WEATHER AND CIRCULATION OF OCTOBER 1978

Mostly Dry with a Warm West and Cold East

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1. Mean circulation

A deeper than normal polar low centered over northern Baffin Island together with intense lows near Novaya Zemlya and the west coast of Alaska produced a vigorous westerly circulation at high latitudes (Fig. 1). The remains of the generally widespread polar blocking which had characterized the circulation during September (Taubensee 1978) consolidated near the northeast Siberian Coast (Figs. 1 and 2), resulting in generally below normal heights at high latitudes.

The midlatitude zonal westerlies averaged close to normal strength but the mean flow pattern was less amplified than during September. However, the 700 mb wind maximum was stronger than normal and located north of its normal position except over the western Pacific, eastern North America and eastern Europe (Fig. 3). Greatest northward displacements of the wind maximum were near the west coast of North America and over the eastern Atlantic, where anomalously strong midlatitude ridges prevailed (Figs. 1 and 2). The height anomaly

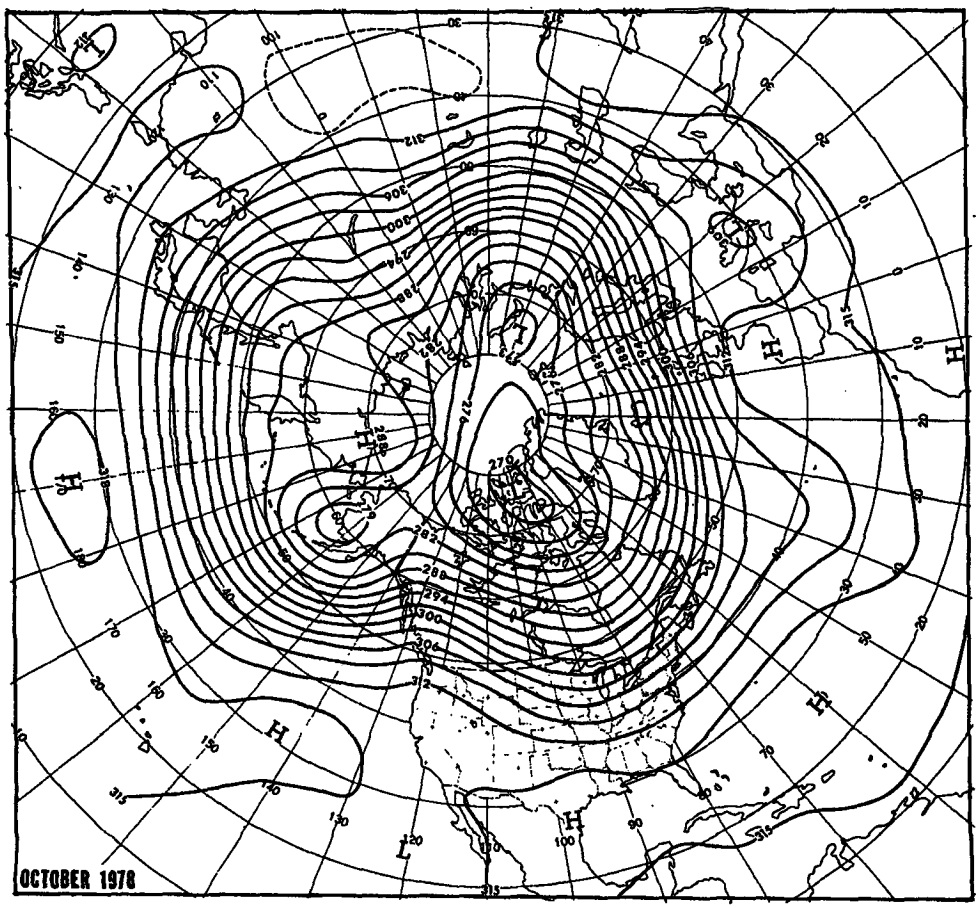


FIG. 1. Mean 700 mb height contours (dam) for October 1978.

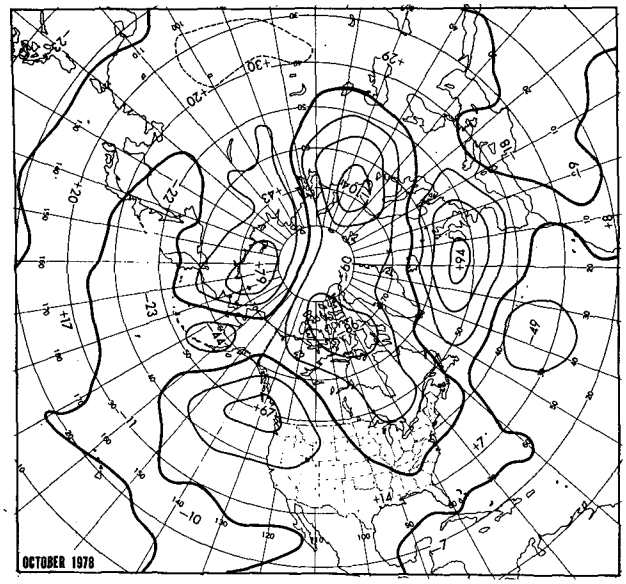


FIG. 2. Departures from normal of mean 700 mb height (m) for October 1978.

pattern over Europe was highly persistent from September, but the increasingly fast westerlies at higher middle latitudes over the Pacific and North America led to progression of the principal circulation features and a reversal of the pattern over the United States.

