WEATHER AND CIRCULATION OF OCTOBER 1979— Continued Warm in the West and Cold in the Northeast

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1. Mean circulation

The Northern Hemisphere 700 mb circulation was characterized by vigorous westerly flow and amplified planetary waves during October 1979. Deep troughs were located over northeast Asia, over the central Pacific south of the Aleutians, over eastern North America and over the eastern Atlantic (Figs. 1 and 2). The flow pattern was less amplified but also faster than normal over Asia.

A large area of blocking covered the entire polar area and was made up primarily by contributions from amplified ridges over western North America and Europe. The blocking was a continuation of a pattern which had developed during late summer and had also prevailed throughout September Taubensee, 1979). The principal change from the previous month was over Eurasia, where the main connection of the blocking to midlatitudes became established over Europe instead of Asia.

Over the Western Hemisphere, the westerlies were located slightly south of their normal position in the mean, mainly due to contributions from the amplified troughs over North America and the Atlantic (Fig. 3). Speeds were as much as 5 m s^{-1} above normal near the maxima over both the Atlantic and the Pacific.

The strong midlatitude westerlies marked the boundary between generally colder than normal air to the north and warmer than normal conditions to the south (Fig. 4). Vigorous storms developed and moved along these zones of enhanced available potential energy. In the Pacific, a number of dying typhoons and tropical systems reintensified into severe extratropical storms after bringing large quantities of eddy available potential energy in the form of sensible and latent heat into juxtaposition with strong westerlies in the polar frontal zone. Northward transport of warm air to the east of the locus of the deep Aleutian low contributed to the anomalously warm ridge over Alaska and northwestern Canada. Elsewhere at high latitudes, air masses were not as warm as might be expected, given the strong positive height anomalies over the polar basin (cf. Figs. 2 and 4). The beginning of the long polar night with enhanced radiational cooling was probably the decisive factor there.

2. Temperature

Strongly contrasting temperature anomalies prevailed during October with a rather warm West and Southwest and cool weather the rule from the northern Mississippi Valley eastward to New England and southward to the eastern Gulf Coast (Fig. 5). This pattern is in general agreement with the thickness anomaly and departure from normal of the mean 700 mb height (Figs. 4 and 2, respectively). The negative thickness anomaly centers near the Great Lakes may not have been fully reflected by surface temperatures due to residual warmth in the Lakes and generally unstable airmasses with the anomalous coldness concentrated mainly aloft in the strongly cyclonic flow of the deep mean trough (Fig. 1).

No cities reported a record cold or record warm October, although both Medford, OR (59.1°F, 5.7°F above normal) and Albuquerque, NM (61.5°F, 3.3°F above normal), reported their second warmest October. Albuquerque shared with much of the southern Great Plains an unusual late season heat wave which saw many records broken (Table 1). There were a total of 14 daily high maximum temperatures equaled or surpassed at Albuquerque, and six at both Roswell, NM and El Paso, TX. A further indication of the unusual prolongation of summerlike conditions in much of the West was that Reno, NV had its latest ever first fall freeze, in airport records dating back to 1942, on 21 October. Another remarkable fact is that the 103°F record high temperature at Abilene, TX on 1 October was the highest temperature there all this year.

The strong southerly flow between the Aleutian low and the western Canadian ridge drove unusually warm air into Alaska, and temperatures over the entire state averaged several degrees above normal. The stronger than normal subtropical ridge just north of Hawaii contributed to warmer than normal weather at all reporting stations there also.

