THE WEATHER AND CIRCULATION OF AUGUST 1952 [1]

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WEATHER HIGHLIGHTS

The protracted hot dry spell of July [1], which had centered about Tennessee and affected most of the southeastern States as well as part of New England, was ended decisively in early August. Relief came as a series of cold fronts (with their attendant upper level troughs), penetrated the southern and eastern United States, accompanied by frontal overrunning and extensive shower activity which spread over most of the parched area. In many sections the relief was timely and beneficial, but some crops—early corn and Burley tobacco—were locally beyond help. A number of States were designated "Disaster Areas", thus making individuals eligible for loans guaranteed by the Federal Government, but the aggregate need for such aid was greatly reduced, as the drought was broken.

At the same time, however, severe drought conditions were becoming established in Texas. Only last May this State was reported as being nearly free of drought in all sections for the first time in two years [2]. During succeeding months conditions locally worsened and finally reached a searing climax in August. In many respects this month, for many Texas localities, was even more extreme than the hot dry August of 1951 [3]. Table 1 gives some idea of the highly anomalous temperature regime and the marked moisture deficiency of August 1952. From the number of all time records broken it was not surprising that as the month closed Texas sought classification as a "Disaster Area", in order to become eligible for the government benefits which had already been made available to the eastern drought areas.

TABLE 1.—*Temperature and precipitation data for selected stations in Texas, August 1952*

	Abilene	Austin	Dallas	Fort Worth	Laredo	Waco	Wichita Falls
Number of consecutive days with maximum temperature 100° F. or over	*29	7	*25	25	25	*23	18
Total number of days with maximum temperature 100° F. or over	*29	20	*26	*27	27	24	27
Average mean temperature	*90.1	87.1	90.3	*91.1	89.7	88.8	*91.1
Departure of mean temperature from normal	+9.8	+3.3	+6.8	+8.4	+2.8	+3.4	+5.2
Total monthly precipitation	.02	0	.27	.44	0	T	.24
Percent of normal precipitation	1	0	10	17	0	0	11

*Record for any month.

Another noteworthy feature of this month's weather was the first tropical storm of the season, which was initially reported north of Puerto Rico on August 27. This storm moved northwestward to a point about 150 miles east of Jacksonville, Fla., on the 29th. Full recurvature apparently was prohibited by a strong Bermuda High extending west-northwestward over the Middle Atlantic States. Subsequently the storm struggled north-northwestward and struck the coast south of Charleston, S. C. The center proved small but contained winds up to 75 m. p. h. as it started to move northward up the Atlantic coastal plain. As August ended, strong winds, torrential rains, and squalls (including a small tornado at Franconia, Va.) were affecting a wide area.[2]

THE BROAD SCALE CIRCULATION PATTERN

The monthly mean circulation pattern (fig. 1) shows the major North American trough at 700 mb. just east of Hudson Bay. At higher latitudes (north of 50° N.) this trough was part of a well-defined wave system of large amplitude and long wave length. At lower latitudes in the United States, there were a number of ill-defined troughs. The important features of the circulation in the United States were the penetration of the westerlies to the Gulf of Mexico, the relatively straight westerly flow over most of the country, and the narrow ridge extending west-northwestward from the Gulf of Mexico across Texas to the Southwest. Other significant features in more remote areas are also shown in figure 1.

The monthly mean 200-mb. map for August (fig. 2) presents much the same features as figure 1 but with greater simplicity and some changes in emphasis. For instance, the troughs in both the eastern Atlantic and eastern Pacific were more prominent circulation features at 200 than at 700 mb. Also, the weak (probably foehn) trough over eastern Colorado at 700 mb. was missing at higher elevations; but, the westerlies at 200 mb. extended no farther southward toward the Gulf of Mexico than they did at 700 mb. As noted in July [1], the western Pacific High seemed to be displaced far westward with increasing elevation, while the eastern lobe showed little or no displacement with elevation.

Apart from the sinusoidal aspects of figure 2, one notes the strong almost zonal west wind band which presumably

[1] See Charts I–XV following p. 143 for analyzed climatological data for the month.

[2] See adjoining article by R. B. Ross for further details about this hurricane.

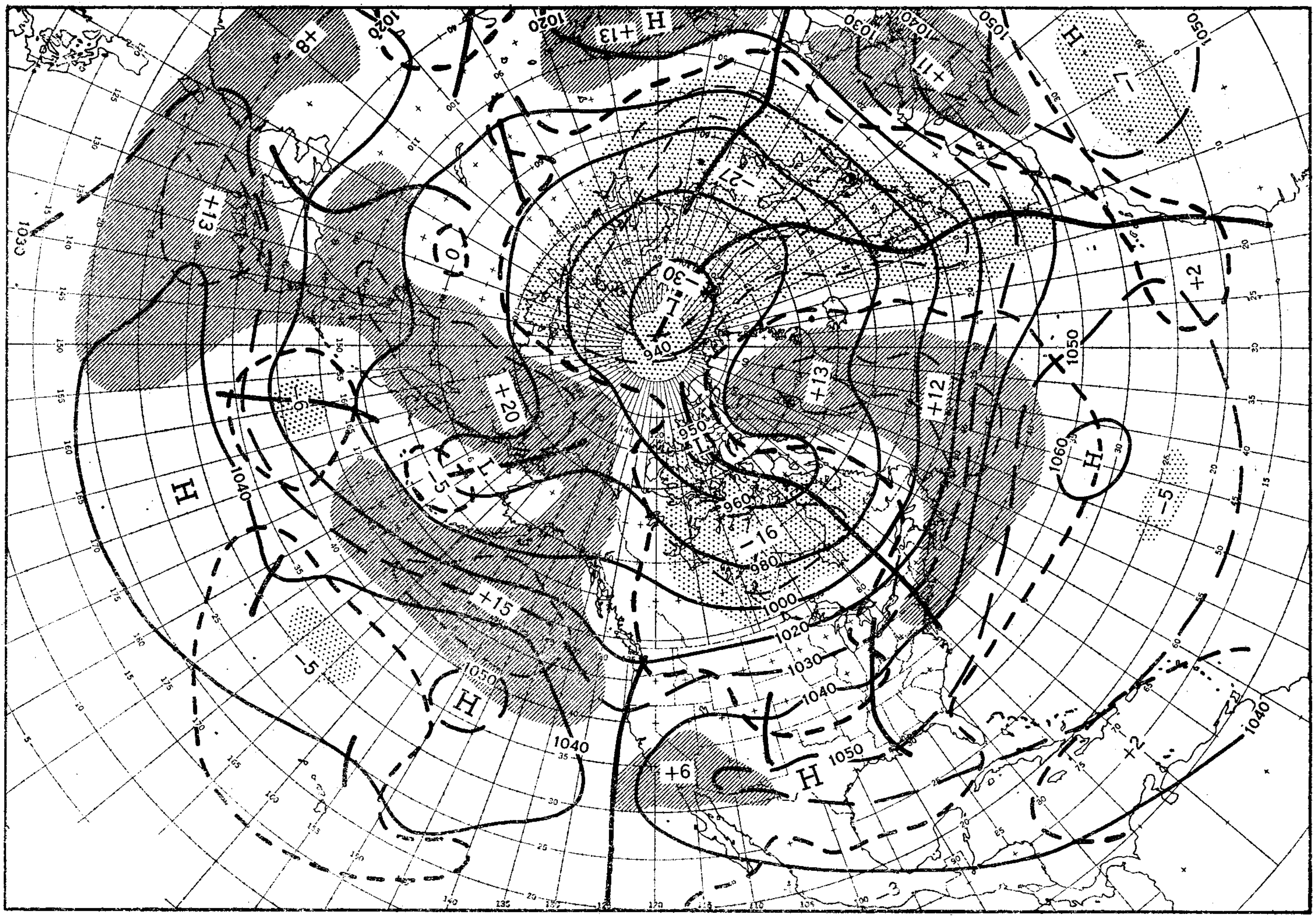


FIGURE 1.—Mean 700-mb. chart for the 30-day period August 2–31, 1952. Contours at 200-foot intervals are shown by solid lines, intermediate contours by lines with long dashes, and 200-mb. height departures from normal at 100-foot intervals by lines with short dashes with the zero isopleth heavier. Anomaly centers and contours are labeled in tens of feet. Minimum latitude trough locations are shown by heavy solid lines. Areas with 700-mb. height anomalies in excess of +50 feet are hatched; areas with anomalies less than −50 feet are stippled.

