

THE WEATHER AND CIRCULATION OF NOVEMBER 1962

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1. INTRODUCTION

The mean 700-mb. chart for November (fig. 1) shows that most major troughs and ridges were near their normal positions for this time of the year. However, there were fairly large exceptions to the typical flow patterns in some areas. The circulation over North America during the

first half of the month was a persistence of the regime established during the latter half of October [1]. Its features were so pronounced that the monthly mean circulation closely resembled the first 15 days even though large-scale changes occurred in the latter half of November. Furthermore, the temperature and precipitation

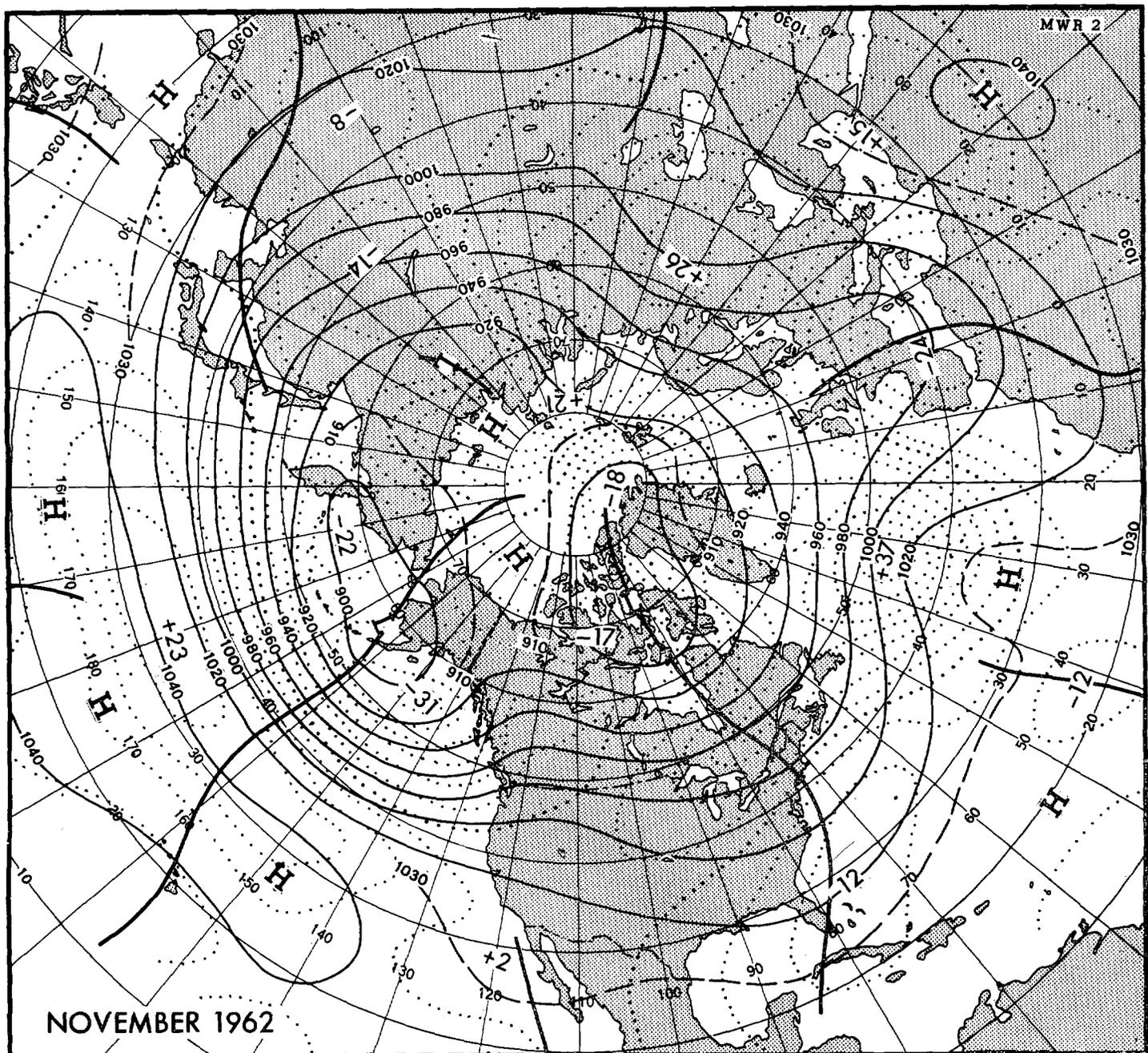


FIGURE 1.—Mean 700-mb. contours (solid) and height departures from normal (dotted), both in tens of feet, for November 1962. Principal features were contrasting mid-latitude regimes in the Pacific and Atlantic Oceans.

