

WEATHER AND CIRCULATION OF FEBRUARY 1982 A Highly Variable Month over the United States

ROBERT R. DICKSON

Climate Analysis Center, NMC/NWS/NOAA, Washington, DC 20233

1. Mean circulation

As has been the case in recent months (Wagner, 1982), blocking ridges at high latitudes were a prominent feature of the mean 70 kPa circulation during February 1982 (Figs. 1 and 2). Maximum height and thickness anomalies associated with these ridges were over the Bering and Baltic Seas (Figs. 2 and 3). While deep troughs flanked the European blocking ridge, below normal heights over the Pacific were largely confined to latitudes south of the blocking

ridge as a strong westerly current undercut that ridge (Fig. 4). The midlatitude westerlies crossed North America with relatively little meridional meandering and strengthened impressively in the zone of strong thermal contrast over the Atlantic between the cold trough to the north and the warm ridge to the south. The 70 kPa geostrophic wind maximum over the Atlantic was more than 150% of the normal value and exceeded the usually stronger maximum over the west Pacific.

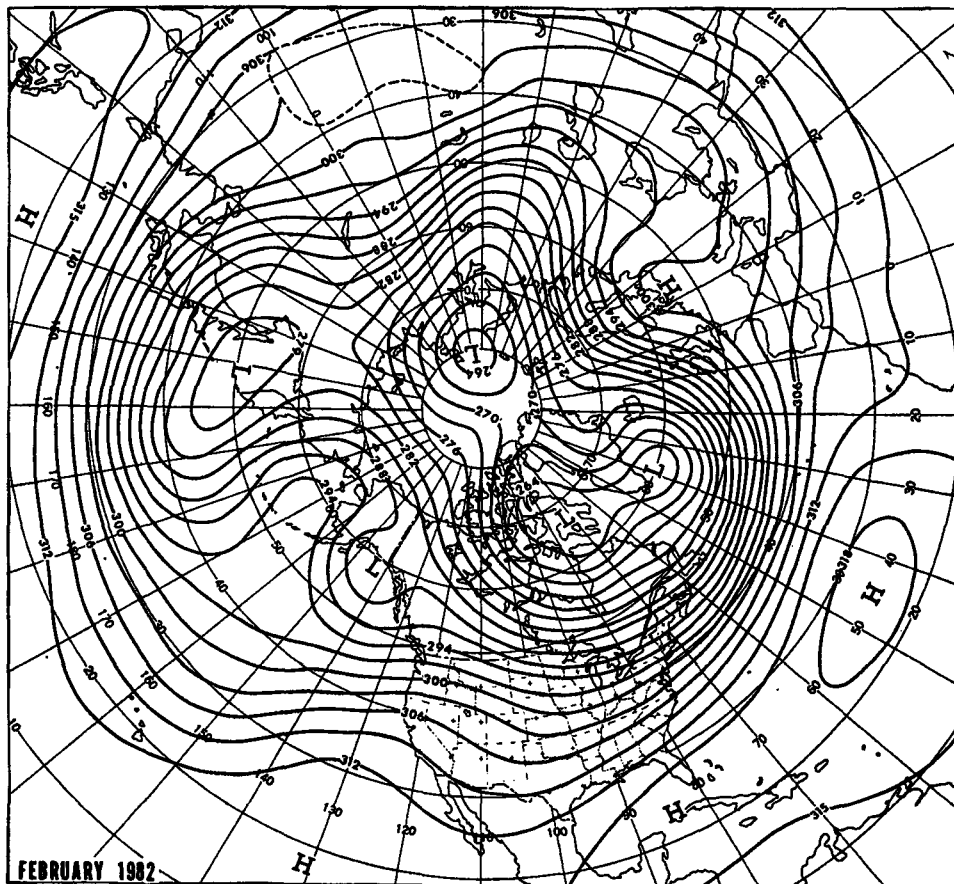


FIG. 1. Mean 70 kPa height contours (dam) for February 1982.