Confluence between arctic air moving southward into northern Canada and mild Pacific air moving northeastward through the western North American ridge led to marked thermal contrasts (Fig. 4) and unusually fast westerlies at all levels of the troposphere over central and southern Canada. Generally mild air masses prevailed over the eastern oceans and western continents, due to the combined effects of advection of mild maritime air in the fast westerlies and subsidence in the strong ridges over these areas. The Siberian block was also associated with anomalously warm air.

The 700 mb subtropical westerlies continued their recent trend of being weaker than normal, due largely to the anomalously strong subtropical ridge that was displaced north of its normal position in some areas. As is normally the case when this type of circulation anomaly prevails in late summer or fall, tropical activity was greater than normal. The increased storminess was most noteworthy over the Atlantic, which had been rather inactive during most recent tropical storm seasons.

2. Temperature

In agreement with the thickness anomaly pattern (Fig. 4) and the reversal of the circulation features from the previous month, the temperature anomaly pattern reversed from September to October. It was warmer than normal from the western Great Plains to the West Coast, while lower than normal temperatures prevailed from the eastern Great Plains to the Atlantic Coast (Fig. 5). Persisting from September were above normal temperatures along the California coast and in Florida, and cooler than normal weather in New England.

Several cities in the Southwest reported record and near-record warmth (Table 1). The monthly mean thickness anomaly was not particularly high in the area of the records, suggesting that local or surface effects may have been contributing to

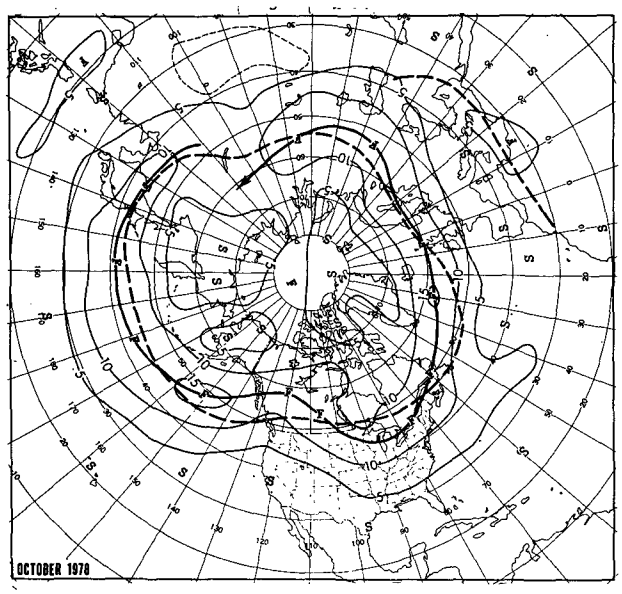


FIG. 3. Mean 700 mb geostrophic wind speed (m s^{-1}) for October 1978. Solid arrows indicate observed axes of maximum wind speed and dashed lines, the normal.

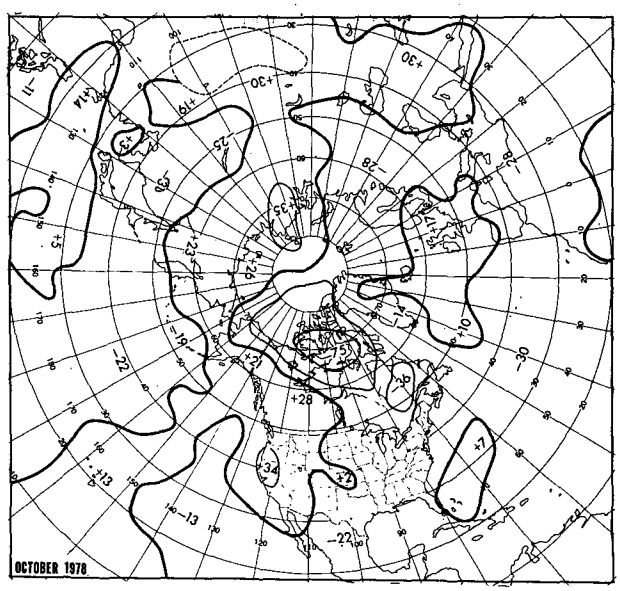


FIG. 4. Departure from normal of mean 1000–700 mb thickness (m) for October 1978.

the high temperatures. The northward displaced subtropical ridge served to delay the normal seasonal increase of maritime flow from the Pacific, and contributed to heat waves when it was most amplified.