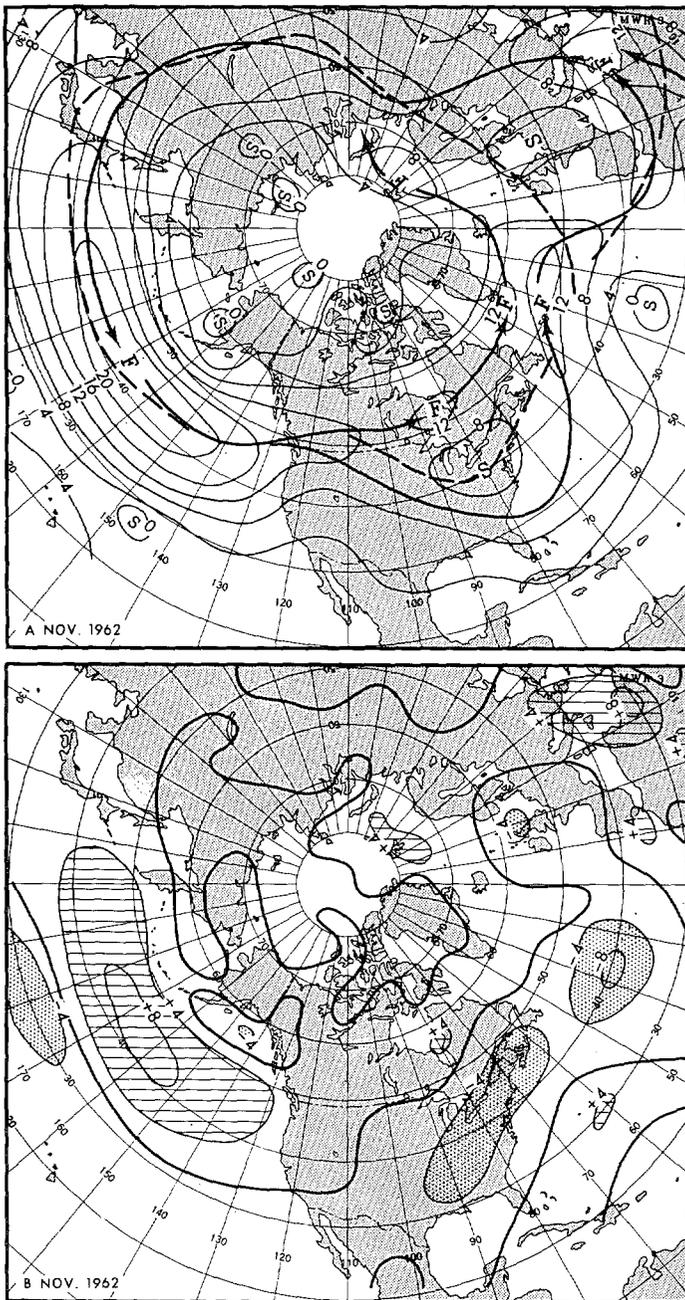


FIGURE 2.—(A) Mean 700-mb. isotachs in meters per second for November 1962. The heavy solid arrows indicate observed axes of maximum wind speed, while dashed lines show the normal axes for November. (B) Departure from the normal 700-mb. wind speed in meters per second for November 1962. Westerlies were much stronger than normal over the Pacific and much lighter than normal over the Atlantic.

anomalies of the first 15 days of November dominated the monthly anomalies, despite considerable transition during the last 15 days.

2. MONTHLY MEAN CIRCULATION

Departures from normal of the 700-mb. height field over the Atlantic and Pacific Oceans (fig. 1) reflected contrasting regimes this month. The Atlantic anomalous flow showed blocking characteristics in middle latitudes,

while the flow at the same latitudes in the Pacific was unusually zonal.

Normal 700-mb. heights over the Atlantic for November have a 10,400-ft. contour enveloping an elongated high pressure cell extending from about 25° N., 30° W. southwestward to Cuba and the Yucatan Peninsula [2]. However, the upper-level pattern over the Atlantic this year had a mainly meridional ridge near 30° W. with a weak 700-mb. center slightly higher than 10,300 ft. at 35° N. Over the western Atlantic and eastern North America the usual trough was stronger than normal in the south and weaker than normal in the north. This was associated with a blocking condition over the Atlantic that extended westward well into the continent. Anomalous easterly flow reached almost to the Rocky Mountains.