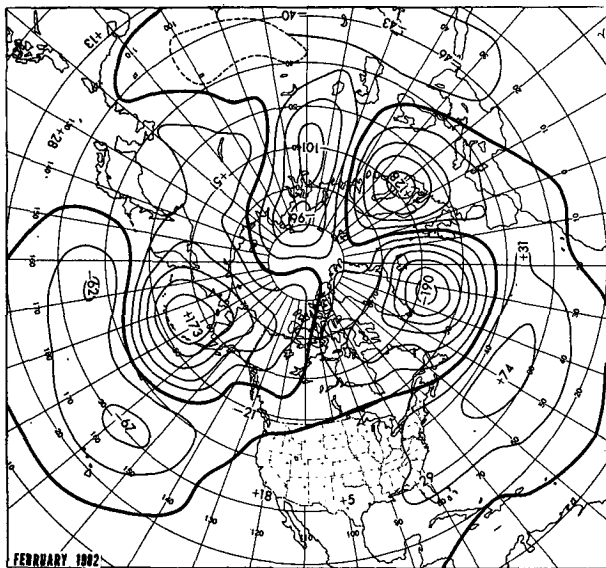


FIG. 2. Departure from normal of mean 70 kPa height (m) for February 1982.

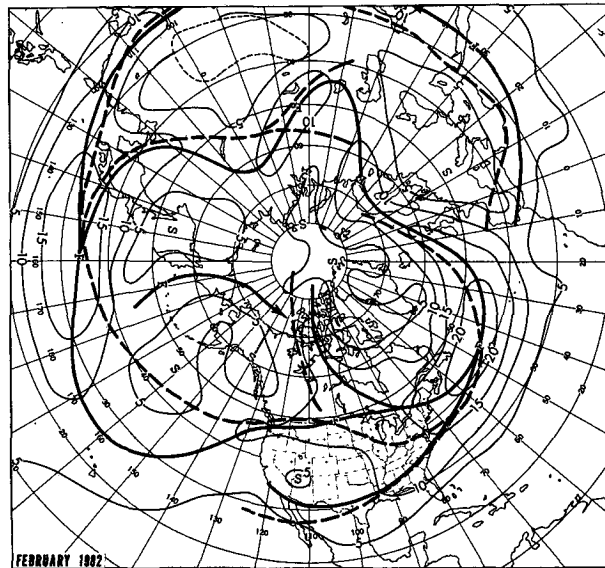


FIG. 4. Mean 70 kPa geostrophic wind speed ($m s^{-1}$) for February 1982. Solid arrows indicate observed axes of maximum wind speed and dashed lines, the normal.

2. Temperature

As will be seen in a subsequent section, much of the Nation experienced an extremely cold first half-month and a very mild last half. Thus, the monthly mean temperature anomalies (Fig. 5) are relatively modest differences between two extreme states.

Strong upper-level northwesterly flow prevailed over central Canada between the blocking ridge to the west and the deep Baffin Island low. This produced an extensive outflow of cold air from Canada

and below normal monthly mean temperatures in most of the area from the Rocky to the Appalachian Mountains. Above normal temperatures prevailed near the western ridge and along the eastern seaboard where 70 kPa heights exceeded normal and southerly wind components were enhanced. February mean temperatures in southern Florida, where warm weather prevailed throughout the month, were among the highest on record.

Enhanced northerly wind components brought cold weather to southern and eastern portions of Alaska while proximity of the blocking ridge kept the northwest warm. Mean temperatures in Hawaii ranged from near to a bit above normal.