Temperature anomalies over Alaska reflected the sharp confluence between arctic flow on the north coast (8°F below normal at Point Barrow) and maritime flow from the Gulf of Alaska along the south coast (4°F above normal at Anchorage). Most reporting stations in Hawaii were warmer than normal under the influence of the subtropical ridge.

3. Precipitation

As is often the case with a height pattern giving northerly anomalous flow components to much of the country (Fig. 2), precipitation was below normal in most areas. The only extensive areas recording more than the normal October precipitation were the interior Southwest and Rio Grande Valley, and portions of the Ohio Valley and Northeast (Fig. 6). Nearly half the Nation had less than half the normal precipitation, and numerous localities, particularly in the West and Southeast, reported record or near-record dryness (Table 2).

Under the influence of northerly flow components from the Siberian block, most of Alaska was drier than normal. This was so even in areas close to the low center under cyclonic flow. The only area with greater than normal precipitation was the panhandle. Most reporting stations in Hawaii had considerably heavier than normal rainfall, mainly due to heavy rains the last two days of the month from a Kona type low.

4. Weekly variability

a. 2–8 October

The blocking high which was over western Alaska during the last week of September (Taubensee, 1978) moved northwestward through the Bering Straits. Downstream features from the eastern

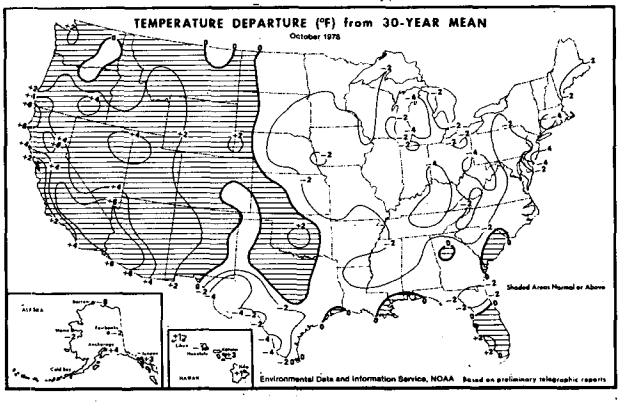


FIG. 5. Departure from normal of average surface air temperature (°F) for October 1978 (from National Oceanic and Atmospheric Administration and Economics, Statistics and Cooperatives Service, 1978).

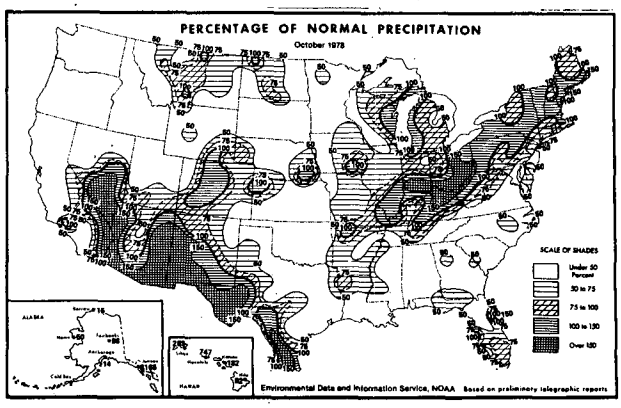


FIG. 6. Percentage of normal precipitation for October 1978 (from National Oceanic and Atmospheric Administration and Economics, Statistics and Cooperatives Service, 1978).

Pacific to eastern North America also retrograded in response (Fig. 7A). As a result, the area of below normal temperatures expanded to cover most of the United States east of the Continental Divide (Fig. 7B). Greatest negative anomalies were under the trough extending southward from the Great Lakes area to the eastern Gulf Coast. At the end of the week a strong polar high settled into the Southeast, setting several daily minimum temperature records.

Unusual late-season warmth continued in the Southwest. Several localities in the interior deserts and southern California had maxima over 100°F. Las Vegas, NV set records for late-season warmth twice with 103°F on the 1st and 99°F on the 7th. Albuquerque, NM set a new record high temperature for the month of October with 89°F on the 2nd.

Precipitation was light over most of the country, with practically none over the western half of the country and in the Southeast. Heaviest amounts fell in the Great Lakes area and in the Rio Grande Valley (Fig. 7C).

b. 9–15 October

There was little change in the main features of the mean 700 mb circulation over the Pacific and North America between the first two weeks of the

TABLE 1. Record and near-record monthly mean temperatures observed during October 1978.