The Aleutian Low was slightly south of its normal position and was deeper than normal. At the same time, the Pacific ridge was quite strong with its axis along or slightly north of the 25th parallel. Ordinarily the November position of the Pacific ridge is south of 25° N. [2]. The effect of the deep Low to the north and an intense High to the south was strong mid-latitude westerlies over the Pacific, contrasted to blocking in the Atlantic (fig. 2A). Average wind speeds were 6 to 10 m.p.s. above normal in the main westerly belt of the Pacific, whereas the westerlies at the same latitude over the Atlantic ranged to 8 m.p.s. below normal (fig. 2B).

Over North America the 700-mb. pattern closely resembled the normal chart, differing only in intensity in most areas. The ridge over the western part of the continent was in a highly favored position. Frequency charts prepared by Klein and Winston [3] show a mean November ridge at 60° N., 120° W. over 80 percent of the time, with an area of maximum frequency extending southward in the identical location of the mean ridge this month. A somewhat weaker than normal Baffin Island Low was displaced slightly to the northwest, with a trough and below normal heights reaching to the North Pole.

Normally there is a 700-mb. Low over the Arctic Basin near Severnaya Zemlya off the Siberian coast [2]. This year, however, the Low was replaced by a small High with a shallow low center located to the south over Siberia.

Weak anticyclonic curvature usually present over Lake Baikal and extending south-southwestward could be detected this November only in a flat northwesterly flow in this area. In contrast, the ridge from Novaya Zemlya southward to the Caspian and Black Seas region was much stronger than normal. An extension of this ridge made up the weak high center noted earlier over the Arctic Ocean. Coupled with this strong 700-mb. ridge over western USSR during November was a much deeper than normal trough over Europe that projected to the south over the Mediterranean Sea into North Africa.

3. MONTHLY TEMPERATURE

Temperature anomalies for November (fig. 3) were

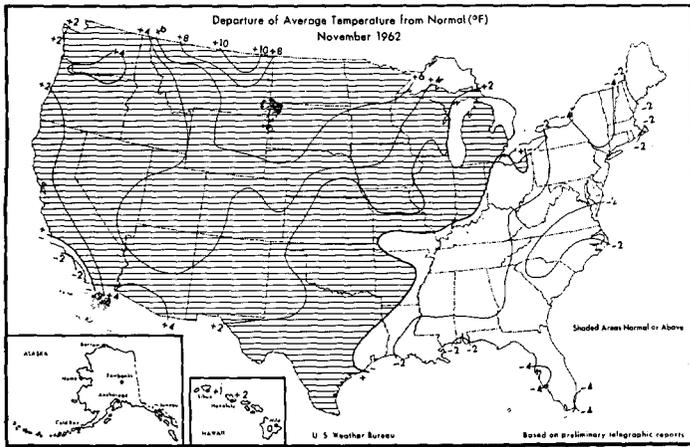


FIGURE 3.—Departure of average temperature from normal (°F.) for November 1962 (from [5]). Except for the immediate southern California coast, temperatures averaged above normal west of the Mississippi and below normal to the east.

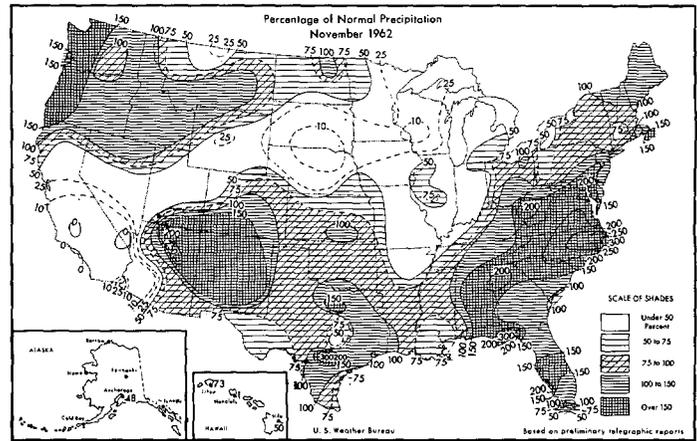


FIGURE 4.—Percentage of normal precipitation for November 1962 (from [5]). Wet in the East, Northwest, and Southern Rockies; dry from Great Lakes through Wyoming into California.

reasonably consistent with the mean 700-mb. circulation. A flat ridge over the Western States and fast westerlies in the Pacific led to mild Pacific air and above normal temperatures in the western half of the Nation. In the East, on the other hand, below normal temperatures prevailed beneath the trough aloft. Departures of 4° F. in the Southeast were associated with the large negative 700-mb. height departure from normal in this area. Farther north below normal temperatures were observed with near or above normal heights, probably related to northerly surface winds originating in an area of abnormal snow cover [4].