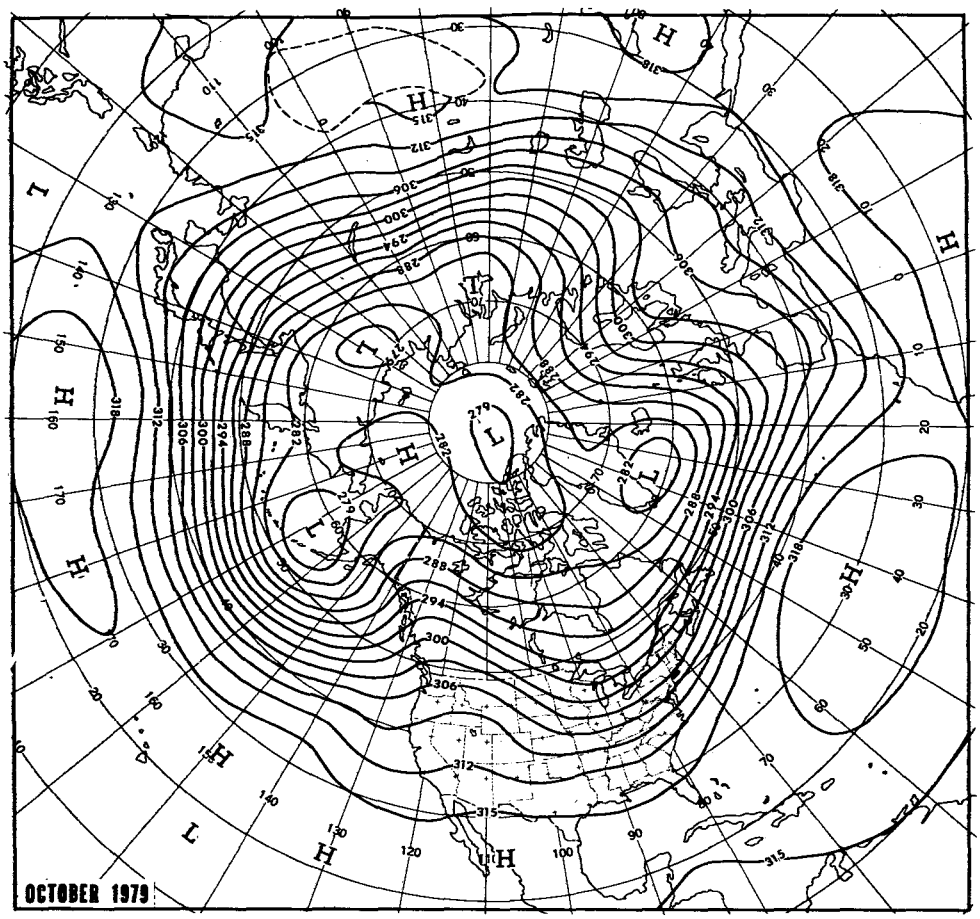


FIG. 1. Mean 700 mb height contours (dam) for October 1979.

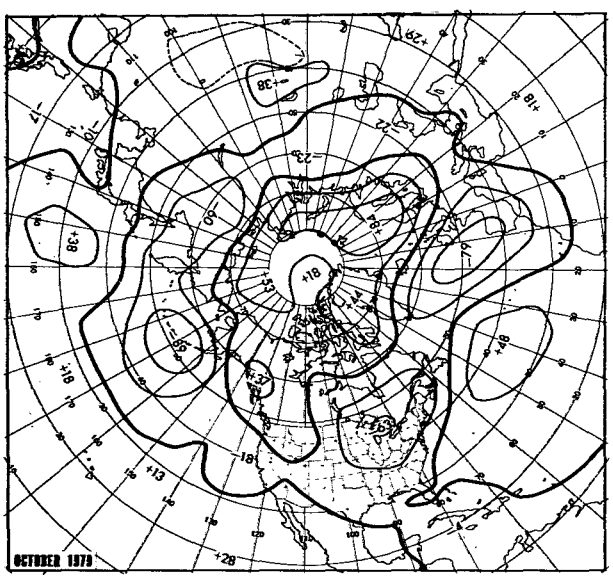


FIG. 2. Departure from normal of mean 700 mb height (m) for October 1979.

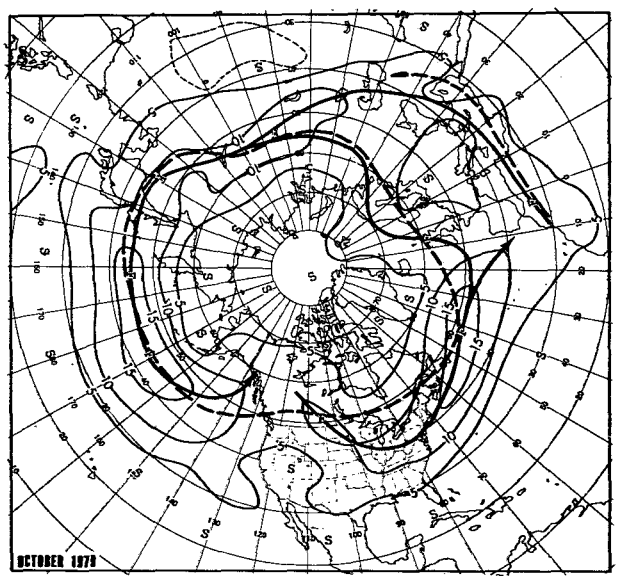


FIG. 3. Mean 700 mb geostrophic wind speed (m s^{-1}) for October 1979. Solid arrows indicate observed axes of maximum wind speed and dashed lines, the normal.

