

WEATHER AND CIRCULATION OF NOVEMBER 1978

Cold in the Northwest, Warm in the Southeast

ROBERT R. DICKSON

National Meteorological Center, National Weather Service, NOAA, Washington, DC 20233

1. Mean circulation

Continuing the unsteadiness characteristic of this fall, the mean 700 mb wave pattern over the United States changed phase from October to November. This brought a deep mean trough to the Southwest and a strong ridge to the East (Figs. 1 and 2), returning the wave phase to that observed in September.

Substantial changes were also observed over the Pacific, where the Asiatic coastal trough deepened and built northward while the previous east Pacific trough (Wagner, 1979) filled and was largely replaced by a strengthening and retrograding mean ridge. The previously strong arctic ridge near northeastern Siberia disappeared as the high-latitude westerlies strengthened markedly. Although a mean

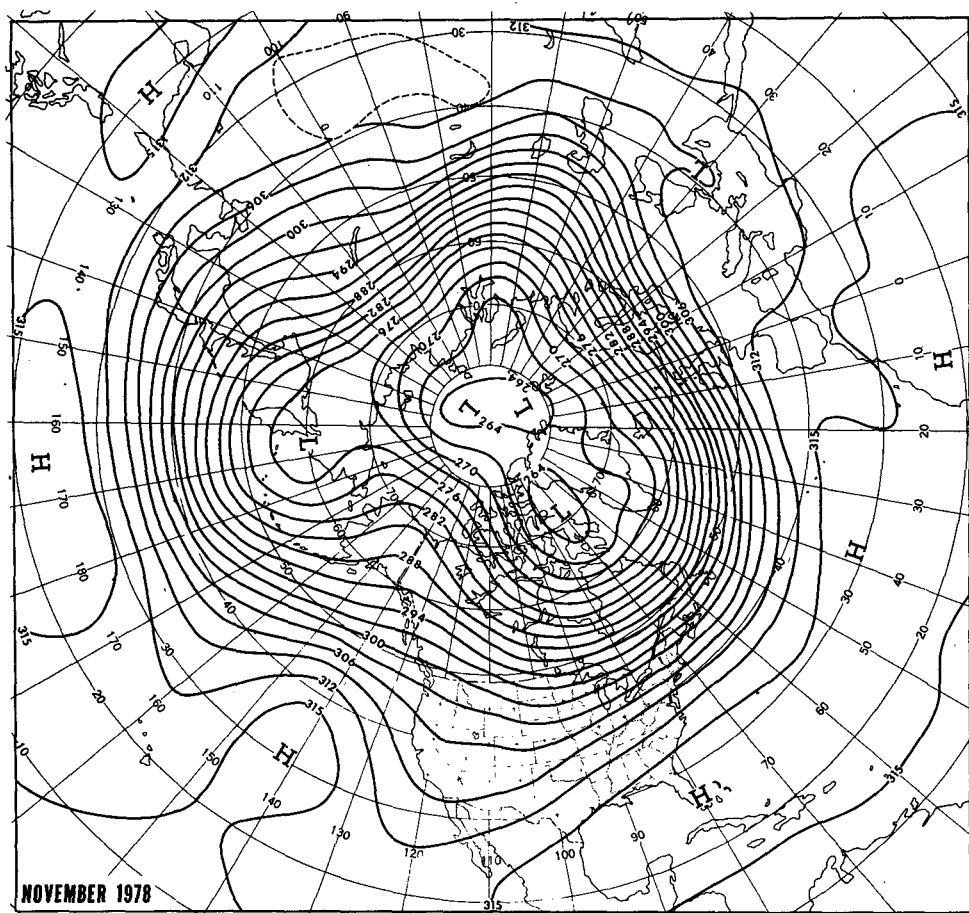


FIG. 1. Mean 700 mb height contours (dam) for November 1978.