Normal 1000–700-mb. thickness contours for November [2] are about parallel to the 700-mb. contours observed this month over most of the United States. As a result, the cross-contour flow indicated by the anomaly lines in figure 1 approximates the areas of cold and warm air advection relative to the normal. Reference to figure 3 shows that the zero temperature anomaly line follows the indicated line of zero advection from the Great Lakes to New Mexico fairly closely.

4. MONTHLY PRECIPITATION

A mean trough over eastern North America resulted in mostly above normal rainfall in the East Coast States (fig. 4). Heaviest precipitation relative to normal fell around Cape Hatteras, N.C., where monthly totals were three times the average November amounts. Several sections from Pennsylvania to Florida received twice normal rainfall.

Relatively dry conditions prevailed in a large area extending from the Great Lakes through Wyoming and over most of California. Generally wet weather persisted along the northwestern coast in stronger than normal southwesterly flow, with above normal precipitation reaching inland through Idaho into Montana. The extreme southern Rockies also had above normal pre-

cipitation. Although the large dry area and the rainfall over the east coast and in the Northwest can be reasonably well explained by the monthly mean flow pattern, most of the precipitation in the United States can better be explained by the changing conditions of the last half of the month. Section 5 of this report will deal more fully with these precipitation and temperature variations.

5. INTRA-MONTH VARIATIONS OF CIRCULATION AND WEATHER OVER NORTH AMERICA

The circulation for November 1–15 (fig. 5A) was extremely persistent, and each of the three 5-day mean charts which made up the 15-day period looked very much like the half-month average. The ridge in the West was generally more than 100 ft. above normal and was associated with warm dry air from the Plains States westward (fig. 5B). In the northwestern coastal section strong onshore upper-level winds along with frequent sea level cyclonic activity off the coast resulted in as much as 6 in. of rain by mid-month (fig. 5C). Some parts of the coast from northern California to Tatoosh Island received at least moderate rainfall each day from the 5th through the 15th.

Heavy precipitation in the Eastern States during the first half of November was the result of frequent surface storm development in an almost stationary long-wave trough. Three storms developed strongly over coastal waters and moved up the east coast in rapid succession during the first six days. On the 9th a storm developed in the Gulf of Mexico and moved north, then northeast through New England, giving widespread heavy rain. As this storm moved away still another was developing east of Florida. The latter moved north about 200–300 miles off shore, reaching such intensity that winds rose to 75 m.p.h. along the New England coast on the 15th [5]. Following each of these periods of storminess in the East, a fresh surge of cold air moved down from Canada,