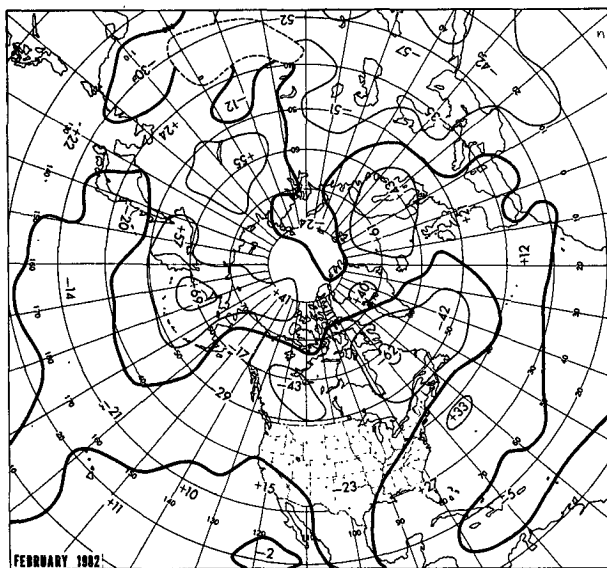


FIG. 3. Departure from normal of mean 100-70 kPa thickness (m) for February 1982.

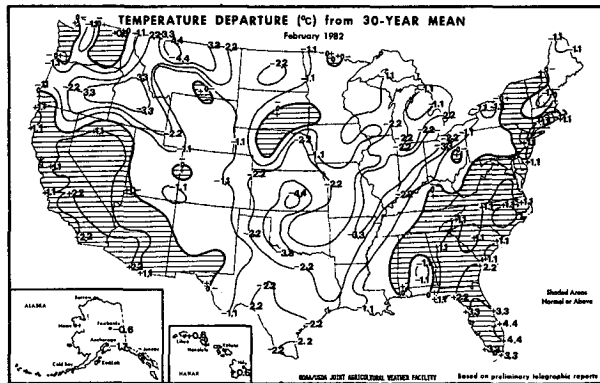


FIG. 5. Departure from normal of average surface air temperature ($^{\circ}C$) for February 1982 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service and World Agricultural Outlook Board, 1982).

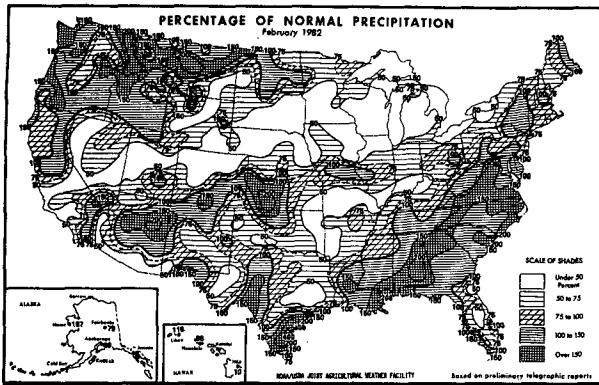


FIG. 6. Percentage of normal precipitation for February 1982 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service and World Agricultural Outlook Board, 1982).

3. Precipitation

Enhancement of the Gulf of Alaska trough and the associated increase in southwesterly flow to its south spread heavier than normal precipitation across the Northwest (Fig. 6). Relatively heavy precipitation also prevailed to the east of the mean trough over the south-central states and in a band from the southern Plateau to Kansas. The latter was associated with a series of deep upper-level troughs which transited the area, mostly during the first half of the month.

Although precipitation in the vicinity of the Great Lakes was subnormal in February, there was sufficient snowfall there to bring seasonal snowfall totals through February to near-record levels at some locations. South Bend, IN reported a seasonal snowfall through February of 282 cm, 178 cm above the long-term mean. At Minneapolis, MN seasonal snowfall through February totaled a record 201 cm. Snow depth at Fort Wayne, IN built to 53 cm on 9 February before melting to 10 cm during the mild last-half of the month. By the end of the month some rivers in the vicinity of Fort Wayne were already at flood stage preparatory to severe flooding in March.

Strengthened westerlies along the northern flank of the Pacific blocking ridge brought greater than normal precipitation to the northwest coast of Alaska, but elsewhere in the state amounts were subnormal. Precipitation totals in Hawaii varied from well below normal at Hilo in the south to near to above normal elsewhere.