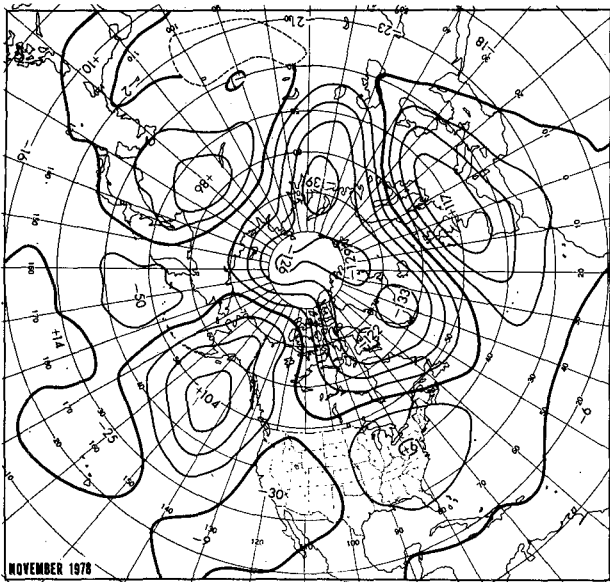


FIG. 2. Departure from normal of mean 700 mb height (m) for November 1978.

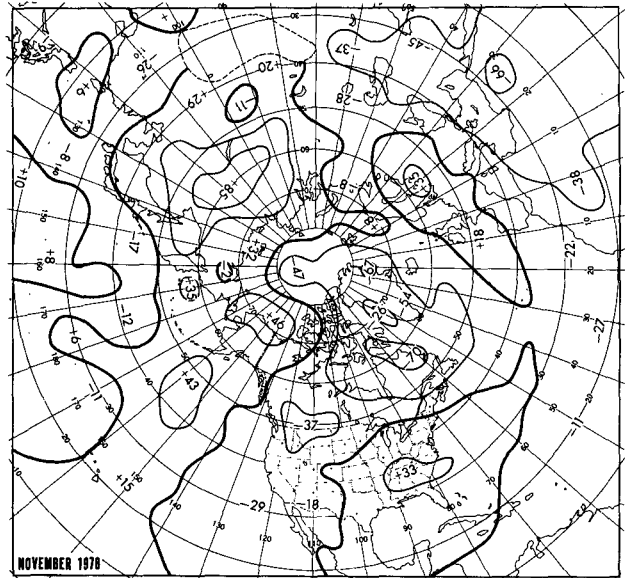


FIG. 4. Departure from normal of mean 1000-700 mb thickness (m) for November 1978.

trough progressed to the western Atlantic and the westerlies increased over the upper midlatitudes over the Atlantic, the wave phase across the Atlantic and Europe generally persisted from October (Wagner, 1979).

The axis of the mean 700 mb westerlies was displaced north of normal around most of the Northern Hemisphere (Fig. 3). Sizeable southward displacements were mainly limited to the western United States and eastern Europe where cold air was driven to relatively low latitudes (Fig. 4).

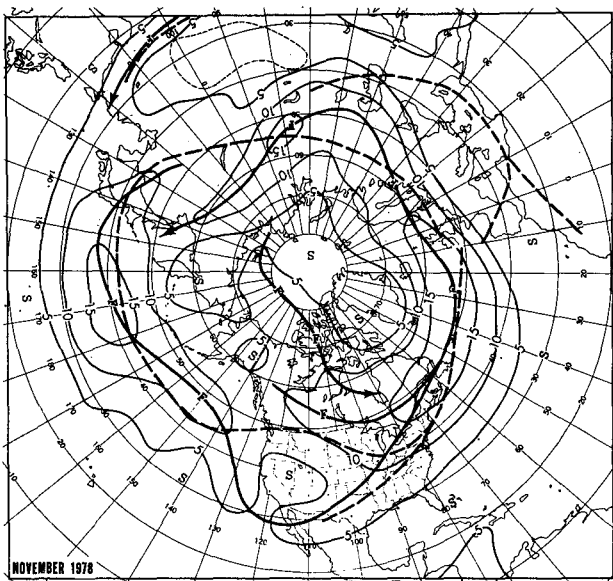


FIG. 3. Mean 700 mb geostrophic wind speed ($m s^{-1}$) for November 1978. Solid arrows indicate observed axes of maximum wind speed and dashed lines, the normal.