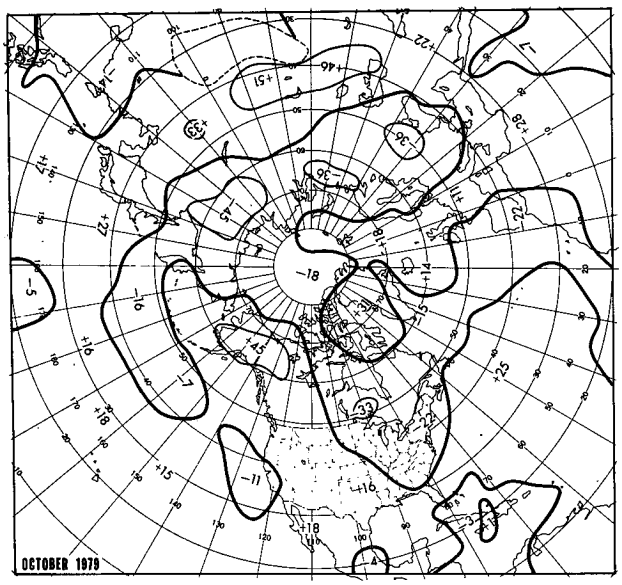


FIG. 4. Departure from normal of mean 1000–700 mb thickness (m) for October 1979.

3. Precipitation

Precipitation was somewhat greater than what would normally be expected with a strong western mean ridge and eastern mean trough pattern (Fig. 6). This was due mainly to a variability of regimes within the month which produced precipitation in parts of the West and the Great Plains which were, in fact, practically rainless for the first half of the month. The wet regime in the West is hinted at by the trough segment and negative mean height anomaly off northern California (Figs. 1 and 2). Medford, OR, had its fifth wettest October, with most of the rain falling in the second half of the month. It was the wettest October since 1962 at Mount Shasta, CA, where the water year total since 1 July was brought up to about twice normal by the end of October.

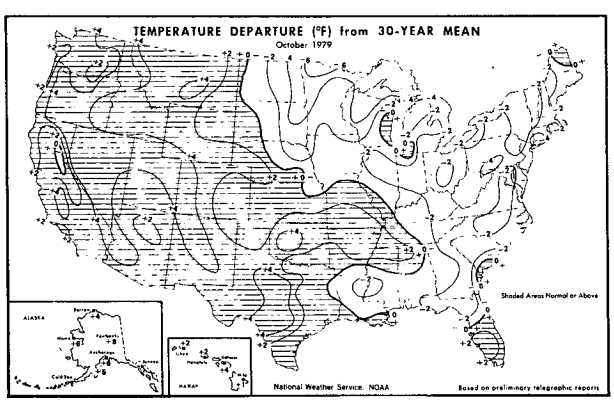


FIG. 5. Departure from normal of average surface air temperature (°F) for October 1979 (from National Oceanic and Atmospheric Administration and Economics, Statistics and Cooperatives Service, 1979).

TABLE 1. Record- and near-record high temperatures for the month and for so late in the season observed during October 1979. All are highest for so late in the season except as otherwise noted.

Station	Temperature (°F)	Date	Remarks
Abilene, TX	103	1	Also highest for October
	99	7	
	102	8	
	97	11	Equaled highest so late
	99	12	
	93	20	Equaled highest so late
	93	21	
Waco, TX	101	3	
Del Rio, TX	106	3	
El Paso, TX	94	5	Equaled highest so late
	94	6	
	96	7	Also equaled highest for October
	95	8	
	96	11	Also equaled highest for October
Lubbock, TX	98	7	Also highest for October
	98	8	Also equaled highest for October
	93	11	
	92	16	Equaled highest so late
Midland, TX	99	7	
	100	8	Also highest for October
	98	12	
Wichita Falls, TX	94	20	
Oklahoma City, OK	93	20	
Wichita, KS	95	8	
	92	20	
Albuquerque, NM	91	2	
	88	3	
	91	5	
	90	7	
	89	8	
	88	11	
	87	12	Equaled highest so late
Medford, OR	96	3	Equaled highest so late
	92	5	
Salem, OR	89	9	
Eugene, OR	88	9	
Winnemucca, NY	90	6	Also highest for October
Salt Lake City, UT	88	7	
Pocatello, ID	88	7	Also highest for October
Kalispell, MT	82	7	
Casper, WY	83	7	
New Orleans, LA	88	19	
	90	21	
Springfield, IL	89	21	Equaled highest for so late
Avoca, PA	83	22	
Binghamton, NY	80	21	
	81	22	
Syracuse, NY	84	22	
Albany, NY	86	22	
Providence, RI	86	22	
Concord, NH	86	22	
Burlington, VT	81	22	