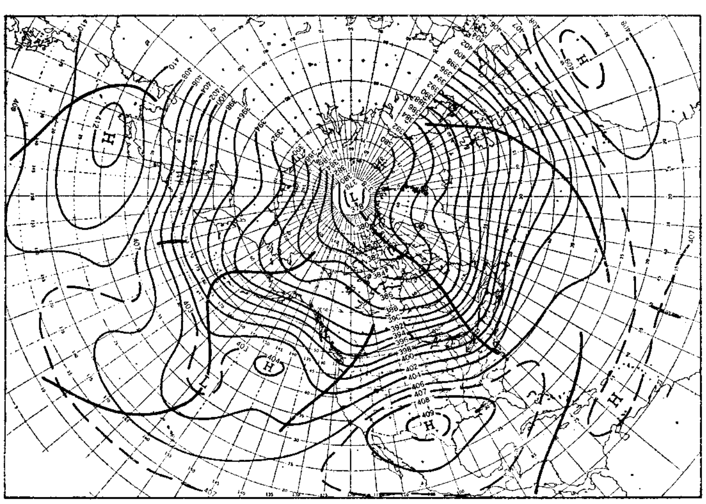


FIGURE 2.—Mean 200-mb. chart for the 30-day period August 2–31, 1952. Contours at 200-foot intervals are shown by solid lines, intermediate contours by dashed lines and minimum latitude trough locations by heavy solid lines. Contours are labeled in hundreds of feet.

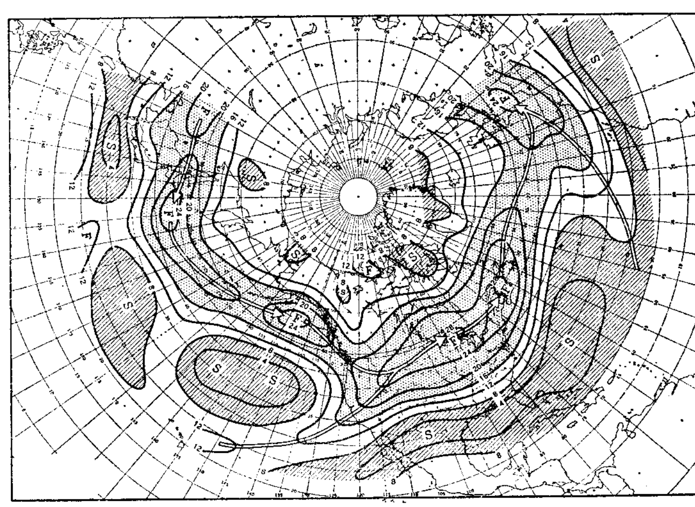


FIGURE 3.—Mean geostrophic (total horizontal) wind speed at 200 mb. for the 30-day period August 2–31, 1952. Solid lines are isotachs at intervals of 4 m/sec. Arrowed lines delineate the axes of maximum wind speed or "jets." Centers of maximum and minimum wind speeds are denoted by "F" and "S" respectively. Areas with speeds in excess of 16 m/sec. are stippled; areas with speeds less than 8 m/sec. are hatched.

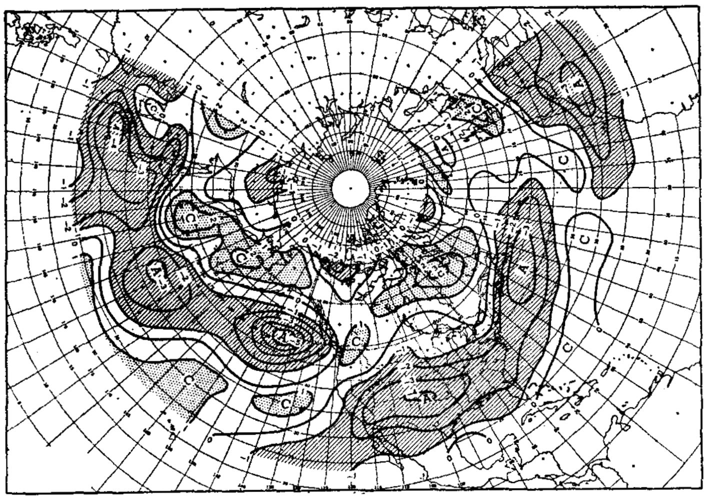


FIGURE 4.—Mean relative geostrophic vorticity (horizontal component about the vertical) at 200 mb. for the 30-day period August 2–31, 1952. Isopleths at intervals of $1\times10^{-5}sec^{-1}$ are shown by solid lines. Centers of anticyclonic and cyclonic vorticity are labeled "A" and "C" respectively. Areas of cyclonic vorticity in excess of $1\times10^{-5}sec^{-1}$ are stippled; areas of anticyclonic vorticity less than $-1\times10^{-5}sec^{-1}$ are hatched.

girdled the hemisphere at upper levels. The 200-mb. isotach analysis, figure 3, shows that the speed of the mean "jet" near 50° N. latitude averaged more than 60 m. p. h. (27 m. p. s.) in some areas. The zonal orientation, as well as the strong horizontal wind shear on either side of the jet axis, is evident in figure 3. As in July [1], there were secondary axes of maximum wind speed associated with the eastern oceanic troughs, although no split jet was evident over western Europe in August as it had been in July. The isotach analysis at 700 mb. (not shown) contained similar features north of 45° N., but the lower latitudes differed considerably, in the sense that could be anticipated by comparing figures 1 and 2. Both the maximum wind speeds and the horizontal wind shear at 700 mb. appeared to be less than half that at 200 mb.

Analysis of the relative vorticity at the 200-mb. level, is shown in figure 4. When the height patterns are of relatively small amplitude and the horizontal wind shear is well marked, then the jet axis delineates quite closely the separation of cyclonic from anticyclonic (relative) vorticity. In this case the zonal belts of anticyclonic vorticity south of the mean jet and cyclonic vorticity north of it were well marked. The only two extensions of the cyclonic vorticity southward into low latitudes occurred in connection with the eastern oceanic troughs. At extremely low latitudes cyclonic vorticity was fairly common in the easterlies south of the sub-tropical ridge line.

The area of the United States was the scene of strong anticyclonic vorticity with a center over the Texas Panhandle and a zonal axis extending from California to the Carolinas. Canada, on the contrary, was under the influence of cyclonic vorticity north of the jet with the maximum centered just east of Hudson Bay in the mean trough (figs. 1 and 2). The analysis of relative vorticity at 700 mb. was essentially similar, but showed considerably weakened extremes and much less anticyclonic vorticity over the Central Plains and Florida.

SURFACE WEATHER RELATED TO MEAN CIRCULATION

The North American anticyclone tracks (Chart IX) show that, almost without exception, the sea level Highs passed eastward near or just south of the upper level wind speed maxima in the Upper Lakes and the Gulf of St. Lawrence. Their occurrence north of these wind speed centers, in the area of strong relative cyclonic vorticity, was quite rare as was also noted in July [1]. For the most part the anticyclones came southeastward through Alberta or originated in southeastern Alberta and traveled east-southeastward through the Northern Plains and thence northeastward. As might be expected from the strong center of anticyclonic vorticity (fig. 4) the eastern Pacific anticyclone (Charts IX and XI) was stronger than normal and relatively persistent.

