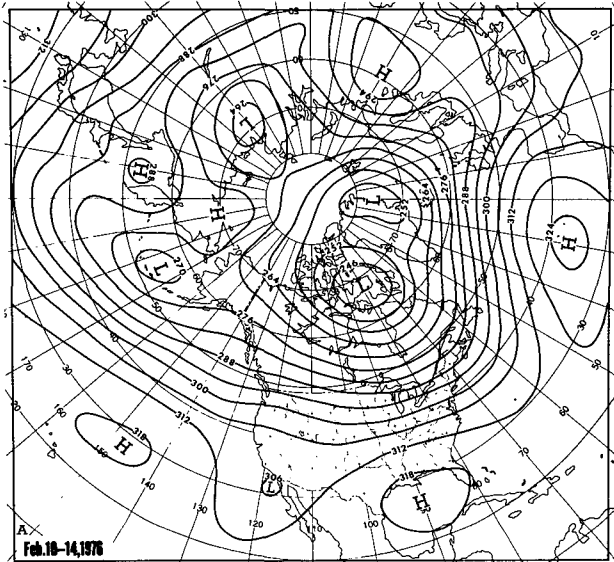


FIG. 8. Same as Fig. 7; (A) for 10-14 February 1976, (B) and (C) for week of 9-15 February 1976.

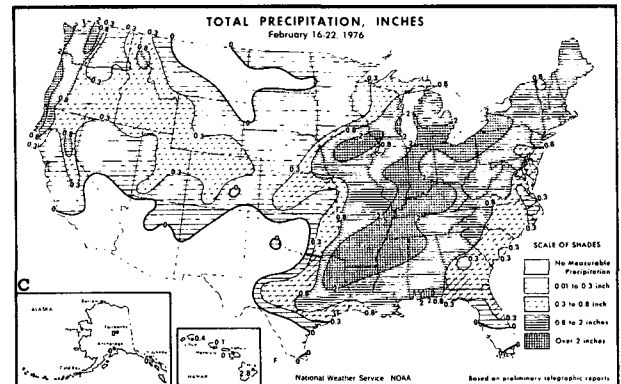
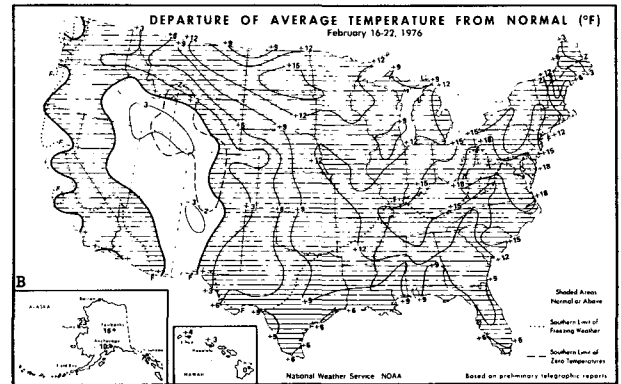
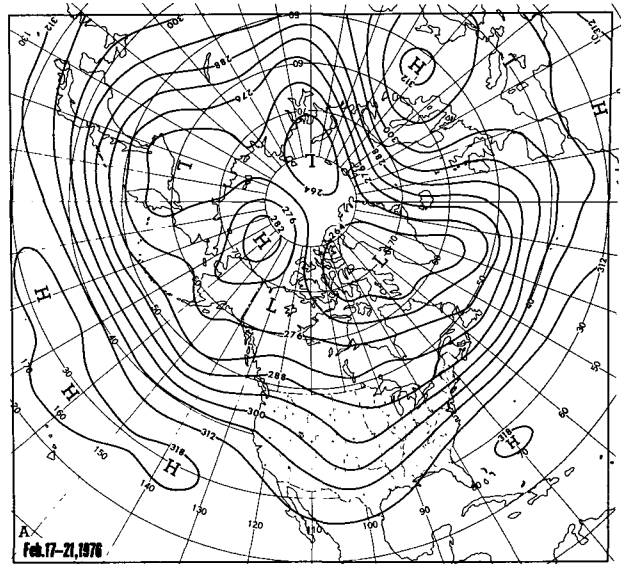


FIG. 9. Same as Fig. 7; (A) for 17-21 February 1976, (B) and (C) for week of 16-22 February 1976.

handle, the Texas high plains, southeast Colorado, and western Kansas. Most of the southeast, an area largely bypassed by the storm systems, was also quite dry this month.

With a weak mean trough over the north-central Pacific, most stations in Alaska received less than normal February precipitation. In Hawaii, south of a strong subtropical ridge, precipitation amounts were