Station	Temperature (°F)	Anomaly (°F)	Remarks
Las Vegas, NV	73.5	+6.4	Warmest October
Phoenix, AZ	78.6	+6.4	2nd warmest October
Yuma, AZ	80.6	+4.7	Record high October mean min. temp.
San Diego, CA	70.1	+4.0	Record high October mean min. temp.
Bakersfield, CA	75.2	+8.3	Warmest October
Fresno, CA	70.0	+5.8	2nd warmest October
Red Bluff, CA	71.6	+6.6	Warmest October

month (Fig. 8A). The West Coast ridge amplified more and developed a closed center over California. Weekly mean temperatures were as much as 12°F above normal in the San Joaquin Valley of California (Fig. 8B). Bakersfield, CA had a record-high maximum for so late in the season of 102°F on both 13 and 14 October. Albuquerque, NM and Tulsa, OK also reported record late-season warmth of 87 and 94°F, respectively, on the 12th. Medford, OR also set a late-season record for warmth with 88°F on the 13th, and equaled the record with 86°F the next day. The combination of unusually warm air aloft and strong easterly flow at the surface overcame the strong maritime influence at Eureka, CA, where the 79°F maximum on the 13th was one of the highest this decade, although not a record.

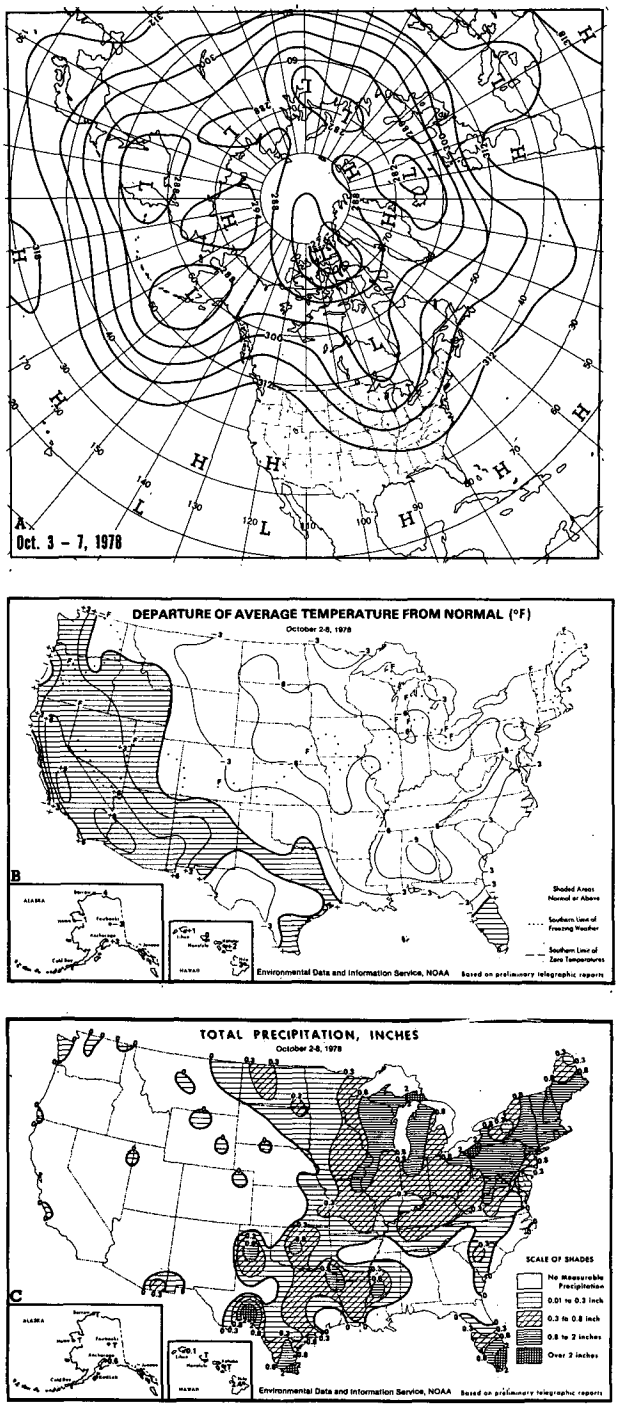


FIG. 7. (A) Mean 700 mb contours (dam) for 3–7 October 1978; (B) departure from normal of average surface air temperature (°F) and (C) total precipitation (inches) for week of 2–8 October 1978 (from National Oceanic and Atmospheric Administration and Economics, Statistics and Cooperatives Service, 1978).

TABLE 2. Record and near-record low precipitation totals observed during October 1978.