An active storm track extending from the Texas Panhandle area to the Great Lakes was associated with heavy precipitation giving the wettest October

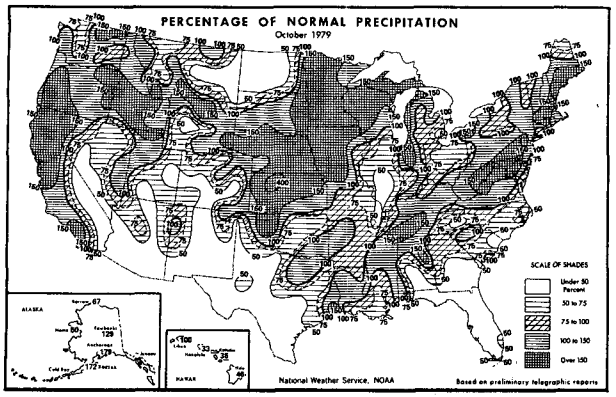


FIG. 6. Percentage of normal precipitation for October 1979 (from National Oceanic and Atmospheric Administration and Economics, Statistics and Cooperatives Service, 1979).

on record at Sioux City, IA (5.30 inches, 3.67 above normal) and Sault Ste. Marie, MI (6.36 inches, 3.51 above normal). Rochester, MN reported its fourth wettest October (4.95 inches, 3.13 above normal).

The drought that had begun in late summer continued over much of the southern Great Plains, perhaps aggravating the excessively high maximum temperatures observed in that area. Many stations in the Southeast also had only a small fraction of their normal October rainfall, but the dry period was welcome for harvesting activities following a very wet September (Taubensee, 1979).

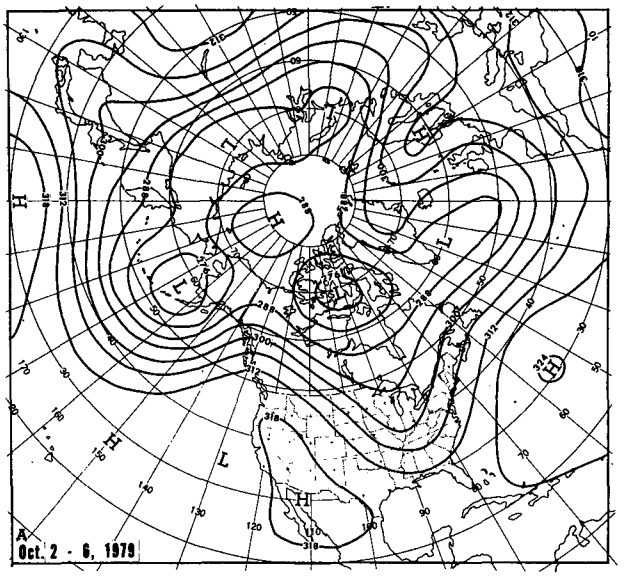
Precipitation was well in excess of normal over the southern coast and interior sections of Alaska due to strong advection of mild, moist air from the Pacific, but the moisture failed to penetrate to the northern and western coasts, which were drier than normal. The strong subtropical ridge near Hawaii generally supressed the tradewinds and gave increased subsidence, resulting in a dry month at most locations there.

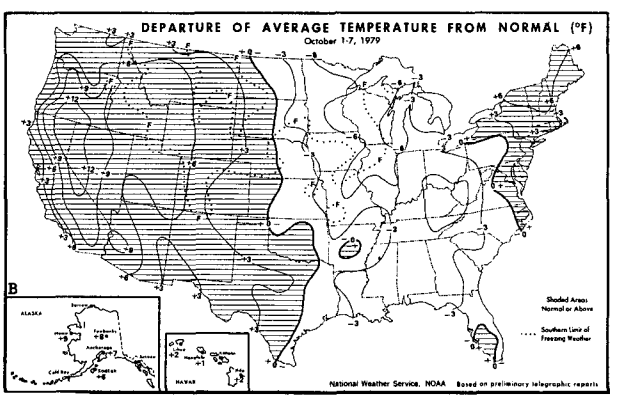
4. Weekly variability

a. 1–7 October

Deepening and progression of the low that had been in the Bering Sea to the Aleutian Islands led to amplification of the westerly flow pattern that had prevailed during the last week of September (Taubensee, 1979). Strongly amplified ridges were located over the western United States and British Columbia, south of Newfoundland and over Europe during the first week of October (Fig. 7A). Vigorous troughs were positioned between the ridges over eastern North America and the eastern Atlantic.