The cyclone tracks (Chart X), while less concentrated than those for the anticyclones, are nevertheless amenable to reasonable generalization. The area of most frequent cyclonic activity seemed to be eastern Hudson Bay, under the center of cyclonic vorticity (fig. 4). Storms entered this area mainly from the west and from the southwest. Another secondary storm track was evident from the South Dakota-Kansas area east-northeastward through Michigan and Quebec. This latter track was probably associated with the weak 700-mb. troughs over the central United States (fig. 1) and the deformation of the anticyclonic vorticity field (fig. 4) in this same area.

The net effect of these circulation features was to produce a generally warm temperature regime in the United States (Chart I, A, and B). Successive penetrations of the United States by cold fronts accompanied frequent anticyclone passages and resulted in near to below normal temperatures in the upper Mississippi Valley and a portion of the Middle Atlantic States. The precipitation and cloudiness attending this activity and the cyclonic circulation at 700 mb. also contributed to the near or slightly above normal temperatures over the eastern third of the country. Of some importance was the fact that most of the highs which traversed this region were of continental origin. During summer this usually implies only relatively mild invasions of cool air followed by rapid warming due to intense insolation under the anticyclonic regime. After the extreme heat of July, August temperatures afforded real and welcome relief.

The western half of the country experienced generally above normal temperatures except for the extreme West Coast and the Northern Rockies. There were two centers of positive temperature anomaly: southeastern Nevada, which had temperatures averaging 6° F. above normal, and northern Texas, where the monthly normals were exceeded by 8° F. The cool regime of the West Coast was attributable to a combination of sea breeze and occasional intrusions of cool Pacific air due to intensifications of the West Coast trough. The warm center in Nevada was a reflection of the persistent anticyclonic regime with above normal heights aloft. Absence of showers and their attendant cloudiness (Chart VI) were also concomitant with ridge conditions in this area. Relatively cooler conditions prevailed over eastern Arizona, western New Mexico, and north-northeastward through the Rocky Mountains. In this area a weak 700-mb. trough was associated with shower activity in the western moist tongue. Cloudiness (Chart VI–B) accompanying this activity effectively reduced mean temperatures in the Rocky Mountain States. At both 700 and 200 mb. Texas was the seat of a strong anticyclone and the center of strong anticyclonic relative vorticity. The persistence of these conditions was outstanding; the resulting anomalies were considered separately in the first section of this article.

Precipitation was near to above normal over a large area (Charts II and III) which covered the Northern and Central Plains, the Middle and Upper Mississippi Valley, the Ohio Valley, and most of the Atlantic Coast States and Alabama. The breaking of the drought in the East can be readily associated with the mean 700-mb. trough in the Mississippi Valley and the strong southward displacement of the subtropical ridge into the Gulf of Mexico. In the area of generally cyclonic circulation, moisture of Gulf and Atlantic origin was released in fairly copious amounts. Cold front penetrations and a few abortive wave formations provided the mechanisms for the rainfall. In North Central United States weak trough activity in the area of below normal heights at 700 mb. was associated with the local cyclogenesis previously described. These perturbations released considerable amounts of moisture which had reached the area either from the far Southwest or by a more direct trajectory from the Gulf of Mexico.

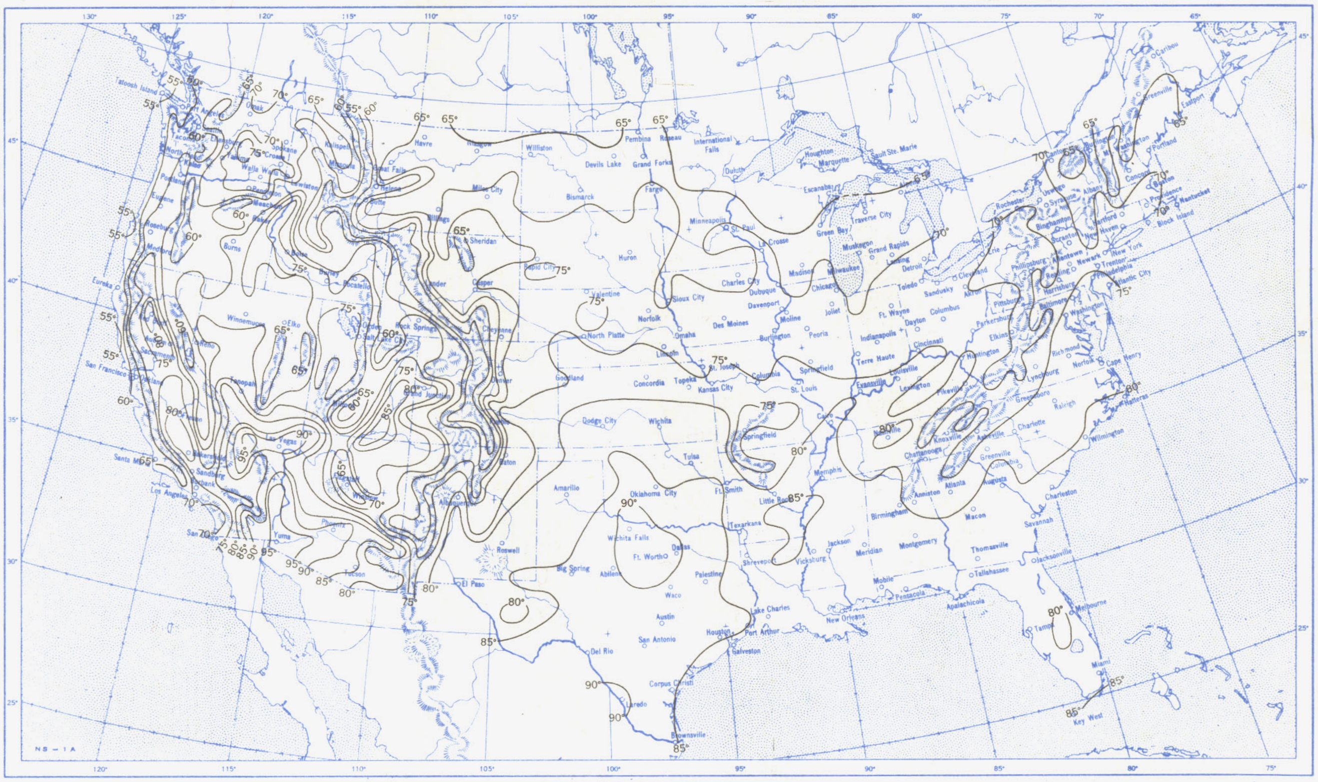
The Southern Plains, Texas, and the Lower Mississippi Valley were dry as they remained under anticyclonic circulation aloft or, occasionally, were subjected to dry foehn winds as the westerlies penetrated farther south. The Far West also experienced below normal precipitation under the upper level ridge, except for the extreme West Coast where the mean trough was responsible for some above normal precipitation. The shower activity of Arizona and New Mexico averaged somewhat less than normal as might be expected from the westward extension of a 700-mb. ridge over this area. Nevertheless, the cloudiness (Chart VI–B) was apparently persistent enough to affect the temperatures as previously indicated.

After the devastating weather of July, August was an excellent agricultural month over much of the country. Far more crop recovery was made in the eastern States than had ever been deemed likely. The major corn belt of the Midwest was experiencing one of its best growing seasons with a bumper harvest in sight. Prospects were that 95 percent of the crop would mature before the normal occurrence of the first frost. In the South and the extreme Northeast crop prospects were well below normal but much improved. Only in Mississippi did the July drought continue during August, but the rapid development of critical drought conditions in Texas became a new source of concern.