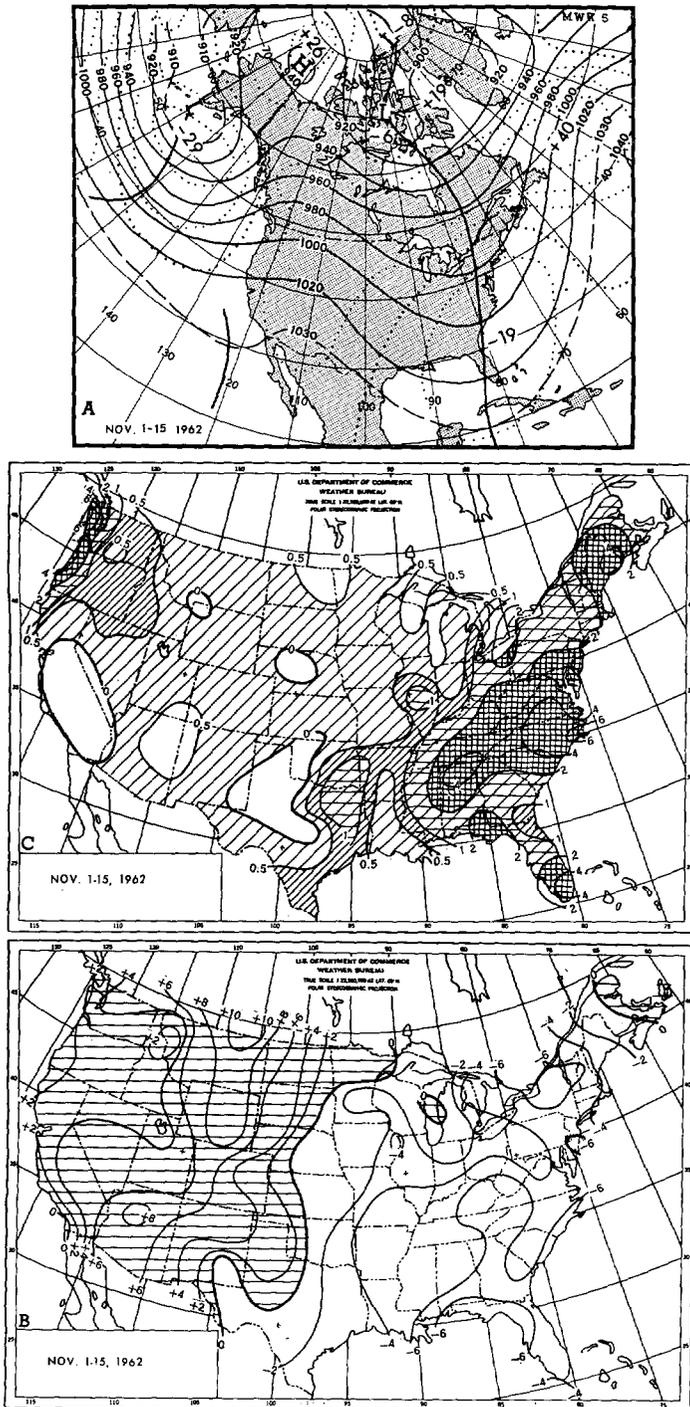


FIGURE 5.—(A) 700-mb. height and departure from normal, (B) surface temperature departure from normal, and (C) total precipitation, all for November 1–15, 1962.

keeping temperatures well below normal from Maine to Florida and westward to the Plains States (fig. 5B).

About mid-month the stable pattern of the latter part of October and early November began to change. A long-wave trough that had been either moving very slowly or not at all through the eastern Pacific suddenly advanced into the United States with the 5-day mean position (fig. 6A) reaching the central part of the country by the

November 17–21 period. The cooling and precipitation (figs. 6B and 6C) associated with the eastward-moving trough broke the extended period (more than 2 months) of warm dry weather in Colorado and nearby States. In the *Weekly Weather and Crop Bulletin* [5] it was stated that 10 to 15 in. of snow fell in the higher mountains of Colorado, and the more complete precipitation reports of the same bulletin showed rainfall amounts of more than 1 in. in parts of New Mexico, Arizona, and northeastern Utah. In advance of the mean trough strong warming occurred in the Southeast for the first time in November. Temperatures reached 8° F. above normal in southern Georgia and northern Florida. Progression of the long-wave trough also triggered another rainstorm in the Gulf of Mexico which moved through the Southeastern States during the 21st and 22d, giving as much as 4 in. of rain to parts of Alabama and Georgia and up to 2 in. in North Carolina (figs. 6C and 7C). Cooling followed in the Southeast and warming in the Southwest as the 700-mb. height field returned to the early month pattern of ridge in the West and trough in the East (figs. 7A and 7B).

The last day of the 5-day period included in figure 7A was the beginning of a very dramatic change of circulation over the eastern United States. On the 25th of November a fairly small perturbation in the upper-level flow moved southeastward across the Ohio Valley. This small disturbance plunged southward off the coast of North Carolina, formed a closed circulation aloft, stopped its eastward progress, and with the aid of low-level heating [6] over the warm ocean, produced rapid and intense cyclogenesis. The surface High directly north and over New York State remained stationary, becoming a warm anticyclone.

Moving to the southwest toward Florida as it intensified, this new storm reached a point south of 30° N. on the 27th, then very, very slowly curving eastward and later north-eastward in an almost circular path, it again approached Cape Hatteras, N.C., moving on a northwesterly course at the end of the month. Eastern North Carolina received extremely heavy rain from this storm before the end of the month (fig. 8C), and the immediate coastal sections of South Carolina, southern Georgia, and northern Florida also reported heavy rainfall during the same period.

Figures 9 and 8A demonstrate the persistence and stability of this east coast pattern which actually persisted for several more days into December. A comparison of figures 7A and 8A shows how dramatic was the change in the long-wave pattern during the development of the off-shore storm.