Temperatures rose to record levels over much of the West under the strong ridge, averaging as much as 12°F above normal for the week (Fig. 7B). On the first few days of the month, temperatures went over 100°F at several cities in Texas and Arizona, beginning an unusual October hot spell that set numerous records for late-season and October warmth (Table 1). The number of localities with daily record-high temperatures is even greater, and these are not listed. By way of contrast, the strong





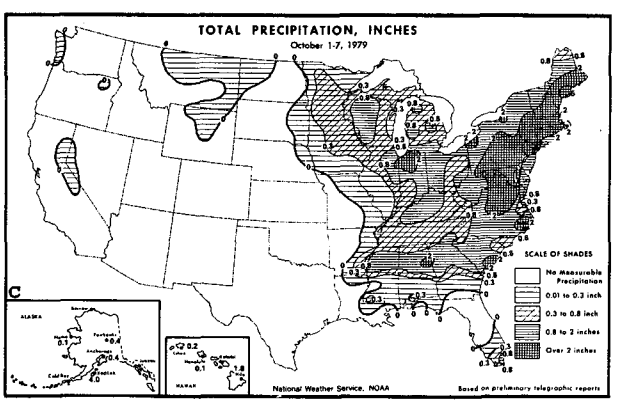


FIG. 7. (A) Mean 700 mb contours (dam) for 2–6 October 1979; (B) departure from normal of average surface air temperature (°F), and (C) total precipitation (inches) for week of 1–7 October 1979 (from National Oceanic and Atmospheric Administration and Economics, Statistics and Cooperatives Service, 1979).

northwesterly flow to the rear of the eastern trough brought cool air to the area between the eastern Great Plains and the Appalachian Mountains. A number of daily record-low temperature records were set in the southern Mississippi Valley and northern Florida, but no seasonal or monthly records were reported.

Precipitation was for the most part confined to the eastern half of the country, near and east of the deep mean trough. The West was practically rainless under the influence of strong subsidence and northerly flow components that tended to keep moisture out of the area (Fig. 7C). Four separate cyclonic disturbances moving through the deep mean trough contributed to the eastern precipitation. The second of these interacted with residual tropical air to produce severe thunderstorms with large hail in the Columbia, SC vicinity on 2 October and triggered a damaging tornado in Windsor Locks, CT the next day as it moved northeastward up the Appalachians. The following disturbance was the strongest of the series, however, and led to a rapidly deepening storm that moved northward from North Carolina across western New York State into Canada.

b. 8–14 October

The highly amplified 700 mb pattern persisted with little change through the second week of October, except for slight progression over the Atlantic and Europe (Fig. 8A). The late-season heat wave continued over the West and Southwest (Table 1), while negative temperature anomalies increased in magnitude over much of the East (Fig. 8B). An unusually cold air mass traversing the area from the northern Mississippi Valley to the Ohio Valley set many daily records on 13 and 14 October, and readings of 23°F at Omaha, NE; 27°F at Kansas City, MO; and 24°F at Indianapolis, IN were also the lowest for so early in the season.

Precipitation was again confined mainly to the eastern half of the country, although the closed low off California brought light rainfall to northern and central portions of the Pacific Coast (Fig. 8C). The weather event of the week was a record-early season snowstorm that struck an area from the central Appalachians to southern New England on 10 October. Some snowfall totals were 2.4 inches at Lynchburg, VA; a trace at Richmond, VA; 2.1 inches at Philadelphia, PA; 2.5 inches at Providence, RI; 6.8 inches at Blue Hill Meteorological Observatory near Boston, MA; and 7.5 inches at Worcester, MA. All of these were either or both the earliest measurable snow in the fall and/or the greatest 24 h snowfall at any time during October. Most were also the most total snowfall even observed in the month of October. The combination of unseasonably cold air at both the surface and aloft,