4. Variability within the month

a. 31 January–6 February

Amplitude of the mean upper-level waves over the Pacific and North America rapidly increased during early February (Fig. 7A) as strong ridges built over

the east Pacific and the west Atlantic and a deep trough extended from Hudson Bay to east Texas. The development and motion of the east Pacific

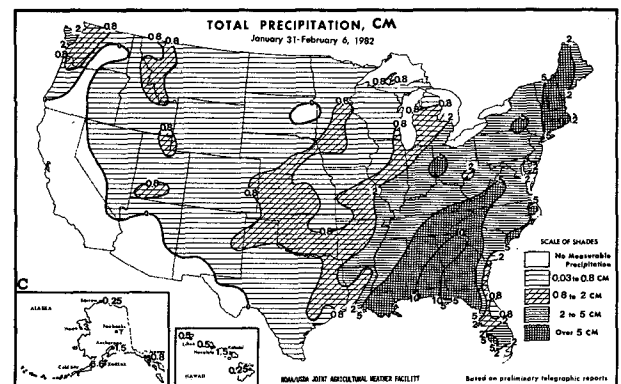
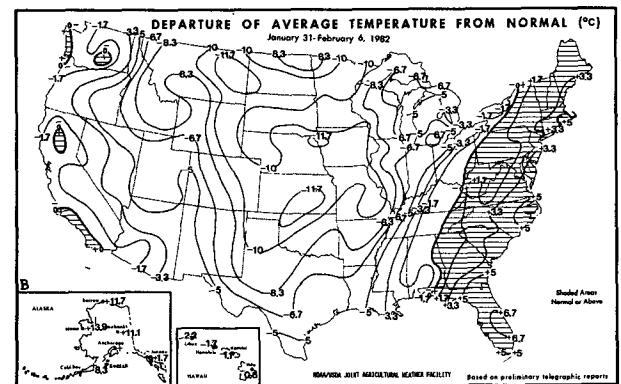
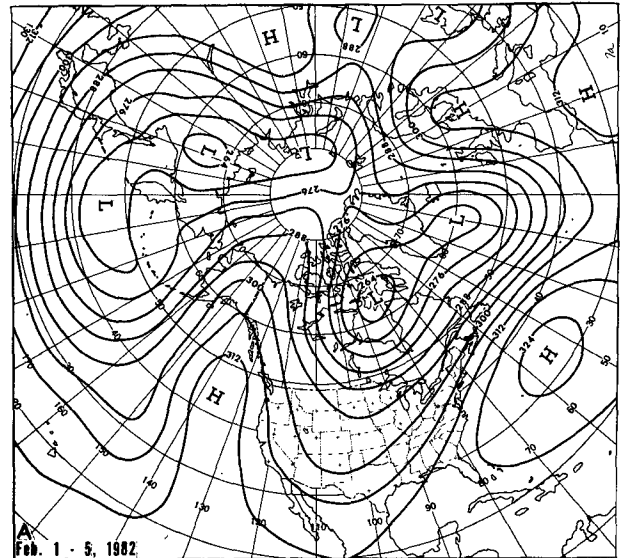
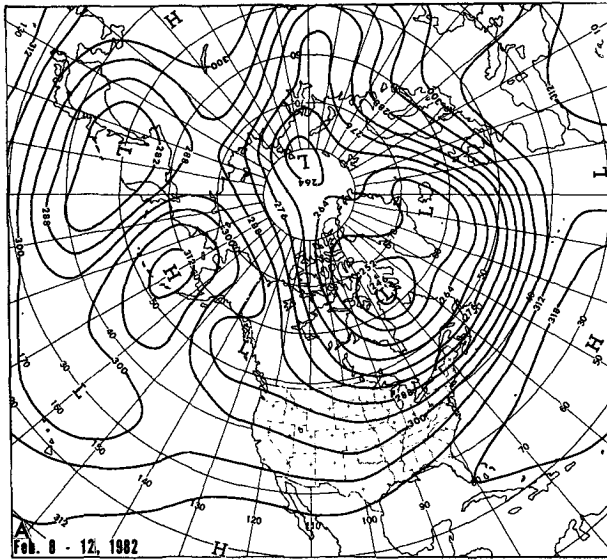