2. Temperature

In keeping with the change in wave phase of the mean 700 mb flow pattern, the mean temperature anomaly pattern changed sign over much of the United States this month (Fig. 5). Enhanced northerly wind components between the strong east Pacific-Alaska ridge and the deep troughs to its east brought cold air to the northwestern quarter of the country and much of California. Over parts of this area monthly mean temperatures were at or near the lowest of record for November (Table 1).

Above normal temperatures, on the other hand, were observed over most of the area between the complex of central and western troughs and the strong ridge near the East Coast. It was the warmest

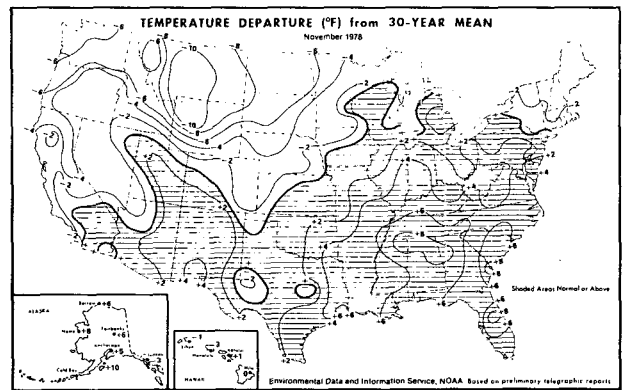


FIG. 5. Departure from normal of average surface air temperature ($^{\circ}F$) for November (from National Oceanic and Atmospheric Administration and Economics, Statistics and Cooperatives Service, 1978).

TABLE 1. Record and near-record monthly mean temperatures (°F) observed during November 1978.

Station	Temperature	Anomaly	Remarks
Pendleton, OR	33.5	-7.9	Coldest November
Olympia, WA	37.9	-5.4	Coldest November
Billings, MT	24.6	-11.1	2nd coldest November
Burns, OR	39.2	-4.3	2nd coldest November
Casper, WY	26.9	-7.0	3rd coldest November
Walla Walla, WA	36.1	-6.6	3rd coldest November
Mt. Shasta, CA	36.8	-4.9	3rd coldest November
Sheridan, WY	23.6	-9.8	2nd coldest November since 1938
Charleston, SC	63.0	+7.0	Warmest November
Norfolk, VA	56.3	+4.4	Warmest November
Columbia, SC	59.6	+6.1	3rd warmest November
Knoxville, TN	54.4	+5.2	Warmest since 1931; first November of record without freeze.
Montgomery, AL	61.9	+6.9	Warmest November since 1946
Orlando, FL	72.3	+5.7	Warmest November since 1948

November of record in parts of the Southeast (Table 1), just west of the mean ridge.

Temperatures averaged well above normal at most locations in Alaska under a strong mean ridge. Mean temperatures in Hawaii ranged from near normal in the south to below normal in the north.

3. Precipitation

Precipitation exceeded normal over most of the area between the western and central complex of troughs and the East Coast ridge (Fig. 6). Record high November precipitation (2.34 inches) and snowfall (25.2 inches) were observed at Billings, MT. Record snowfall for the month was also reported at Olympia, WA (14.8 inches) and Pocatello, ID (11.5 inches). By the end of November the boundary of 1 inch or more snow cover extended well south of its median location from the Pacific

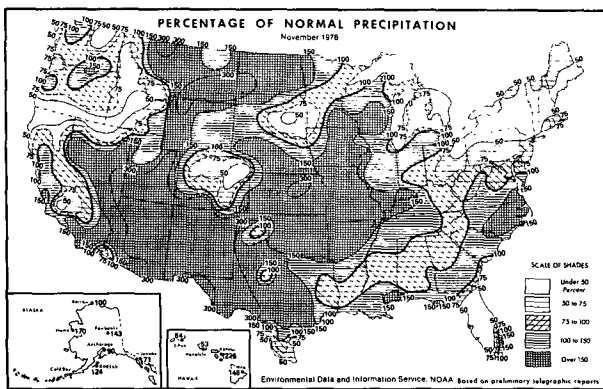


FIG. 6. Percentage of normal precipitation for November 1978 (from National Oceanic and Atmospheric Administration and Economics, Statistics and Cooperatives Service, 1978).