Station	Amount (inches)	Anomaly (inches)	Remarks
San Francisco, CA	0	−1.06	Tied driest October
Mount Shasta, CA	0	−2.54	Driest October
Red Bluff, CA	0	−1.17	Tied 1917 for driest October
Medford, OR	0.01	−2.04	3rd driest October
Sexton Summit, OR	0.03	−3.60	Driest October
Portland, OR	0.36	−3.23	Driest October
Pendleton, OR	T	−1.11	Driest October at airport
Walla Walla, WA	0.03	−1.46	Tied for 3rd driest October and driest since 1936
Missoula, MT	0.01	−0.91	Driest October
Kalispell, MT	0.07	−1.14	3rd driest October
Helena, MT	0.02	−0.57	Driest October
Salt Lake City, UT	T	−1.16	Tied 1958 for driest October
Minneapolis, MN	0.19	−1.59	4th driest October
Wichita, KS	0.05	−2.45	4th driest October
Houston, TX	0.01	−3.91	Tied 1944 for 2nd driest October
Baton Rouge, LA	T	−2.65	Tied 1940 for driest October
Montgomery, AL	0.01	−2.23	Tied 1891 for 2nd driest October and driest since 1904
Mobile, AL	T	−2.55	2nd driest October
Pensacola, FL	0	−3.13	Driest October
Rome, GA	0.06	−2.95	3rd driest October
Columbus, GA	0.02	−1.95	Tied 1961 for 2nd driest October
Asheville, NC	0.30	−2.95	4th driest October

Cooler than normal weather continued over the eastern part of the country. Daily record low temperatures were set over a wide area from New York to South Carolina and as far west as Mississippi on the 9th. A second cold air mass set more daily low temperature records over the Midwest and East at the end of the period on the 15th.

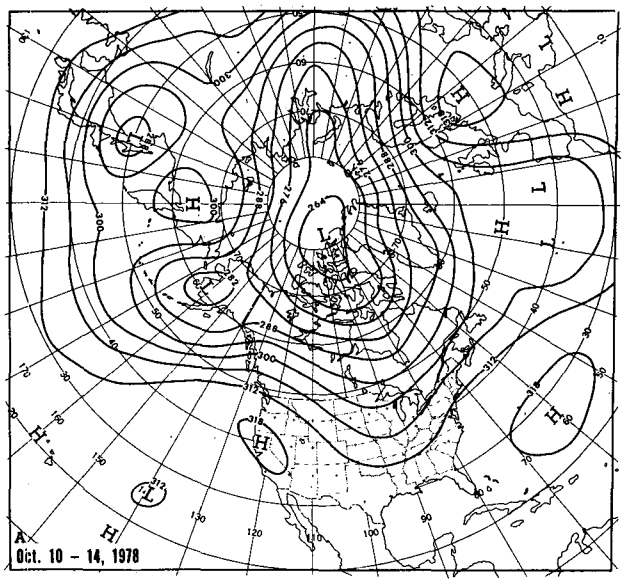
Most of the West was again rainless under the influence of the strong ridge. Heaviest rainfall occurred in the Ohio Valley when an intensifying short wave digging over the Midwest triggered a wave cyclone on an active cold front on the 13th and 14th.

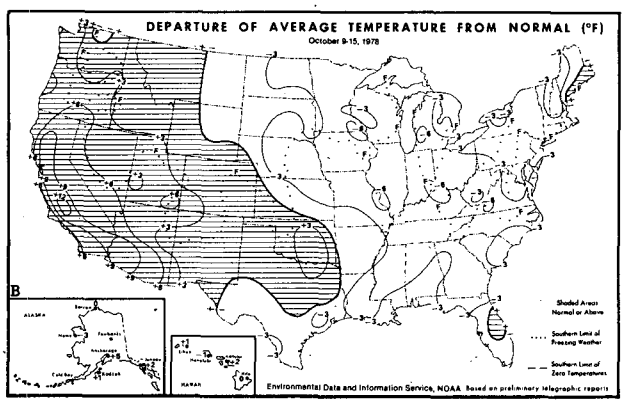
c. 16–22 October

The Siberian block weakened considerably during the second half of October, although a ridge remained there throughout the month (Fig. 9). Westerly flow across the Pacific strengthened, leading to flattening of the flow over the United States as 700 mb mean heights fell in the western ridge and rose in the eastern trough. The pattern over the Atlantic and Europe amplified, however,

with deepening troughs over the central Atlantic and eastern Europe and strengthening of the ridge near the Bay of Biscay.

As the eastern North American trough moved into the western Atlantic during the third week of October, increasing westerly flow spread across southern Canada (Fig. 10A). The warm air that had been confined to the West earlier in the month spread rapidly eastward to the Mississippi River in the weekly mean (Fig. 10B). Temperatures averaged more than 6°F below normal over parts of the Northeast, due mainly to an unusually cold high that dominated the East during the first part of the week.