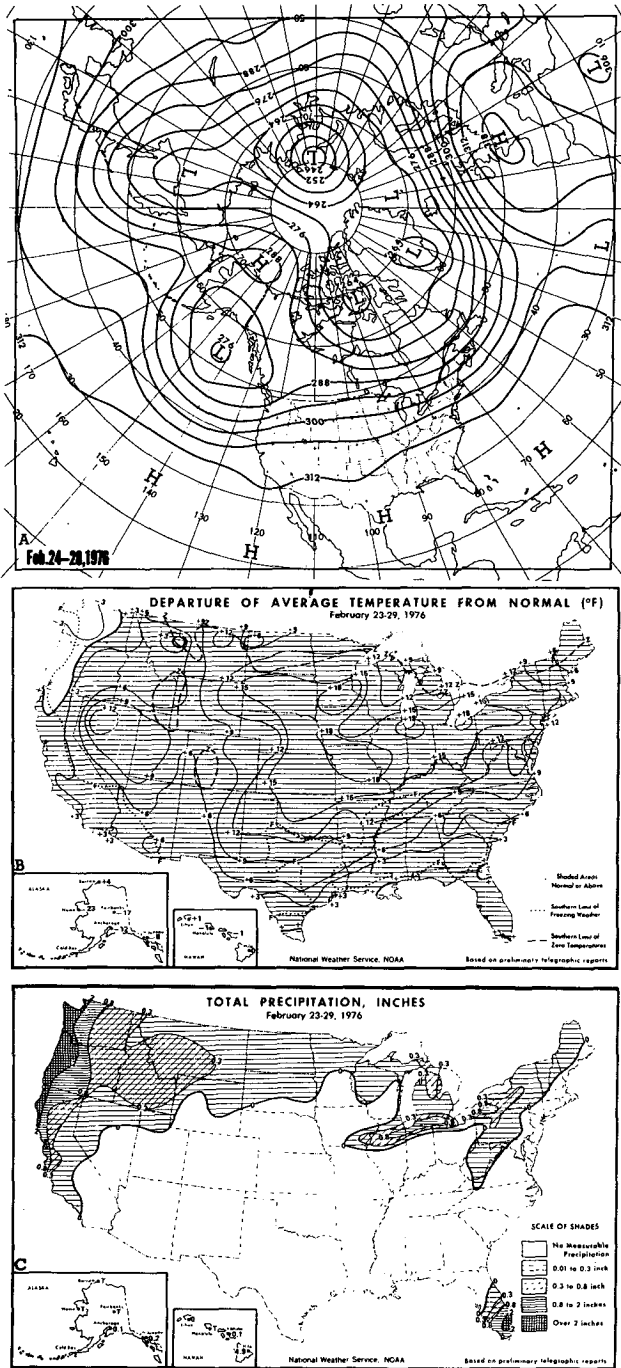


FIG. 10. Same as Fig. 7; (A) for 24-28 February 1976; (B) and (C) for week of 23-29 February 1976.

quite variable with Honolulu reporting more than twice the normal amount and some other stations recording subnormal totals.

4. Variability within the month

a. February 2-8

This was the only week in the month with a high-amplitude wave pattern over North America (Fig. 7)—

a carryover from the dominant pattern of January. There were, however, some significant changes from the circulation at the end of January. The mean wave over the eastern Pacific amplified markedly this week bringing a deep trough to California, the site of a mean ridge the previous week.

Strong cold air advection generated by the east Pacific ridge in conjunction with the two troughs to its east brought below normal temperatures to the Northwest as well as most of the eastern half of the nation. This proved to be the only cold week of the month for the eastern half. Despite a below normal weekly mean temperature, Caribou, Me., recorded a record high February temperature, 49°F, on February 2.

Storm systems associated with the California trough made this the wettest week of the month over much of the Southwest and were the major factor in alleviating the southern California drought. Elsewhere precipitation was widespread but generally light. A deep storm system moving up the East Coast on February 2 gave record low sea-level pressure for February from Hatteras to Maine and blizzard conditions at Albany, N. Y. The minimum sea-level pressure at Caribou, Me., during this storm was 28.26 inches, an all time low for that location.

b. February 9-15

The wave pattern flattened around much of the Hemisphere this week and most circulation features at middle latitudes progressed (Fig. 8). The flattening trend over North America brought deep, fast moving storm systems to the northern border and warm maritime air to most of the nation. Temperatures rose to record February highs of 84°F at Wichita, Kans., and 89°F at Wichita Falls, Texas, on the ninth. Although precipitation was widespread, most significant amounts were in the west due to the still-active California trough and the reactivated mid-latitude storm track.

c. February 16-22

The fast, flat nature of the flow continued this week and wave features were again generally progressive (Fig. 9). The California mean trough was finally picked up by the westerlies and contributed to the mean trough over the central and southern Great Plains this week. Warm air continued to cover most of the country with subnormal temperatures limited to an area west of the mean trough. Heaviest precipitation totals were observed in advance of mean troughs over the central United States and the northeast Pacific. Tornadoes were observed in Arkansas and Missouri on the 21st, accompanying a deep low moving out of the Southwest.

d. February 23-29

The wave pattern amplified over the North Pacific this week giving a deep mean trough over the eastern

TABLE 2. Record high temperatures for February observed in February 1976.

Station	Temperature (°F)	Date	Remarks
Caribou, Me.	49	2	
Wichita Falls, Tex.	89	9	
Wichita, Kan.	84	9	
Duluth, Minn.	55	24	
Albany, N. Y.	67	25	
Providence, R. I.	69	25	Equalled record
Newport, Vt.	60	26	
Milwaukee, Wis.	65	27	
Chicago, Ill.	75	27	
Muskegon, Mich.	62	27	
Grand Rapids, Mich.	67	27	
Bridgeport, Conn.	67	28	
Baltimore, Md.	76	29	Equalled record

Pacific (Fig. 10). However, confluence of the southwesterly flow in advance of this system and the northwesterly flow from northwestern Canada yielded strong mean westerlies along the northern border of the United

States. In this flow the previous trough over the central United States progressed and filled.

With cold air largely contained in Canada, temperatures continued well above normal over most of the nation this week. Record high temperatures for February were observed at a number of stations in the north-eastern quarter of the country (Table 2).

This was the driest week of the month, with precipitation largely limited to the northern border states, near the prevailing storm track, and along the West Coast in advance of the deep mean trough. Moderately heavy rains occurred in southern Florida at mid-week as the sheared-off, southern portion of the previous Great Plains trough slowly traversed the Gulf of Mexico and Florida.

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