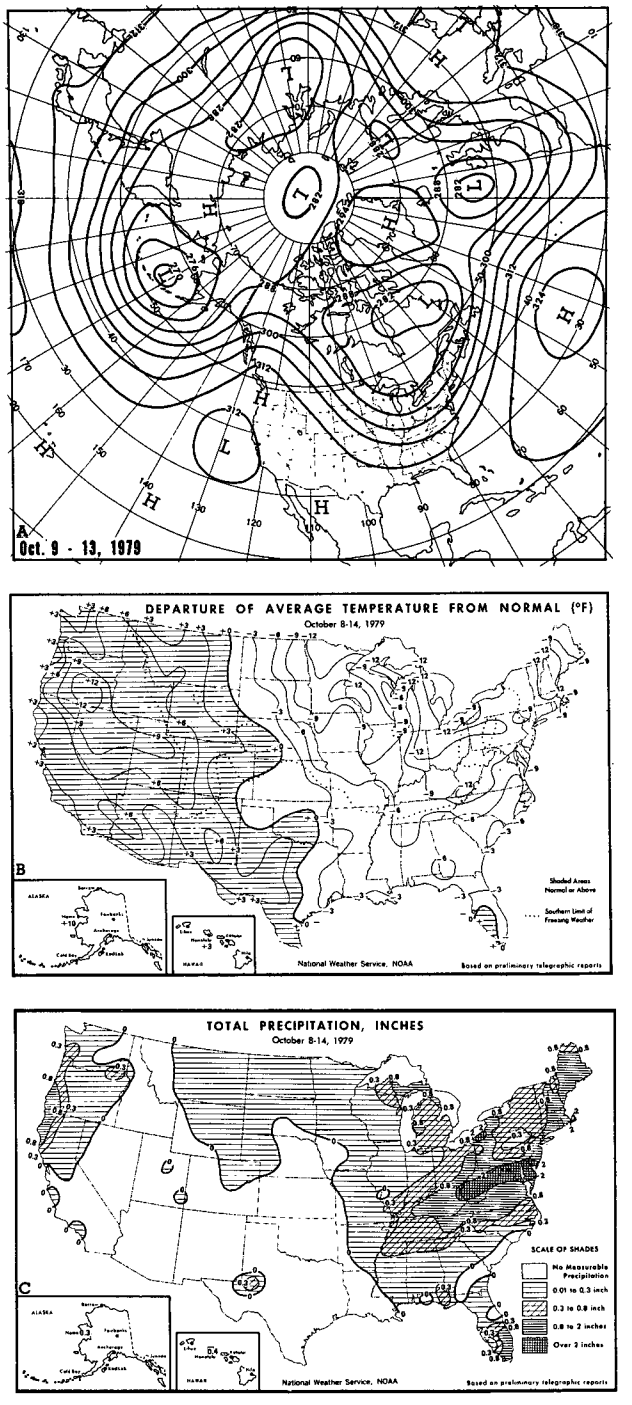


FIG. 8. As in Fig. 7 except for (A) 9–13 October 1979 and (B) and (C) week of 8–14 October 1979.

strong cyclonic curvature preventing subsidence, and surface winds that were mainly northerly instead of blowing off the relatively warm water along the coast contributed to the surprise storm. Much damage was done to trees still in full leaf and power lines, especially in western Virginia where unofficial totals of more than 10 inches were reported in the higher elevations of the Blue Ridge Mountains.

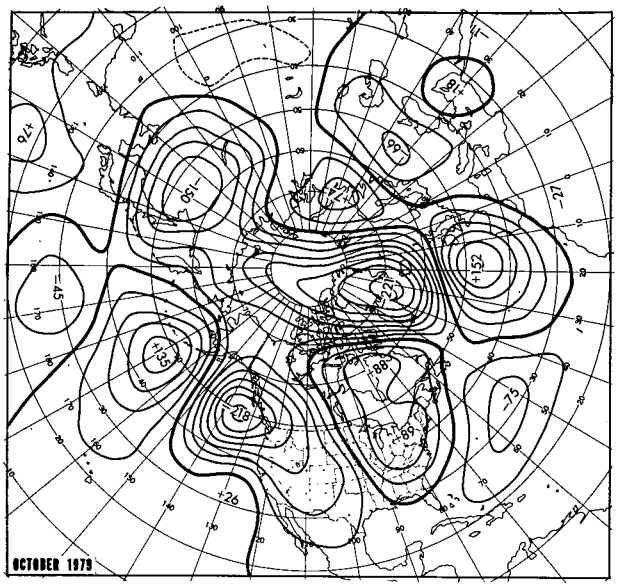


FIG. 9. Mean 700 mb height change (m) from first half to second half of October 1979.

c. 15–21 October

Substantial height falls at high latitudes marked the weakening of much of the blocking during the second half of October (Fig. 9). Large height changes at middle latitudes represented a tendency for flattening and progression of the planetary waves in this sector. During the third week of the month, the phase of the pattern had in fact reversed with flat ridges over the eastern Pacific, eastern North America and the eastern Atlantic and troughs in between (Fig. 10A).