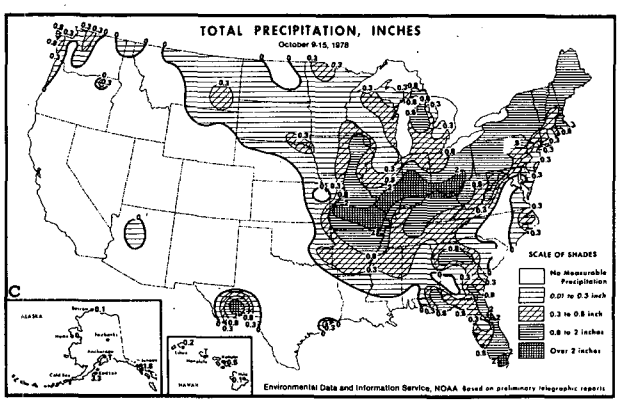


FIG. 8. As in Fig. 7 except (A) 10–14 October 1978 and (B) and (C) week of 9–15 October 1978.

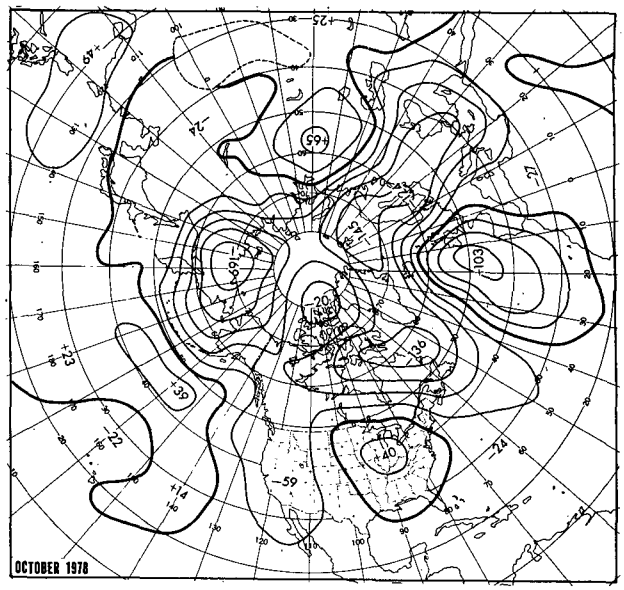


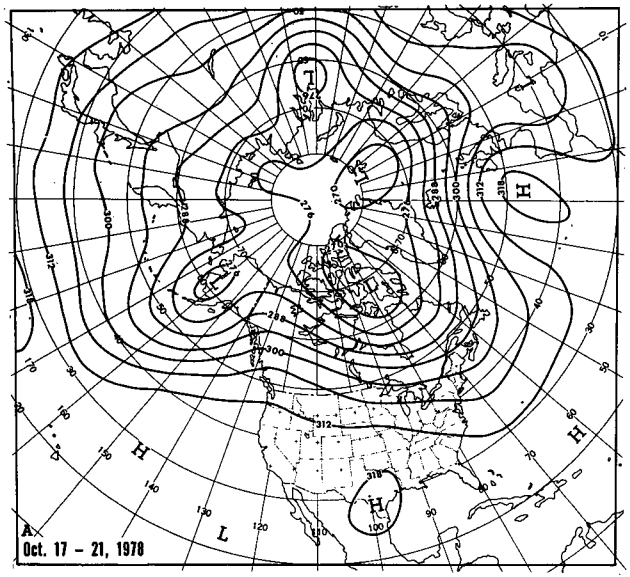
FIG. 9. Mean 700 mb height change (m) from first half to second half of October 1978.

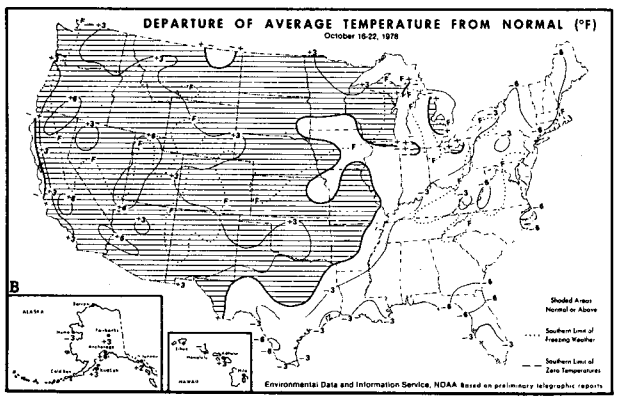
Minimum temperatures that were the lowest ever for so early in the season were observed at several localities in New York and New England from the 16th to the 18th. One of the coldest readings was 13°F at Concord, NH on the 18th. Rapid warming followed as mild air moved eastward. The maximum at Concord on the 22nd was 82°F, a new daily record for warmth. Several other New England cities established new daily records for warmth on 22 and 23 October. Maximum temperatures of 92°F at Ft. Smith, AR and 89°F at Wichita, KS on the 21st were the highest for so late in the season.