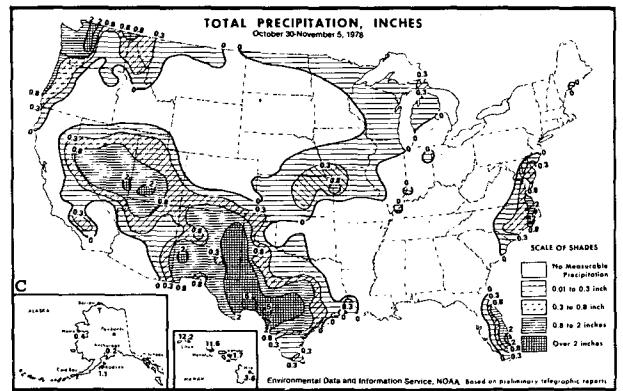
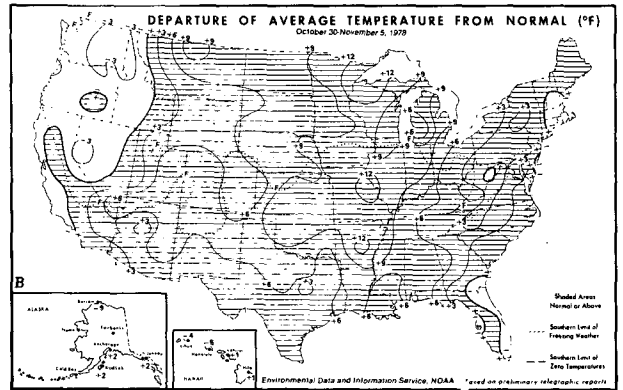
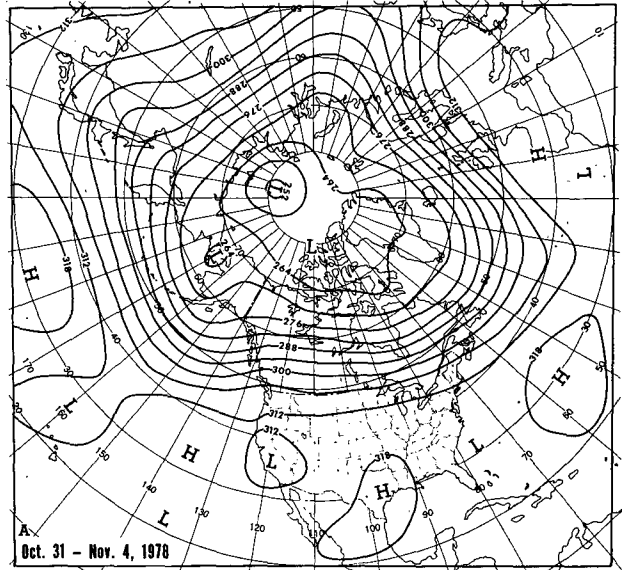


FIG. 7. (A) Mean 700 mb contours (dam) for 31 October-4 November 1978; (B) departure from normal of average surface air temperature (°F); and (C) total precipitation (inches) for week of 30 October-5 November 1978 (from National Oceanic and Atmospheric Administration and Economics, Statistics and Cooperatives Service, 1978).

Northwest through the northern Great Plains to New England.

Drier than normal conditions were confined largely to the vicinity of the strong eastern ridge and to the Pacific Northwest, east of the