FIG. 7. (A) Mean 70 kPa contours (dam) for 1–5 February 1982, (B) departure from normal of average surface air temperature (°C), and (C) total precipitation (cm) for week of 31 January–6 February 1982 (from National Oceanic and Atmospheric Administration and Statistical Reporting Service and World Agricultural Outlook Board, 1982).



to its east drove extremely cold air over much of the country west of the Appalachian Mountains (Fig. 7B). Casper, WY reported a record low February temperature (-33°C) on the second and Wichita,

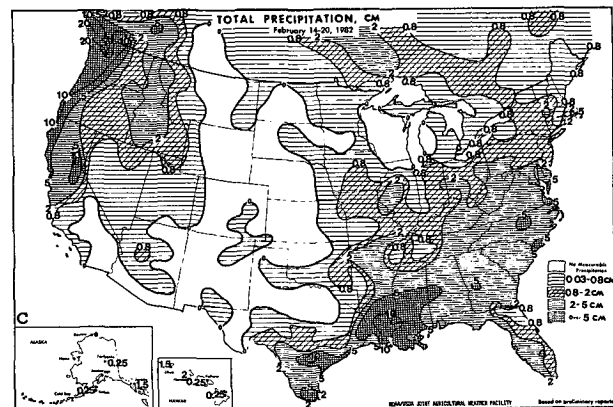
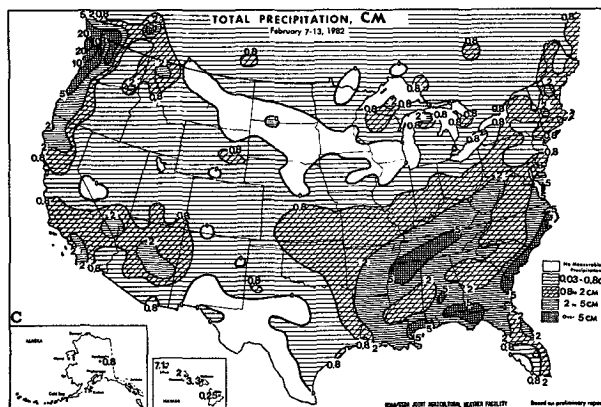
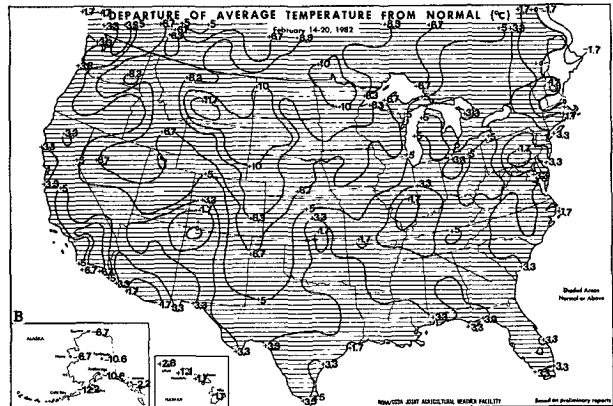
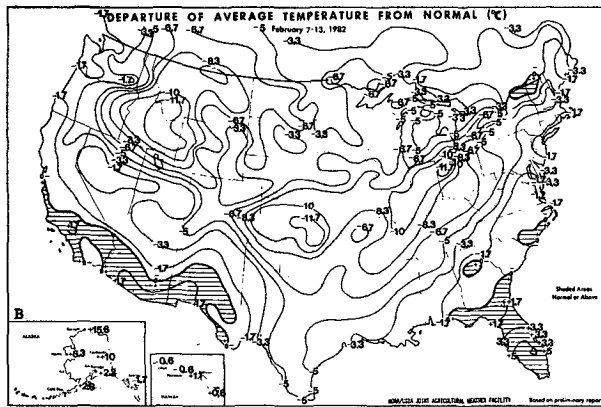
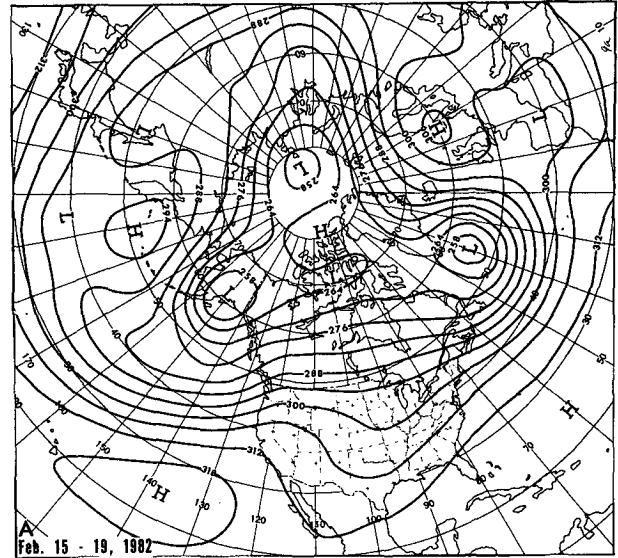