Although Florida experienced 5-day mean temperatures up to 8° F. below normal during the last week of November (fig. 8B), the easterly flow between this storm which moved in a tight circle and the stationary High centered over the northeastern United States injected warm air into most Eastern States and further strengthened the warmth of the central United States. The North Central States became especially warm. Several daily maximum tem-

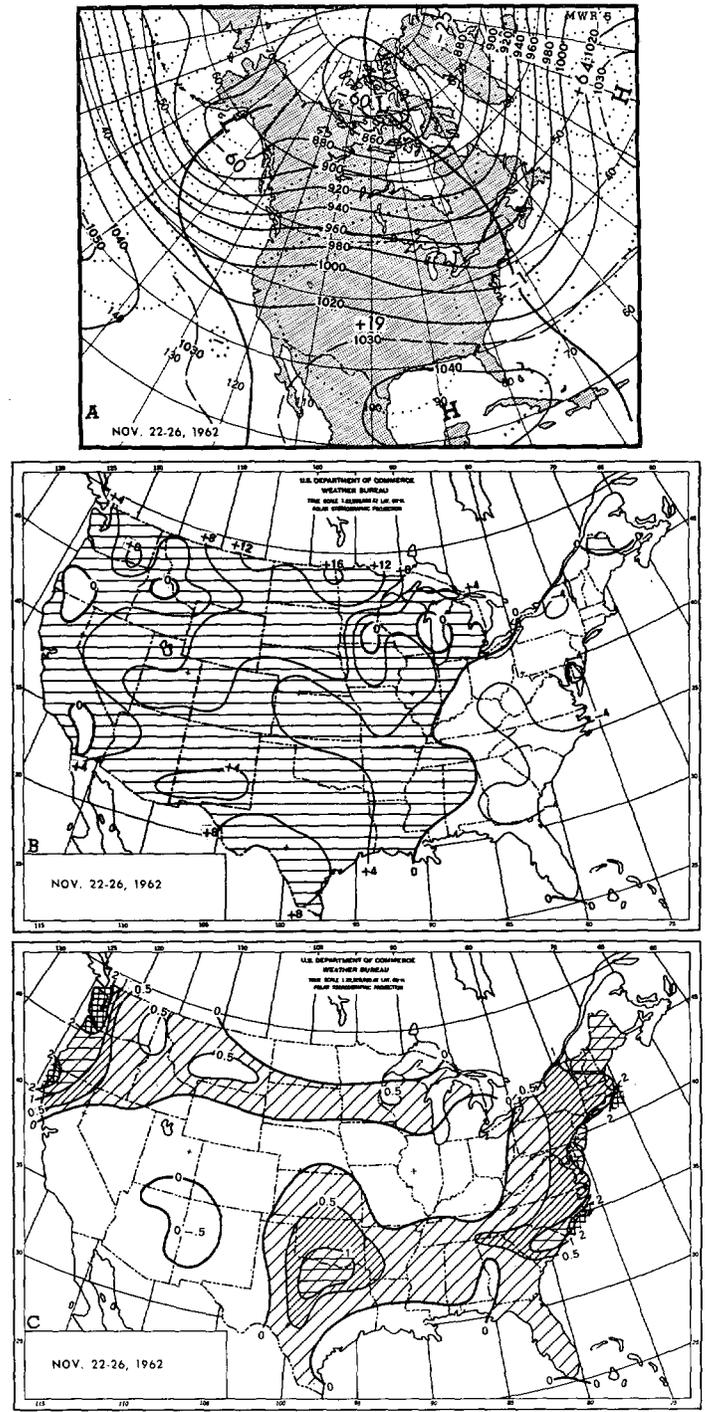
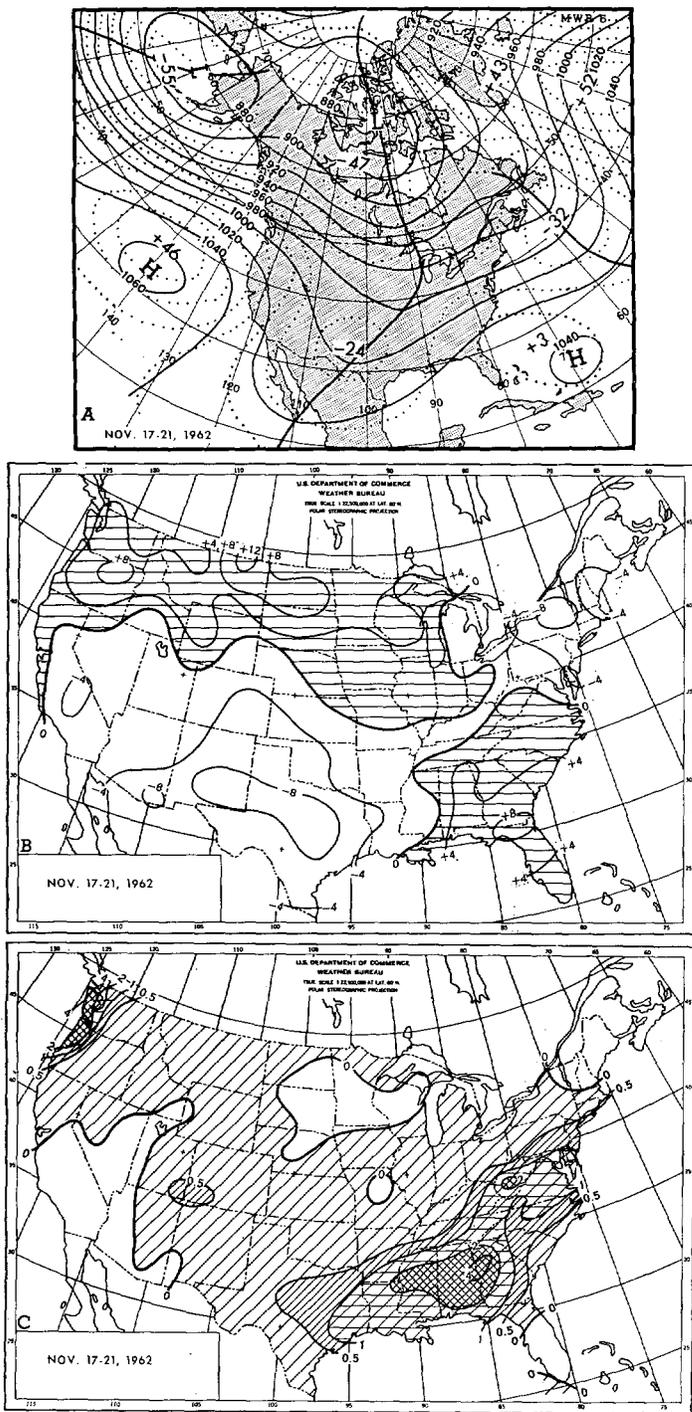