Precipitation was light over most of the country, with none falling over the Great Basin, the northern Mississippi Valley and much of the Southeast. The heaviest totals, an inch or more in some localities, were observed over the southern Plateau and southern Rocky Mountains as moisture from Tropical Storm Sergio streamed northeastward in advance of a progressing weak low which cut off near the southern California coast around the middle of the week.

d. 23–29 October

A series of moderately strong short waves moved rapidly eastward from the Pacific across southern Canada, giving a rather flat mean pattern for the week (Fig. 11A). A mean ridge over the Southeast helped maintain a confluent flow between south-





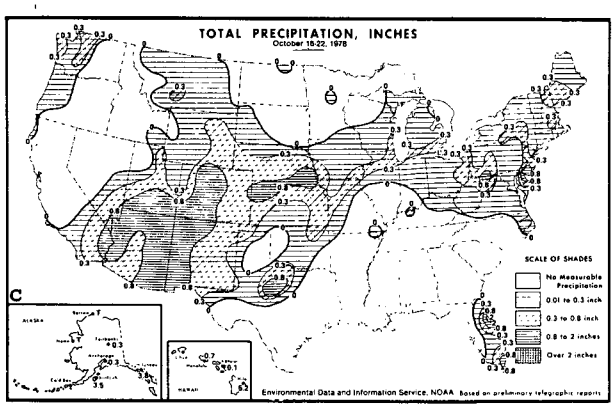


FIG. 10. As in Fig. 7 except (A) 17–21 October 1978 and (B) and (C) week of 16–22 October 1978.

westerly winds in advance of a mean trough over the Southwest and northwesterly flow from western Canada. The temperature anomaly pattern reflected the variability of the weather across the north with weak anomalies where the westerly flow was strongest, while temperature averaged as much as 6°F above normal under the southeastern ridge (Fig. 11B). Several daily records for warmth were set, including a record for late-season warmth of 80°F at Asheville, NC on the 23rd. The largest negative temperature anomaly, as much as 9°F below normal, was observed in western Texas in an area that had persistent cloudiness and heavy rains during the first part of the week in advance of the southwestern trough (Fig. 11A,C).

Other substantial precipitation amounts occurred from the lower Mississippi Valley through the Ohio Valley to New England near the zone of largest temperature contrast (Fig. 11B). The Great Basin and northern and central Great Plains remained rainless, as did parts of the Southeast. Although the dry weather was excellent for harvesting operations, in some areas pastures were deteriorating and there was not enough moisture for good germination and growth of fall-planted crops.

5. Tropical activity

Three tropical storms, one of which reached hurricane intensity, developed in the Atlantic sector this month. Irma developed from a subtropical low a short distance southwest of the Azores on 4 October. It moved northward and then northeastward on the 5th, passing through the northwesternmost islands of the Azores, and was absorbed in an extratropical low later in the day.

Juliet formed north of Puerto Rico on 9 October from an easterly disturbance. It moved northwestward into a weak frontal zone on the 10th, then turned northward and was absorbed in the frontal zone the next day.

A large disturbed area existed over the western Carribbean around October 20th through the 23rd. Although there was extensive shower and thunderstorm activity, no centers of storm strength developed from it.

Kendra formed east of the Bahamas early on 29 October and became a hurricane later the same day. It moved slowly and gradually recurved to the northeast, weakening to tropical storm intensity on the last day of the month as it approached a baroclinic zone. Some minor flooding at high tide occurred along the southeastern coast due to the large-scale gradient set up between Kendra and a strong high over the Northeast, and the coincidence of the maximum astronomical tides as well.

There were also three tropical storms over the eastern Pacific during October, two of which reached hurricane intensity. The first one, Rosa, formed on 2 October off the west coast of Mexico near 16°N, 104°W and developed to hurricane intensity the next day. Moving northwestward, it weakened to tropical storm intensity on the 5th, turned north and grazed the tip of Baja California on the 6th, and dissipated the next day.