FIG. 8. As in Fig. 7 except for (A) 8-12 February 1982, and (B) and (C) week of 7-13 February 1982.

blocking ridge were crucial to the weather over the United States throughout February.

In early February the strong northerly flow between the developing east Pacific ridge and trough

FIG. 9. As in Fig. 7 except for (A) 15-19 February 1982, and (B) and (C) week of 14-20 February 1982.

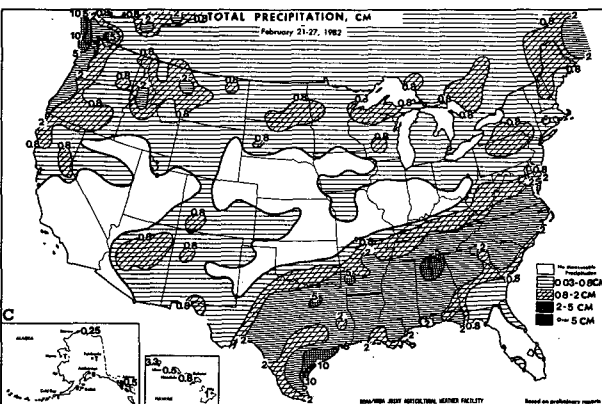
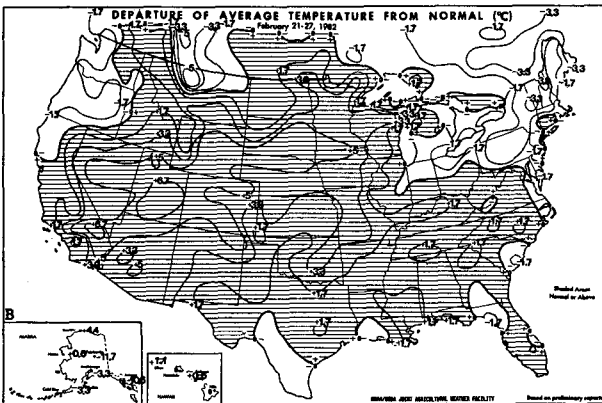
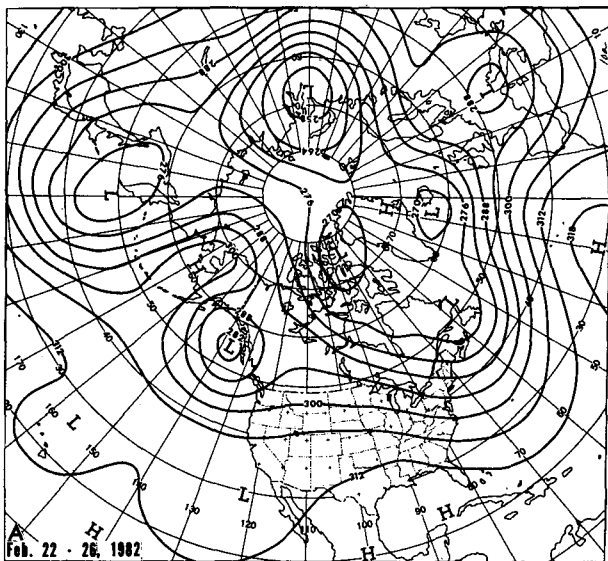