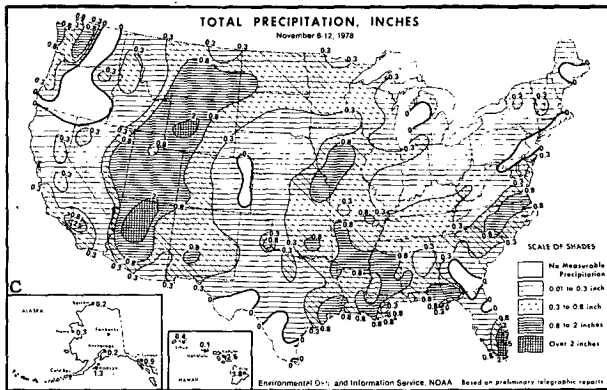
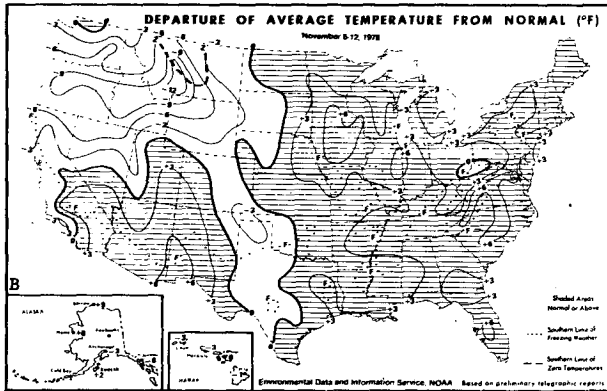
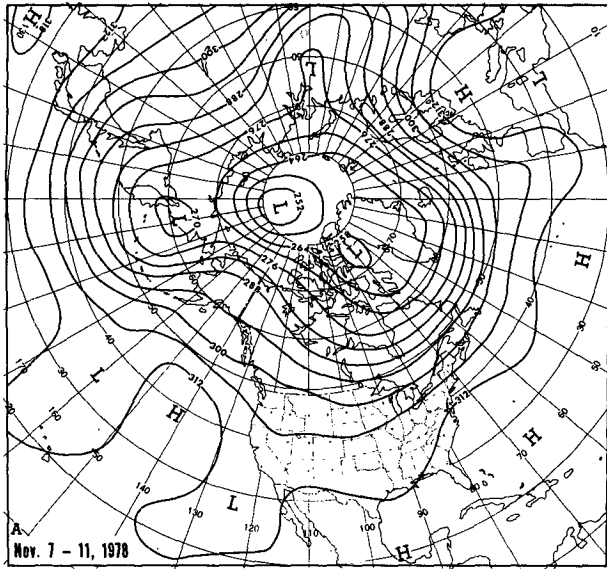


FIG. 8. As in Fig. 7 except (A) 7-11 November 1978 and (B) and (C) week of 6-12 November 1978.

strong east Pacific ridge. It was the second driest November of record at Tampa, FL (0.01 inch) and the driest since 1924 at Erie, PA (1.52 inches).

Enhanced southwesterly flow west of the strong Alaskan ridge was accompanied by above normal precipitation over most of that state. In Hawaii, readily available reports indicate above normal

rainfall over southern portions and below normal amounts to the north.

4. Variability within the month

a. 30 October-5 November

Early in the month deep troughs dominated the high latitudes, strong ridges were observed at