Sergio formed near 16°N, 107°W on the 18th and

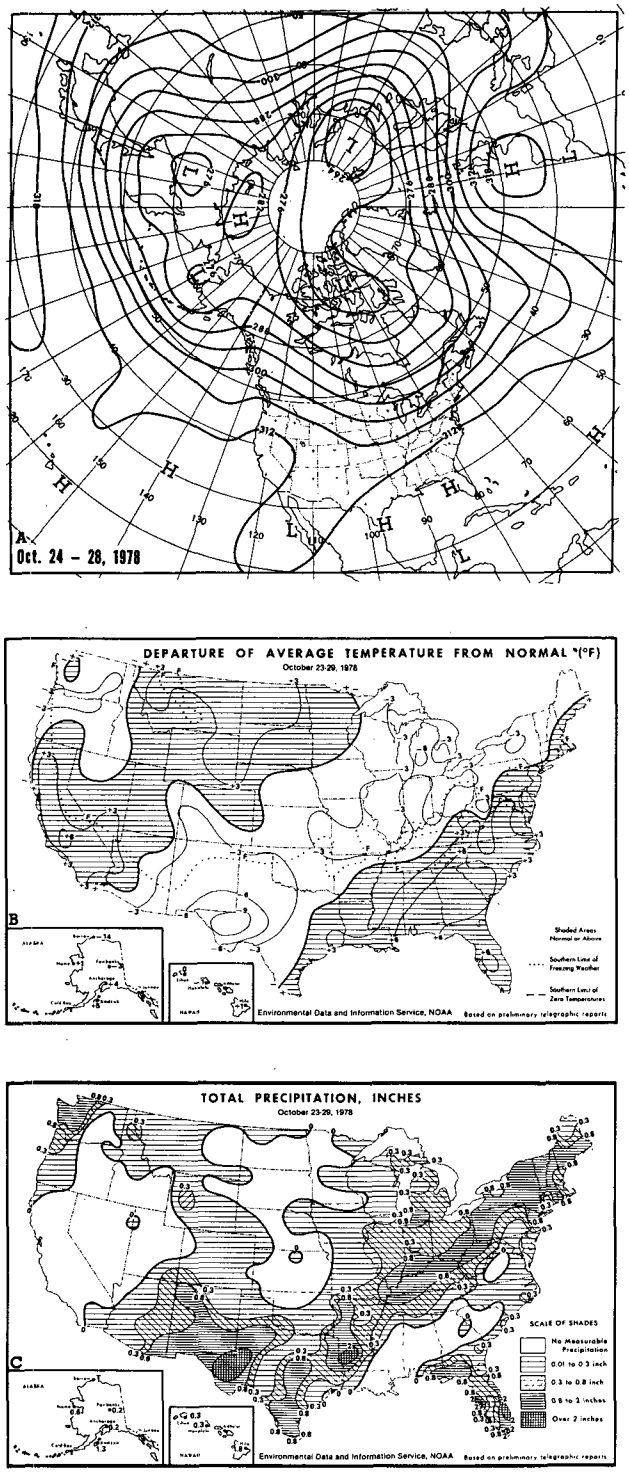


FIG. 11. As in Fig. 7 except (A) 24–28 October 1978 and (B) and (C) week of 23–29 October 1978.

moved as a tropical storm on a slow curve to the northwest and then north into the west coast of Baja California where it dissipated late on the 20th. Moisture from this storm was drawn northward into lower California and Arizona.

Susan formed near 10°N, 145°W on the 18th. Deepening to hurricane intensity the next day, it moved northwestward and then turned more to the west about 350 km south of Hawaii on the 23rd as it weakened and then dissipated the next day.

There were five storms in the western Pacific, all of which reached typhoon strength for at least part of their lifetime. Mamie was already in existence over the west central Pacific at the beginning of the month. After briefly reaching typhoon intensity on the 3rd after recurvature, it weakened again, becoming extratropical near 45°N, 175°W on the 5th, and ending as an intense storm in the Gulf of Alaska on the 8th.

Nina formed on 8 October near 15°N, 130°E from a low in a large disturbed area that had been in existence for several days. It moved westward across Luzon Island on the 10th and slowed to a near stop in the South China Sea on the 12th and 13th. After becoming a typhoon on the 14th, it moved northwestward and brushed the south coast of Mainland China on the 16th, where it dissipated.

Ora formed not far from Nina's birthplace on the 10th and moved northwestward under the influence of Nina's circulation. It became a typhoon on the 13th and brushed the northeastern coast of Taiwan the next day. It then recurved and weakened, becoming an extratropical frontal wave south of Japan on the 15th.

Phyllis formed near 15°N, 160°E on 16 October and moved northwestward. It became a typhoon on the 18th and recurved the next day, taking an irregular northward path through the 21st. It turned northeastward and weakened to tropical storm intensity, becoming extratropical on the 22nd and ending as a deep storm near the western Aleutians on the 23rd.

Rita formed near 10°N, 170°E on 18 October and took a long westward path at low latitudes. Reaching typhoon intensity on the 20th, the storm was quite intense when it crossed Luzon Island on the 26th and 27th. Early reports from the area indicated considerable casualties and damage. Rita weakened to storm intensity in the south China Sea on the 28th, dissipating the next day.

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