FIGURE 6.—(A) 700-mb. height and departure from normal, (B) surface temperature departure from normal, and (C) total precipitation, all for November 17-21, 1962.

FIGURE 7.—(A) 700-mb. height and departure from normal, (B) surface temperature departure from normal, and (C) total precipitation, all for November 22-26, 1962.

perature records were established in Minnesota and surrounding States during the last week of November.

The long-wave trough over the Southwest (fig. 8A) resulted in moderate rainfall in New Mexico, very heavy rain in Texas (fig. 8C), and cooling over the western coastal States late in the month. The precipitation in the Northwest during the last 5-day period was associated with unusually strong onshore upper-level flow.

6. TROPICAL STORMS

Continuing the trend of the 1962 hurricane season, no tropical storms were reported in the Atlantic Ocean this month, although the stagnant low pressure system off the southeastern coast late in November appeared to be taking on a warm core character on the 30th. However,

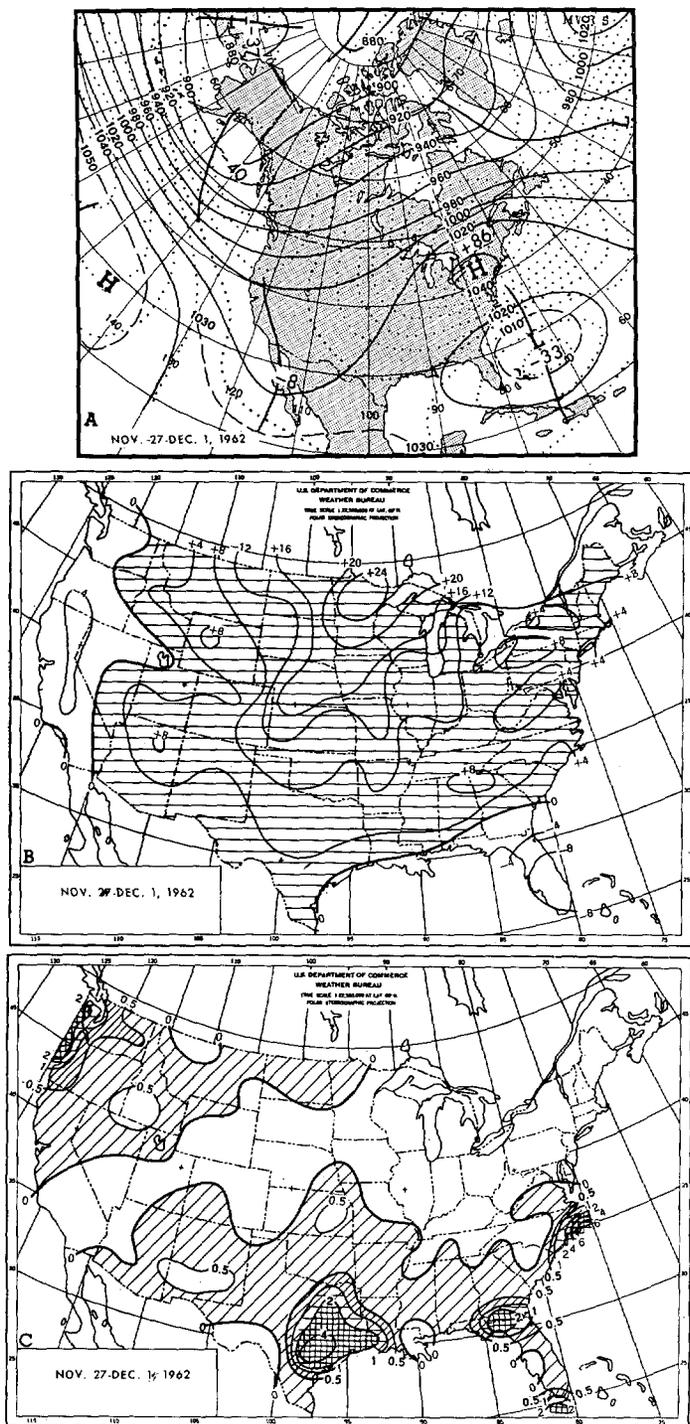


FIGURE 8.—(A) 700-mb. height and departure from normal, (B) surface temperature departure from normal, and (C) total precipitation, all for November 27–December 1, 1962.

later reports in the first days of December did not indicate a warm core for the storm.

Activity in the Pacific was quite different from the Atlantic. A tropical storm was present in the western Pacific during 13 days of the month—Typhoon Karen November 10–17 and Typhoon Lucy November 26–30.

Typhoon Karen formed November 10 near 12° N., 153° E. Karen moved slightly north of west to about

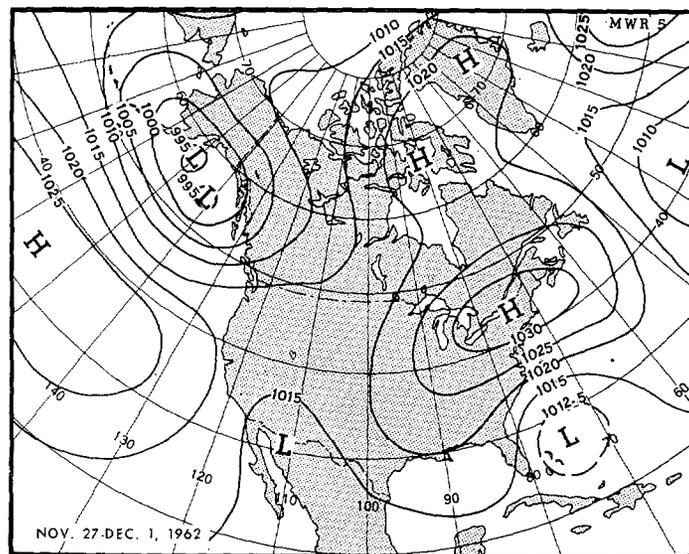


FIGURE 9.—Mean sea level pressure for November 27–December 1, 1962. Comparison with figure 8A shows vertical extent and emphasizes the blocking nature of the east coast pressure patterns.

30° N., 128° E. before recurving sharply to the south of Japan. It then moved east-northeastward and became extratropical near 33° N., 153° E. on the 17th. This storm probably was at its peak intensity as it crossed the island of Guam late on November 11 and during the early morning of the 12th. Wind gusts reached 147 kt. before destroying the anemometer and were estimated over 170 m.p.h. At least six people were killed by Karen and property damage was estimated at \$100 million.

The second Pacific typhoon, Lucy, appeared near 8° N., 131° E. on the 26th. It moved generally westward through the Philippines around 10° N. on the 27th and into the South China Sea where it weakened on the 30th. No major damage was reported as Typhoon Lucy passed through the Philippines.

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