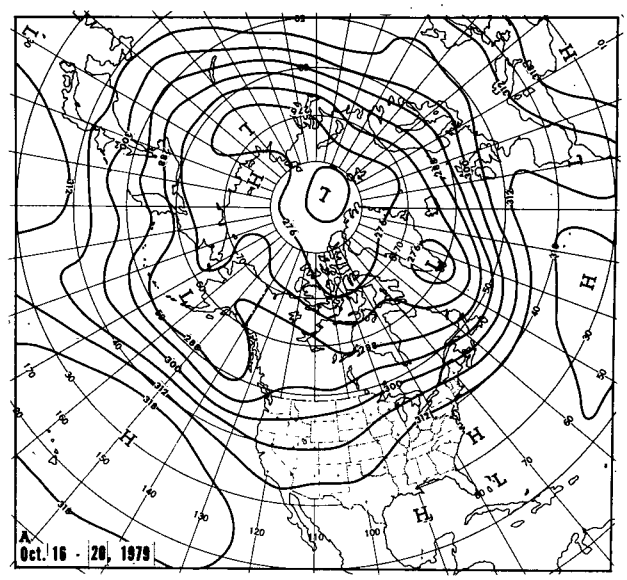
Eastward movement of the western ridge and its attendant warm air brought above normal temperatures to much of the eastern two-thirds of the Nation (Fig. 10B). The relatively fast westerly flow from the Pacific did not introduce really cold air to the West, but brought temperatures down to close to normal levels for the week as a whole.

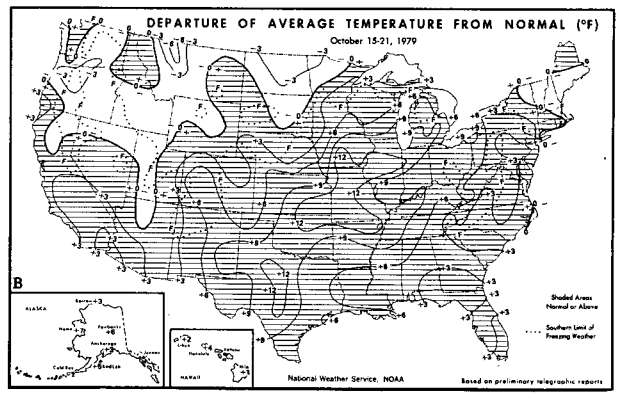
Precipitation increased sharply over the West in response to this increased maritime flow, especially along the Oregon Coast (Fig. 10C). Increasing southerly flow with warmer and more humid air in the middle of the country also brought rather heavy rainfall totals to the central Mississippi Valley and severe thunderstorms to parts of Kansas. The East was relatively dry under the mean ridge.

d. 22–28 October

The wave pattern again amplified and the mean troughs and ridges moved to a position slightly east of that during the first two weeks of the month (Fig. 11A). Temperature anomalies over the United States also reverted to a pattern similar to that of the first half of October, although anomalies were much weaker (Fig. 11B). The relatively weak anomalies reflect in part the sharp change from a brief late-season warm spell in the Northeast (Table 1) to below normal temperatures later in the week. Some daily minimum records were set in the eastern Gulf Coast States and central Appalachians late in the week, while daily maxima were again approaching record levels in the West.

Most of the heavy precipitation in the Midwest





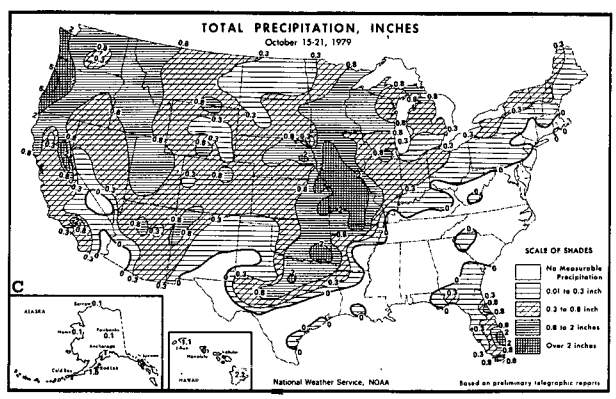


FIG. 10. As in Fig. 7 except for (A) 16–20 October 1979 and (B) and (C) week of 15–21 October 1979.

came from a vigorous storm early in the week, while several systems moving out of the mean trough off the West Coast contributed to heavy precipitation in that area (Fig. 11C). The Great Plains and Southwest remained mostly dry under the mean 700 mb ridge.

5. Tropical activity

No disturbances reached storm or hurricane intensity in the Atlantic sector, although an active easterly wave trough was observed east of the Antilles on 12–13 October and a quasi-stationary tropical depression with an area of showers and thunderstorms was located in the southwestern Caribbean from 13 to 18 October.