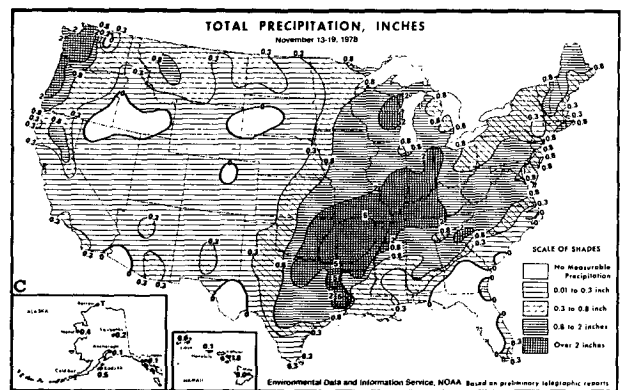
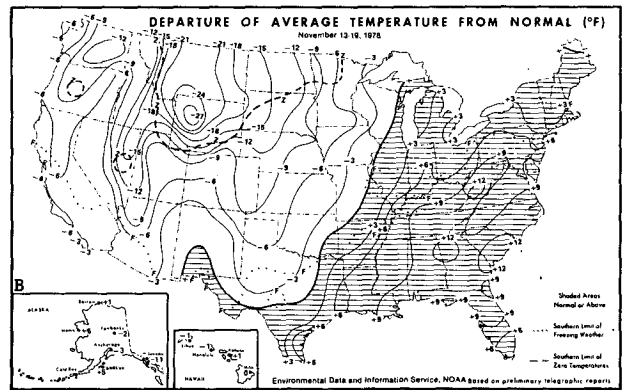
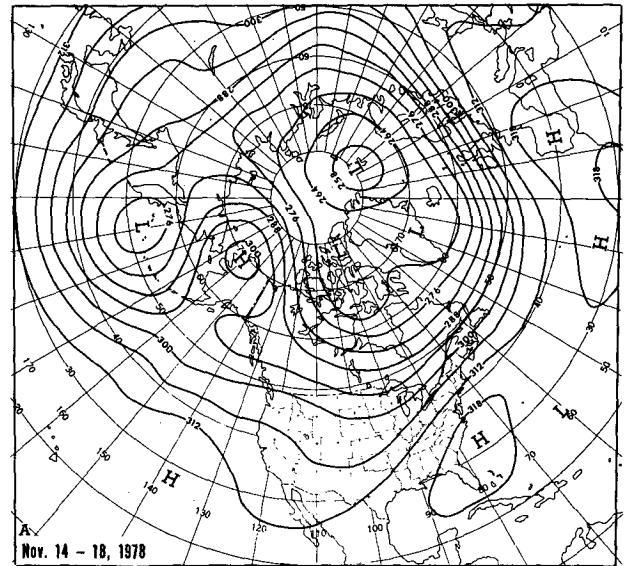


FIG. 9. As in Fig. 7 except (A) 14-18 November 1978 and (B) and (C) week of 13-19 November 1978.

middle latitudes, and a strong belt of westerlies occurred in between (Fig. 7). The strong westerly flow across the northeast Pacific and southern Canada contained the cold air masses over Canada and gave warm weather to most of the United States. Record high temperatures for so late in the season were observed at several locations from Kansas and Missouri to South Dakota and the Great Lakes this week. Record high temperatures for November were set at Alpena, MI (76°F) and Sioux City, IA (81°F), while the old record was equalled at Marquette, MI (74°F) and Spencer, IA (78°F).

Precipitation was concentrated in the vicinity of the western upper low which moved from northern California to the Rio Grande Valley this week.

b. 6-12 November

The waves in the mean flow over much of the Pacific and North America amplified and progressed this week, bringing a deep trough to the west Pacific, a strong ridge to the east Pacific and a deep trough to eastern Canada (Fig. 8). Over the United States the wave distribution was rather complex. Mean troughs occurred over the Great Basin and the Great Plains as the mean ridge progressed to the East Coast.

Cold air advection east of the strong east Pacific ridge brought below normal temperatures to most of the northwest quarter of the Nation, but most of the remainder of the country continued warm. It was a week of rapid change for the West. Highest temperatures for so late in the season in parts of the West gave way to lowest temperatures for so early in the Northwest.

Precipitation was widespread between the western troughs and the East Coast ridge.

c. 13-19 November

The long-wave pattern over the Pacific continued to amplify this week while the wave structure over the United States simplified to a single deep western trough and a persistent, but strengthening, East Coast ridge (Fig. 9).

The strong east Pacific-Alaska ridge, in conjunction with the deep trough to its east, drove very cold air over most of the contiguous United States west of the Great Lakes. The greatest departures from normal occurred over portions of the northern Great Plains and the northern Rocky Mountains where sub-zero temperatures were observed. Mean temperatures in the vicinity of the eastern ridge continued well above normal.

Greatest precipitation occurred in the vicinity of the mean frontal zone; much of it accompanied a rapidly deepening storm which moved from the southern Mississippi Valley across the Great Lakes.