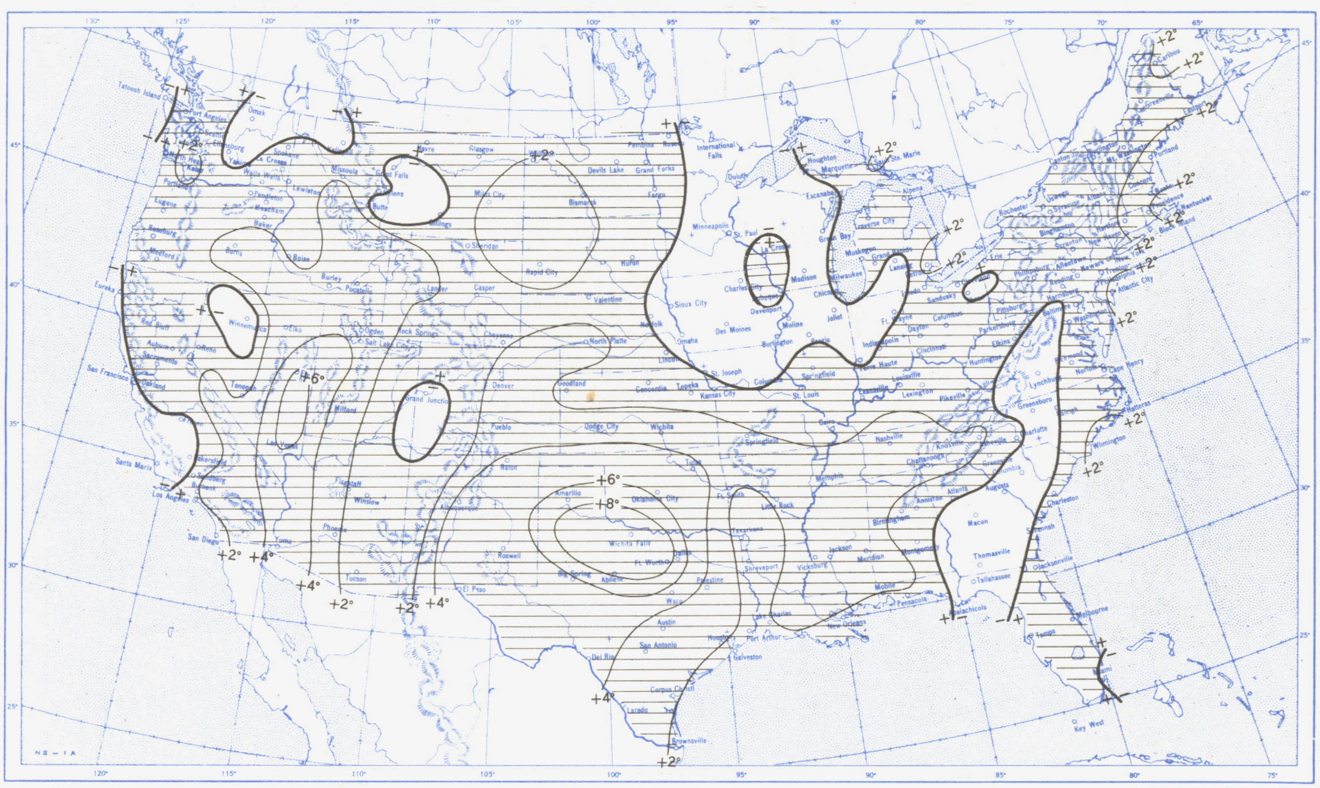
REFERENCES

1. W. H. Klein, "The Weather and Circulation of July 1952, A Month with Drought," *Monthly Weather Review*, vol. 80, No. 7, July 1952, pp. 118–122.
2. H. F. Hawkins, Jr., "The Weather and Circulation of May 1952, Including a Study of Some Recent Periodicities," *Monthly Weather Review*, vol. 80, No. 5, May 1952, pp. 82–87.
3. V. J. Oliver, "The Weather and Circulation of August 1951," *Monthly Weather Review*, vol. 79, No. 8, Aug. 1951, pp. 160–162.

Chart I. A. Average Temperature (°F.) at Surface, August 1952.

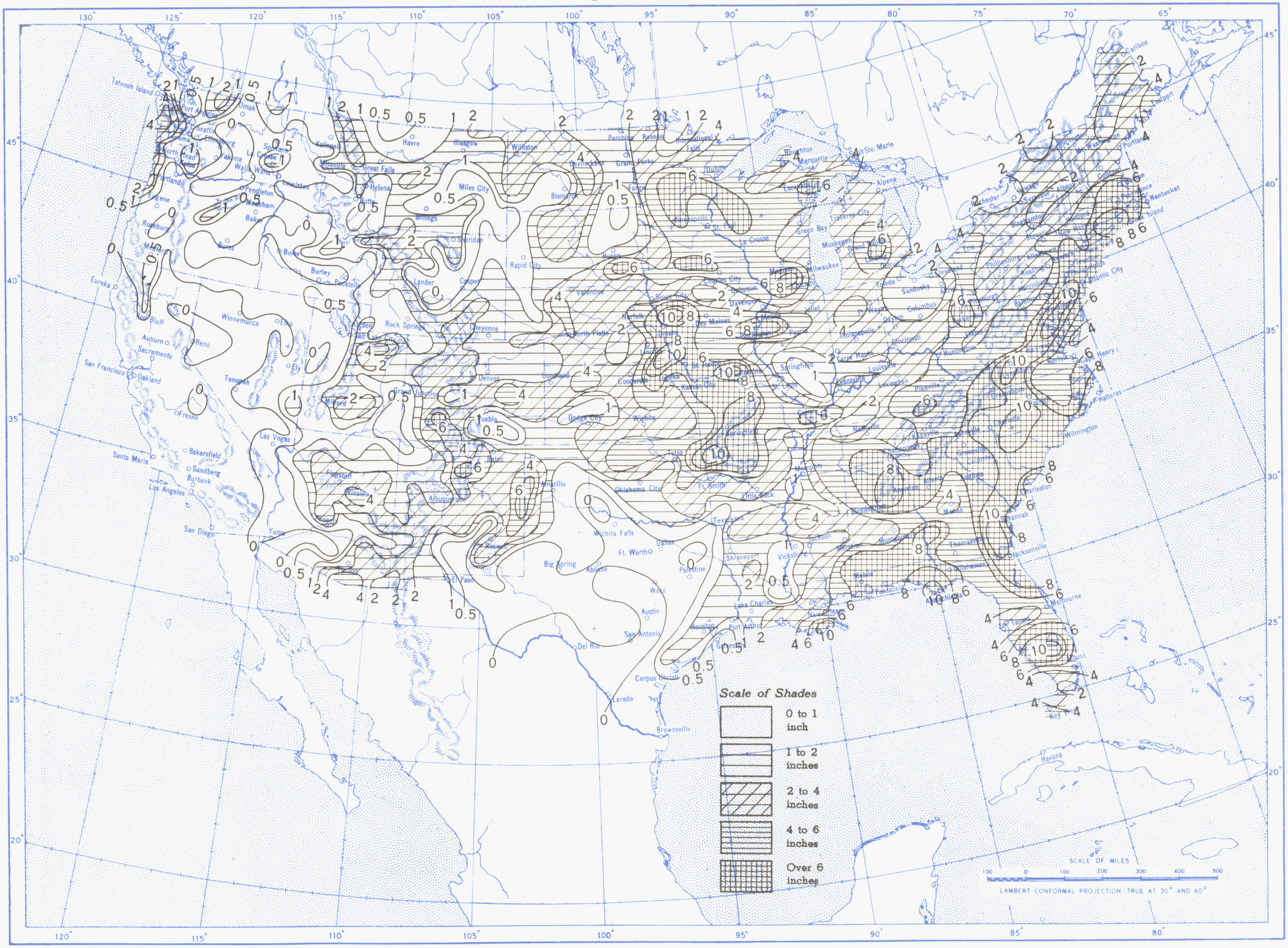


B. Departure of Average Temperature from Normal (°F.), August 1952.



A. Based on reports from 800 Weather Bureau and cooperative stations. The monthly average is half the sum of the monthly average maximum and monthly average minimum, which are the average of the daily maxima and daily minima, respectively.
B. Normal average monthly temperatures are computed for Weather Bureau stations having at least 10 years of record.