FIG. 10. As in Fig. 7 except for (A) 22-26 February 1982 and (B) and (C) week of 21-27 February 1982.

KS, the second coldest for all time (-29°C) on the sixth. Above normal mean temperatures, as well as substantial precipitation, were generally confined to the eastern states, located between the deep central

United States trough and the strong western Atlantic ridge (Figs. 7B and 7C).

b. 7-13 February

The east Pacific blocking ridge built northward and westward this week and the early stages of a Gulf of Alaska low became evident (Fig. 8A). The latter development contributed to a deamplification of the flow pattern to the east as both the central United States trough and the west Atlantic ridge weakened and moved eastward. Transport of extremely cold air from Canada continued, being strong in the west early in the week and in the east later on (Fig. 8B). Mean temperatures were extreme in some areas and below normal over most of the country from coast to coast.

Initiation of the Gulf of Alaska low and the shift to westerly flow along the West Coast brought fairly heavy precipitation to not only the West Coast States, but also much of the Southwest which was affected by a series of deep upper-level troughs (Fig. 8C). Elsewhere, heavy precipitation was confined to the Southeast in advance of a mean trough.

c. 14-20 February

The Pacific blocking ridge retrogressed sufficiently to complete the development of a strong Gulf of Alaska low whose associated trough sloped southward to join the previously secluded trough west of Hawaii (Fig. 9A).

Increasing westerlies over the east Pacific and North America brought a dramatic change in prevailing air mass to the United States. Bitterly cold air of the previous two weeks was replaced by extremely mild air of maritime origin (Fig. 9B). Significant precipitation was concentrated along the middle and north Pacific Coast and in the Southeast in advance of the two principal troughs affecting North America (Fig. 9C). Relatively large precipitation amounts along the West Coast were related to the strong southwesterly flow that prevailed over a vast area of the east Pacific. Heavy rains combined with runoff due to snowmelt caused flooding in parts of the Northwest.

d. 21-27 February

Marked intensification and progression of the Asiatic coastal trough led to the eastward movement of both the Pacific blocking ridge and the Gulf of Alaska low and also to the filling of the trough west of Hawaii (Fig. 10A). The trend toward progression carried over to North America as the mean ridge moved to the Great Plains and the trough pushed well off the Atlantic Coast.

Prevailing zonal flow produced above normal mean

temperatures over most of the country for a second consecutive week (Fig. 10B). Early in the week temperatures rose to record high values for February in parts of the northern and central Great Plains. Progression of circulation features over the Pacific and North America, however, set up patterns of advection which again brought below normal temperatures to parts of both the Northwest and Northeast.

Substantial precipitation continued over the South (Fig. 10C) but this was concentrated at the end of the week when a deep trough, quite uncharacteristic of the weekly mean circulation, crossed the area.

Precipitation amounts diminished along the West Coast as the southwesterly flow to the west declined.

REFERENCES

- National Oceanic and Atmospheric Administration, U.S. Department of Commerce, and Statistical Reporting Service and World Agricultural Outlook Board, U.S. Department of Agriculture, 1982: *Weekly Weather and Crop Bulletin*, **69**, Nos. 6-9 and 11 (9, 17 and 23 February and 2 and 16 March, 1982).
- Wagner, A. James, 1982: The Weather and Circulation of January 1982—A stormy month with two record cold waves. *Mon. Wea. Rev.*, **110**, 310-317.