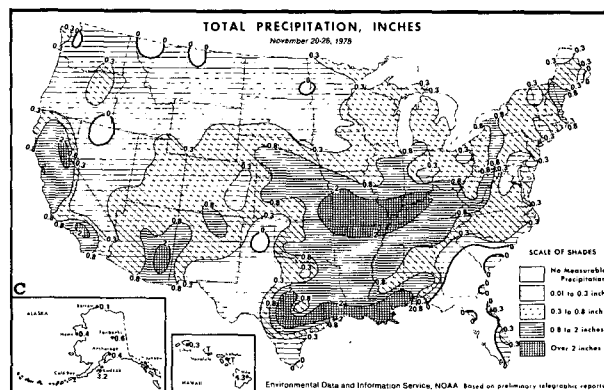
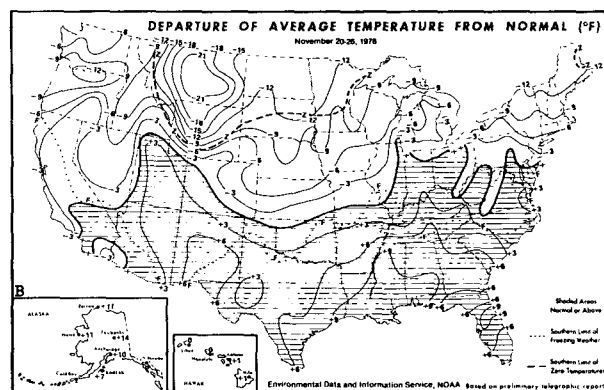
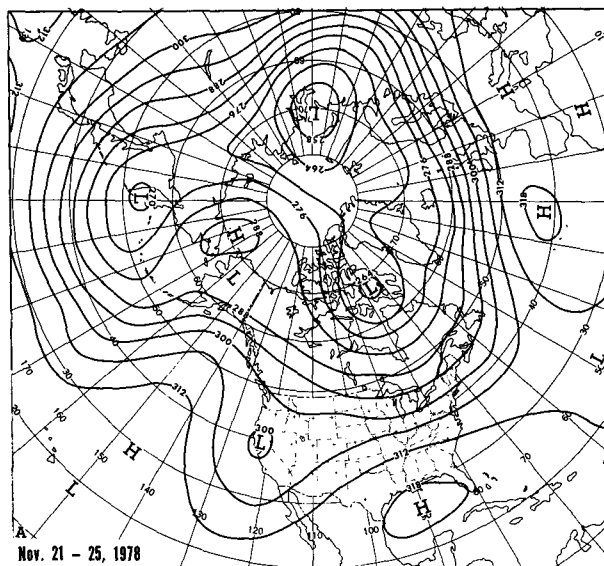


FIG. 10. As in Fig. 7 except (A) 21-25 November 1978 and (B) and (C) week of 20-26 November 1978.

d. 20-26 November

The east Pacific ridge strengthened this week while mean 700 mb heights fell in the still-strong ridge to its north (Fig. 10). The mean trough over North America sheared as the high-latitude portion progressed to a Baffin Island-Nova Scotia axis while the low-latitude trough retrograded to Cali-