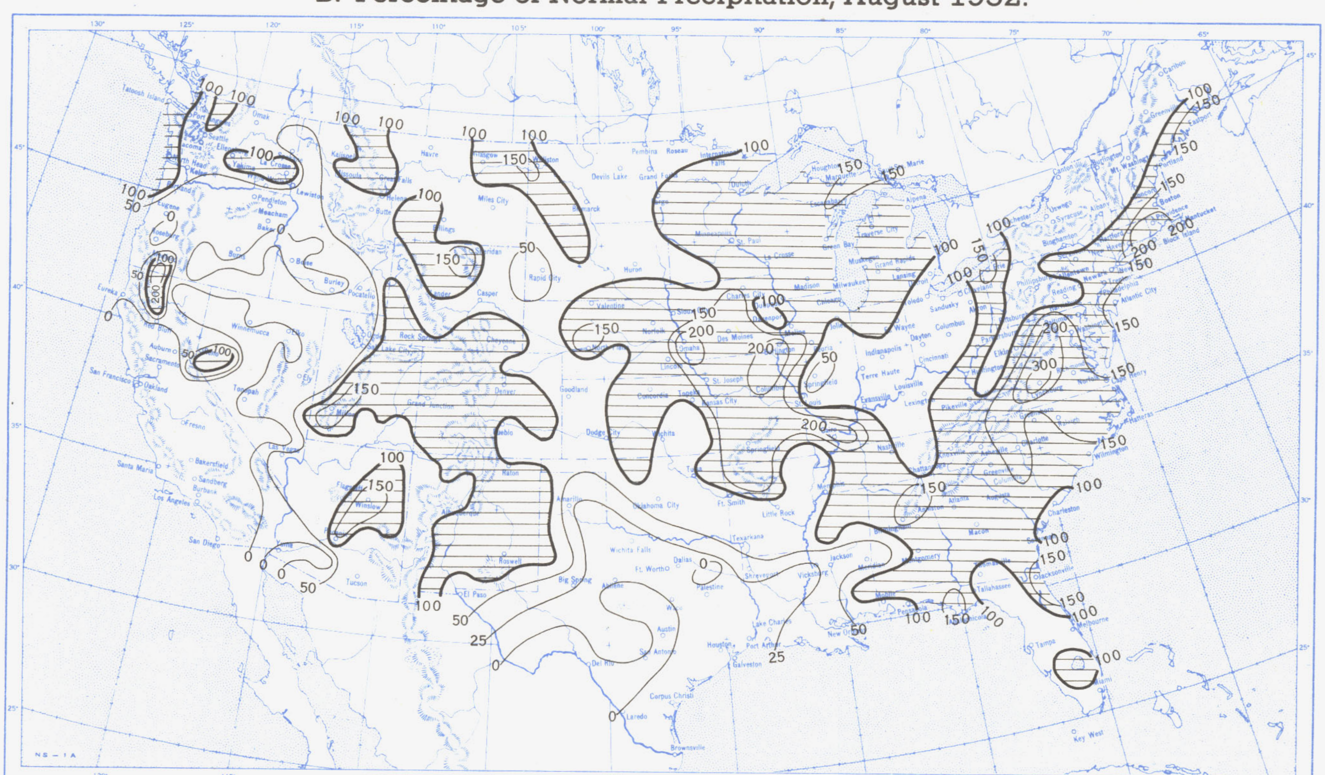
Chart II. Total Precipitation (Inches), August 1952.



Based on daily precipitation records at 800 Weather Bureau and cooperative stations.

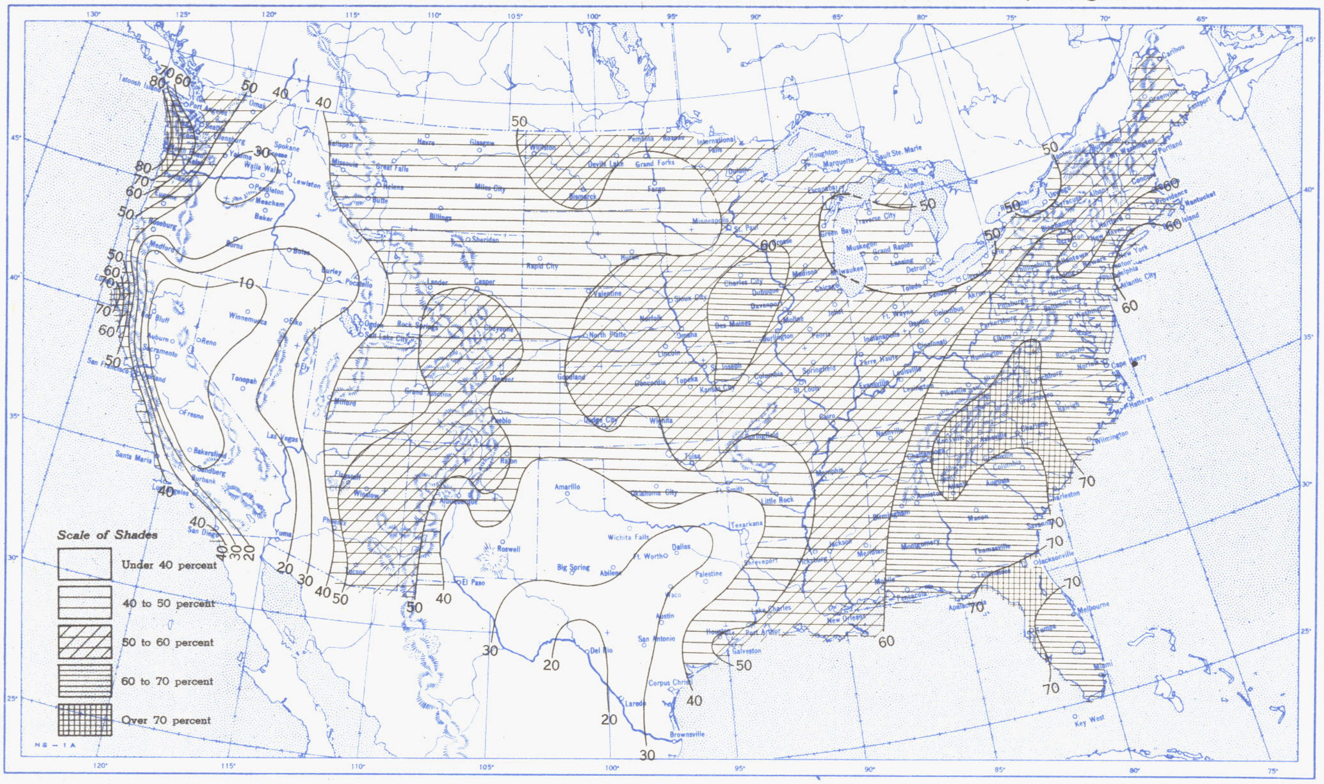
Chart III. A. Departure of Precipitation from Normal (Inches), August 1952.