Over the eastern Pacific, Tropical Storm Hilda was detected by satellite near 15°N, 115°W on 6 October and weakening against the next day as it rapidly dissipated. Tropical Storm Ignacio formed on 24 October south of Acapulco, Mexico, and quickly became a hurricane. It moved slowly westnorthwestward and then recurved to the northeast, weakening to a tropical storm again on the 29th. It subsequently dissipated near the coast between Manzanillo and Acapulco.

There were also two storms over the western Pacific. Tropical Storm Roger formed on 4 October more than 1000 km east of Taiwan. It moved slowly northwestward and then made a cyclonic loop to the south and east as it became attached to the trailing end of a polar front. It turned north again on the 6th and then curved northeastward on the 7th, a short distance east of Japan where it became extratropical by the next day.

Tropical storm Tip, which was first detected on 7 October near 7°N, 153°E, was destined to have a long life and became the deepest storm ever observed. It initially moved in a normal westnorthwest direction, passing ~60 km south of Guam on the 9th and becoming a typhoon the next day. It turned more toward the north and slowed its forward speed on the 11th, becoming very large and intense, with sustained surface winds of over 140 kt. A reconnaissance aircraft detected a central pressure of 870 mb on 12 October near 16.9°N, 137.6°E. This is a new world record low sea level pressure. For the next few days the huge storm moved slowly and irregularly toward directions between west and north, contributing to a mean low south of Japan (Fig. 10A). It was picked up by the westerlies on the 18th and accelerated rapidly northeastward, grazing the southeastern coast of Japan, still as a large and severe typhoon. By the next day, however, it had weakened to tropical storm intensity and later became extratropical east of Hokkaido. It continued northeastward as an intense extratropical storm to east of the Kamchatka Peninsula on the 21st.

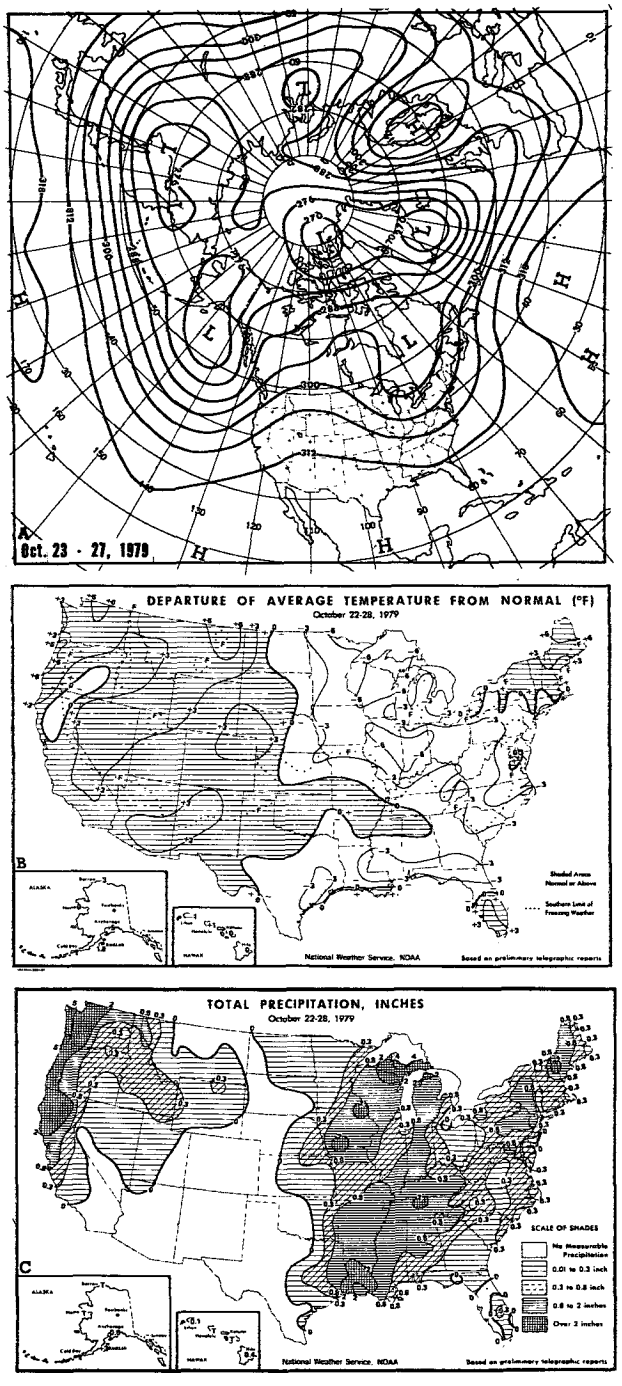


FIG. 11. As in Fig. 7 except for (A) 23–27 October 1979 and (B) and (C) week of 22–28 October 1979.

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