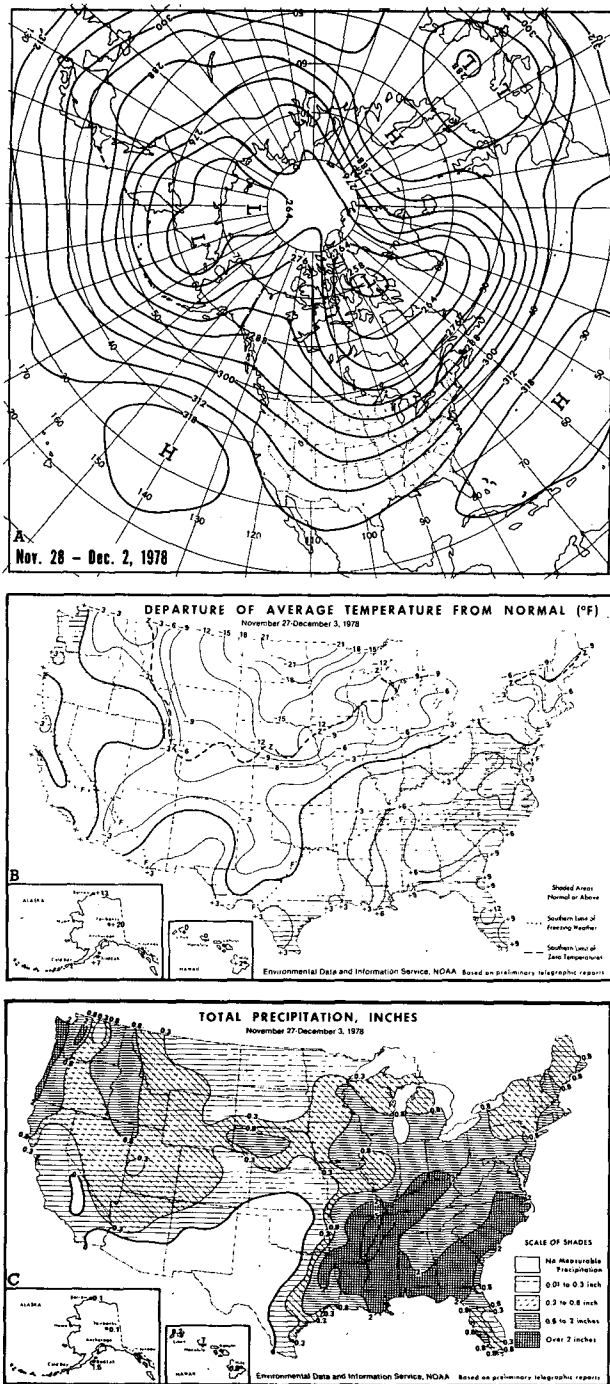


FIG. 11. As in Fig. 7 except (A) 28 November–2 December and (B) & (C) week of 27 November–3 December 1978.

fornia. The latter motion brought the mean ridge back to the lower Mississippi Valley.

For the third consecutive week the combination of a strong east Pacific-Alaska ridge and the deep troughs to its east brought very cold weather to the northwestern quarter of the country. This time however, the effects of the shearing trough were apparent in the spreading of cold weather eastward to New England and warm weather westward to the southern Plateau.

Precipitation continued to be widely distributed with greatest amounts generally over or near the middle or lower Mississippi Valley. Most of the precipitation in that area occurred early in the week, prior to the retrogression of the upper level ridge.

e. 27 November–3 December

Although the waves in the mean flow flattened considerably and generally progressed this week, the east Pacific ridge and its northward extension were still strong enough to advect quite cold air to the north-central portion of the country and New England (Fig. 11). The ridge was far enough east, however, to terminate the long-standing cold spell in much of the Far West.

Although greatest precipitation amounts were observed east of the central mean trough, increasing westerlies upstream also made this the wettest week of the month for the Pacific Northwest. Several tornadoes occurred on 3 December in Mississippi, Louisiana and Arkansas, causing several deaths and extensive damage.

5. Tropical activity

There were four tropical storms in the west Pacific scattered throughout the month. The most significant of these was Tropical Storm Viola, which formed well south of Japan (near 9°N, 142°E) on 18 November, became a typhoon east of the Philippines on the 20th, and diminished in intensity late in the month while recurving south of Japan.

Two severe tropical cyclones occurred near India this month. The first formed west of India on about 6 November and moved to the northern end of the Arabian Sea before dissipating. The second formed over the southern Bay of Bengal on 20 November and crossed Sri Lanka and the southern tip of India on 23 and 24 November before decreasing in intensity over the Arabian Sea at the end of the month.

This storm, apparently one of the most destructive tropical cyclones ever to hit Sri Lanka, was accompanied by 80 kt winds, torrential rains and tidal waves. Nearly 500 people were reported killed, mostly by drowning in the widespread flooding which accompanied the storm. Nine-foot waves reportedly washed away dozens of villages, leaving thousands homeless. Ten casualties were reported from southern India's Tamil Nadu State after the storm crossed that area.

REFERENCES

- National Oceanic and Atmospheric Administration, U.S. Department of Commerce, and Economics, Statistics and Cooperatives Service, U.S. Department of Agriculture, 1978: *Weekly Wea. Crop Bull.*, 65, Nos. 45–49 (7, 14, 21 and 28 November and 5 December 1978).
- Wagner, A. James, 1979: Weather and Circulation of October 1978—Mostly dry with a warm west and cold east. *Mon. Wea. Rev.*, 107, 96–102.