B. Percentage of Normal Precipitation, August 1952.

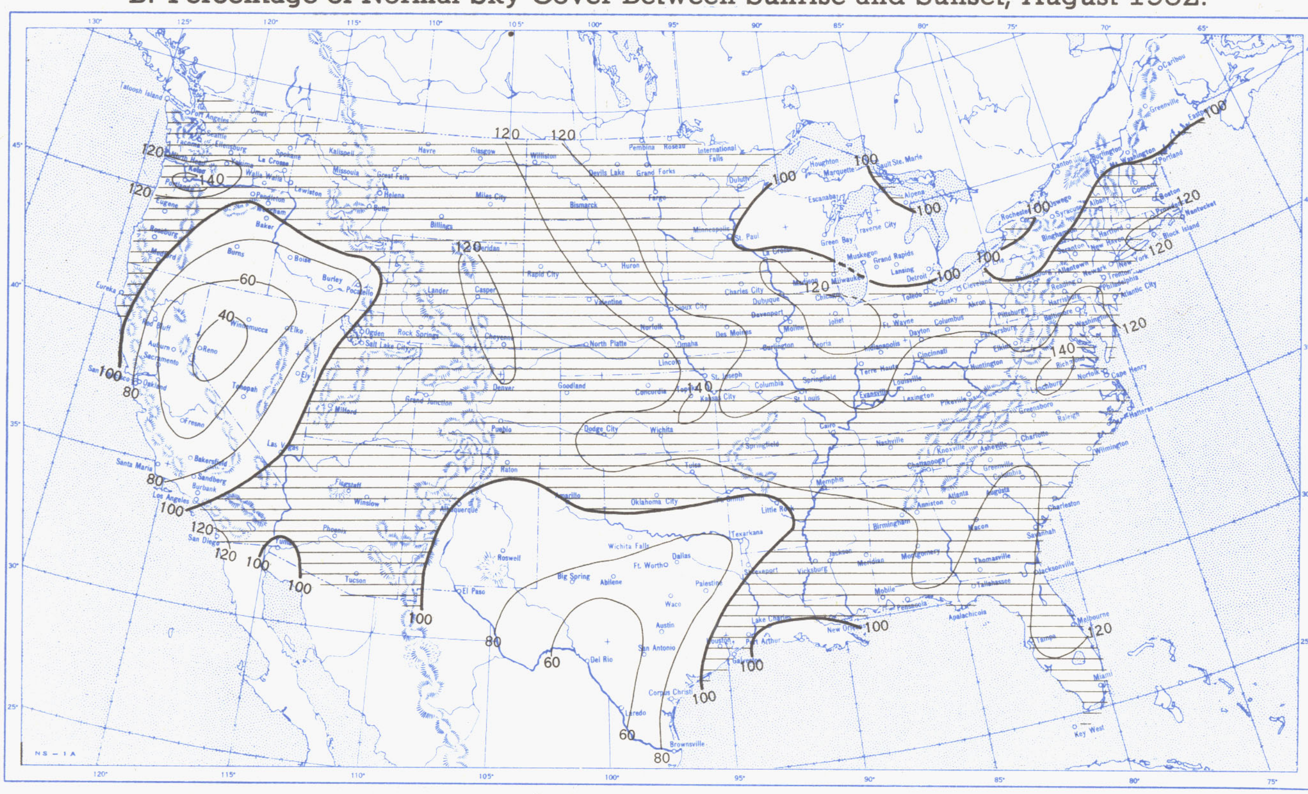


Normal monthly precipitation amounts are computed for stations having at least 10 years of record.

Chart VI. A. Percentage of Sky Cover Between Sunrise and Sunset, August 1952.

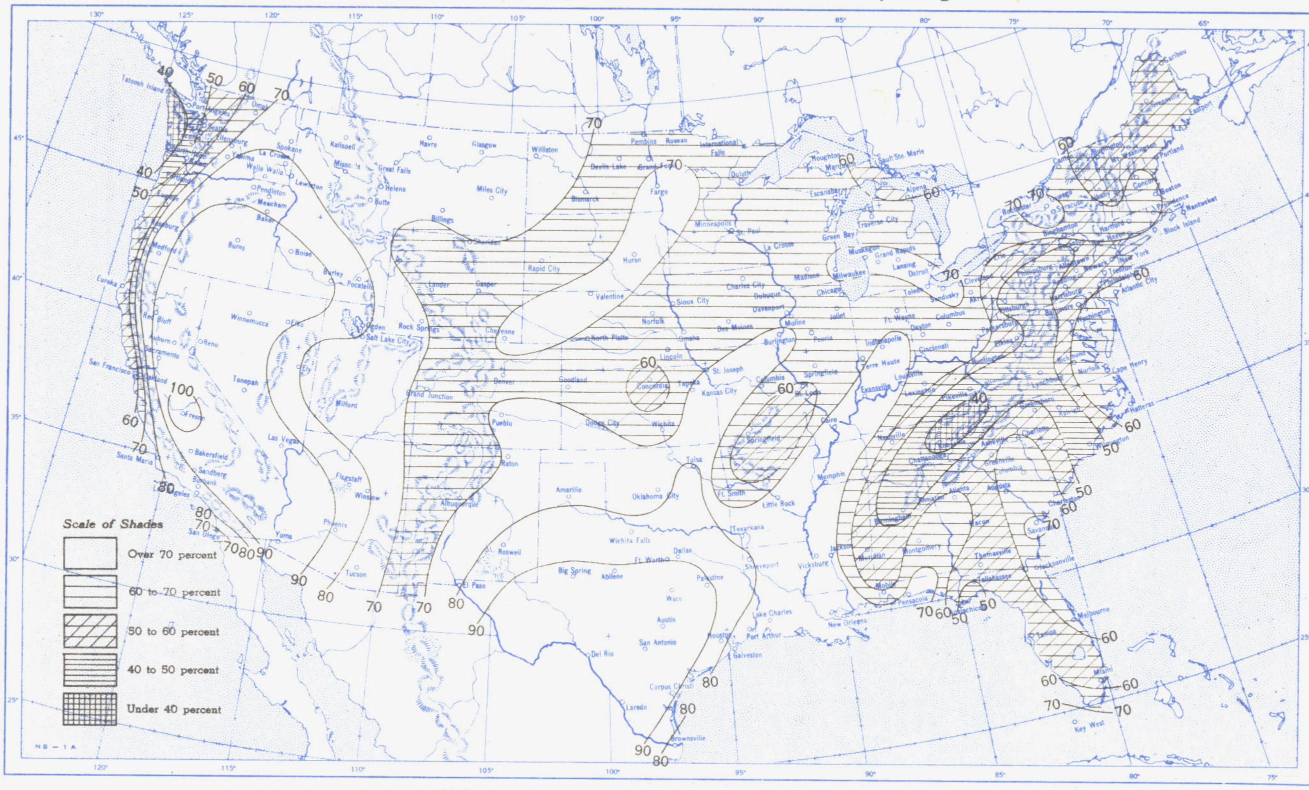


B. Percentage of Normal Sky Cover Between Sunrise and Sunset, August 1952.

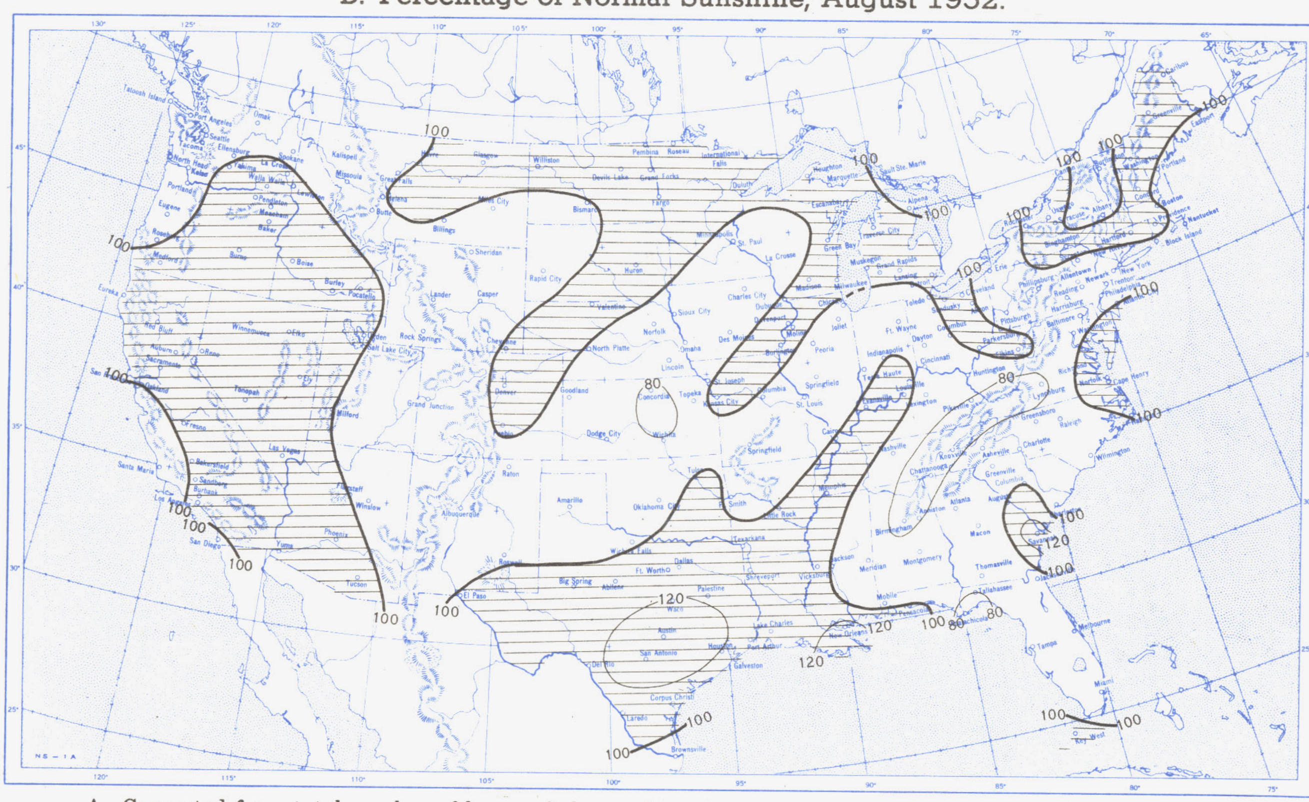


A. In addition to cloudiness, sky cover includes obscuration of the sky by fog, smoke, snow, etc. Chart based on visual observations made hourly at Weather Bureau stations and averaged over the month. B. Computations of normal amount of sky cover are made for stations having at least 10 years of record.

Chart VII. A. Percentage of Possible Sunshine, August 1952.



B. Percentage of Normal Sunshine, August 1952.



A. Computed from total number of hours of observed sunshine in relation to total number of possible hours of sunshine during month. B. Normals are computed for stations having at least 10 years of record.

Chart VIII. Average Daily Values of Solar Radiation, Direct + Diffuse, August 1952. Inset: Percentage of Normal Average Daily Solar Radiation, August 1952.

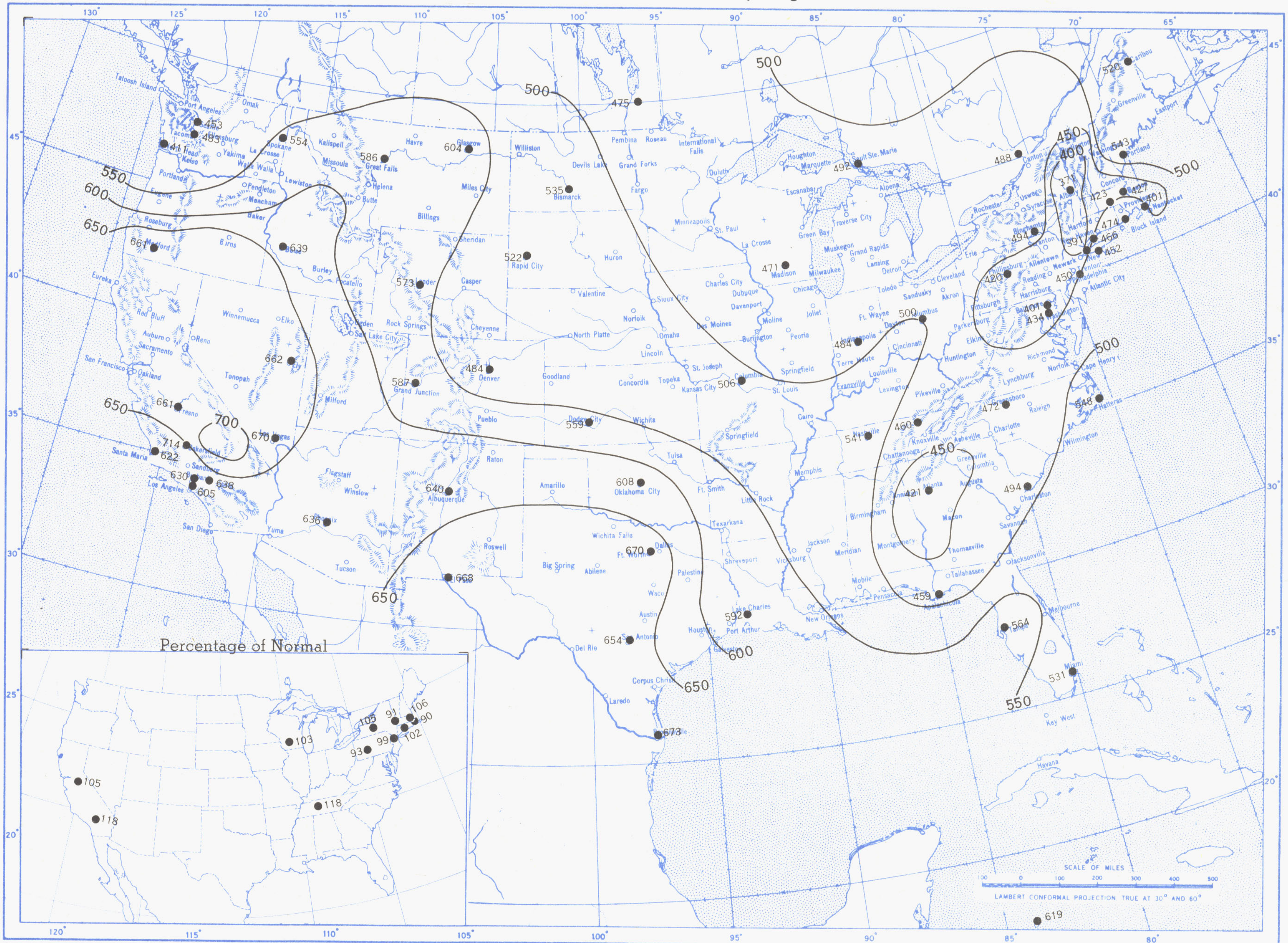
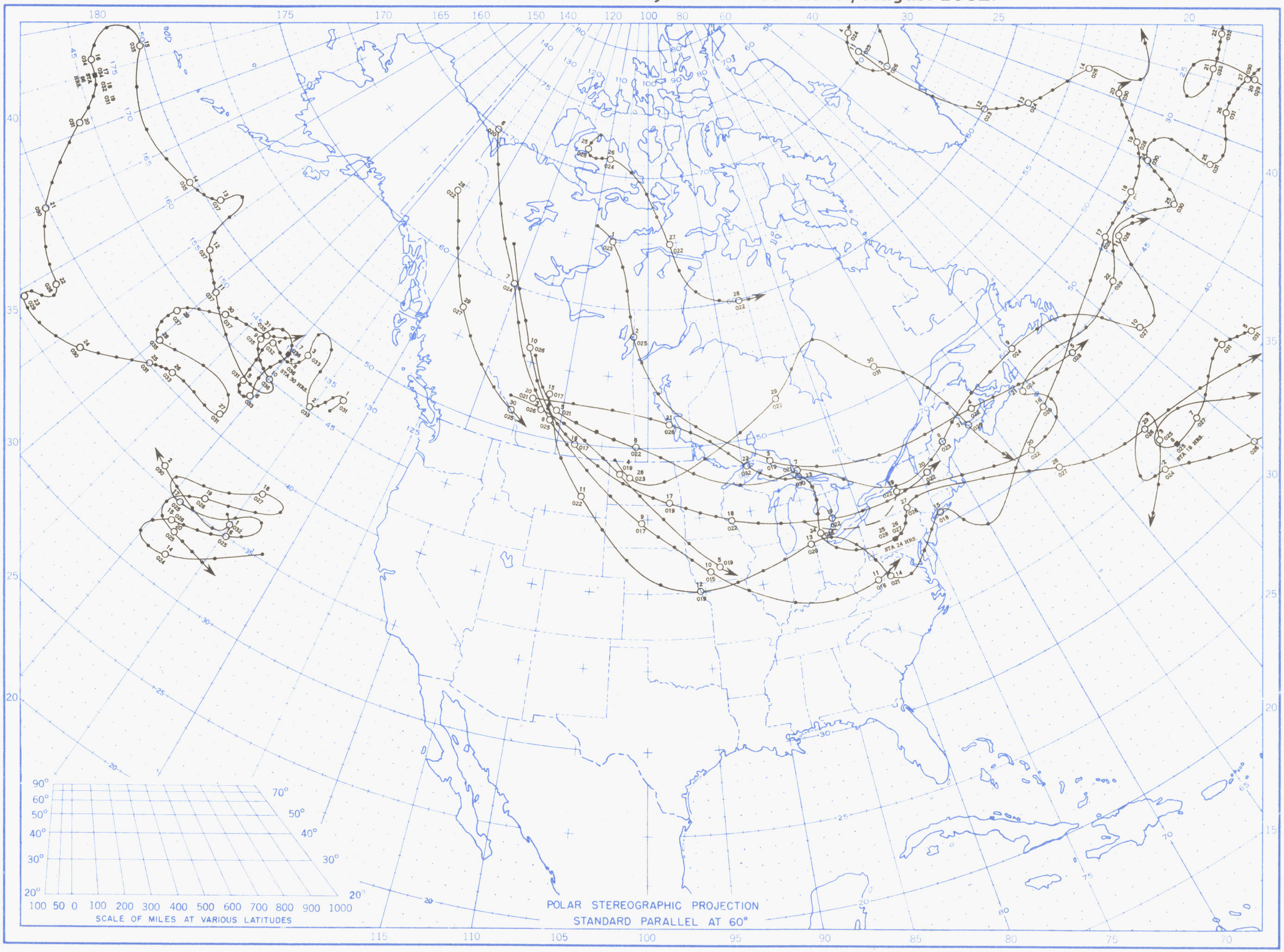


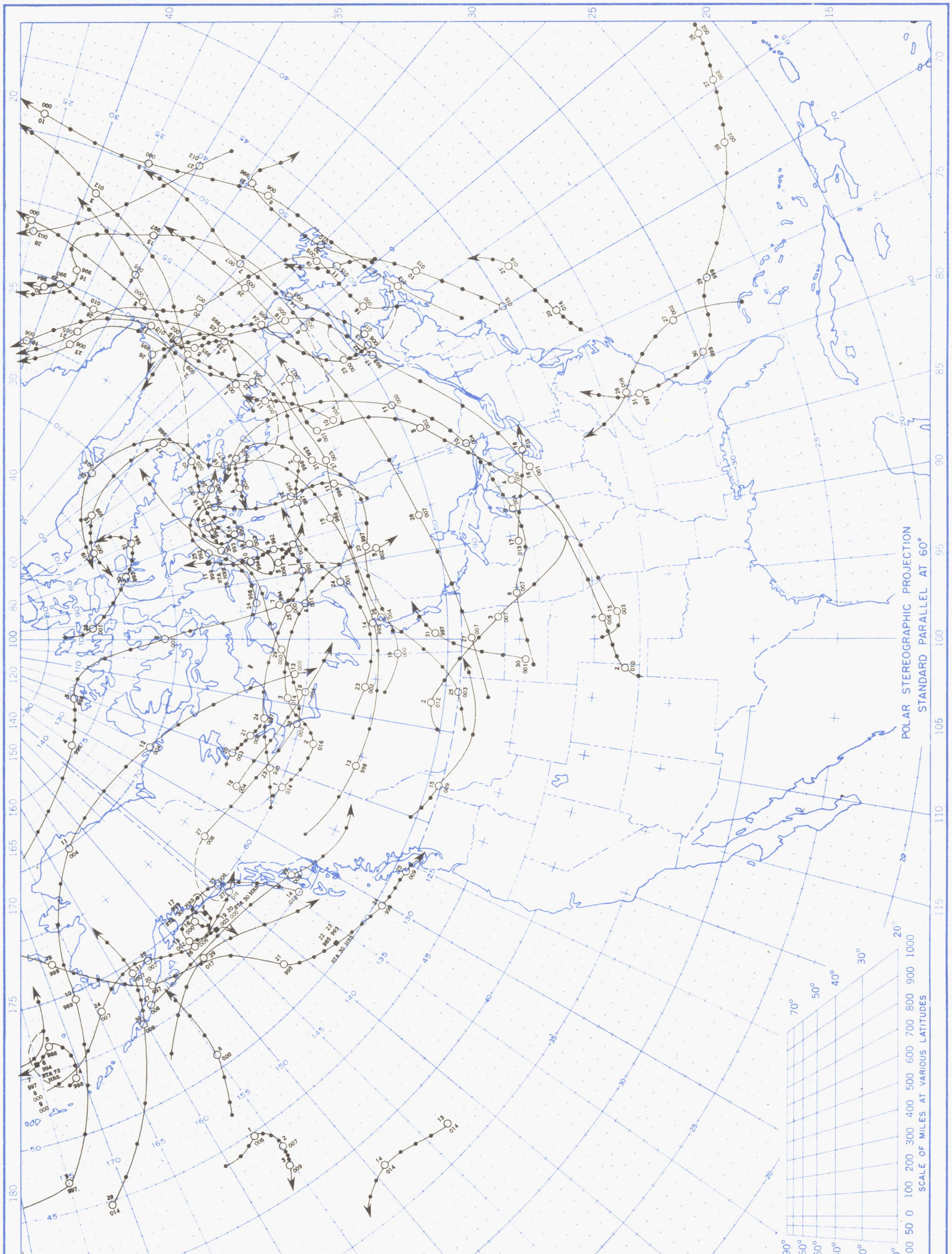
Chart shows mean daily solar radiation, direct + diffuse, received on a horizontal surface in langleys (1 langley = 1 gm. cal. cm.$^{-2}$). Basic data for isolines are shown on chart. Further estimates are obtained from supplementary data for which limits of accuracy are wider than for those data shown. Normals are computed for stations having at least 9 years of record.

Chart IX. Tracks of Centers of Anticyclones at Sea Level, August 1952.



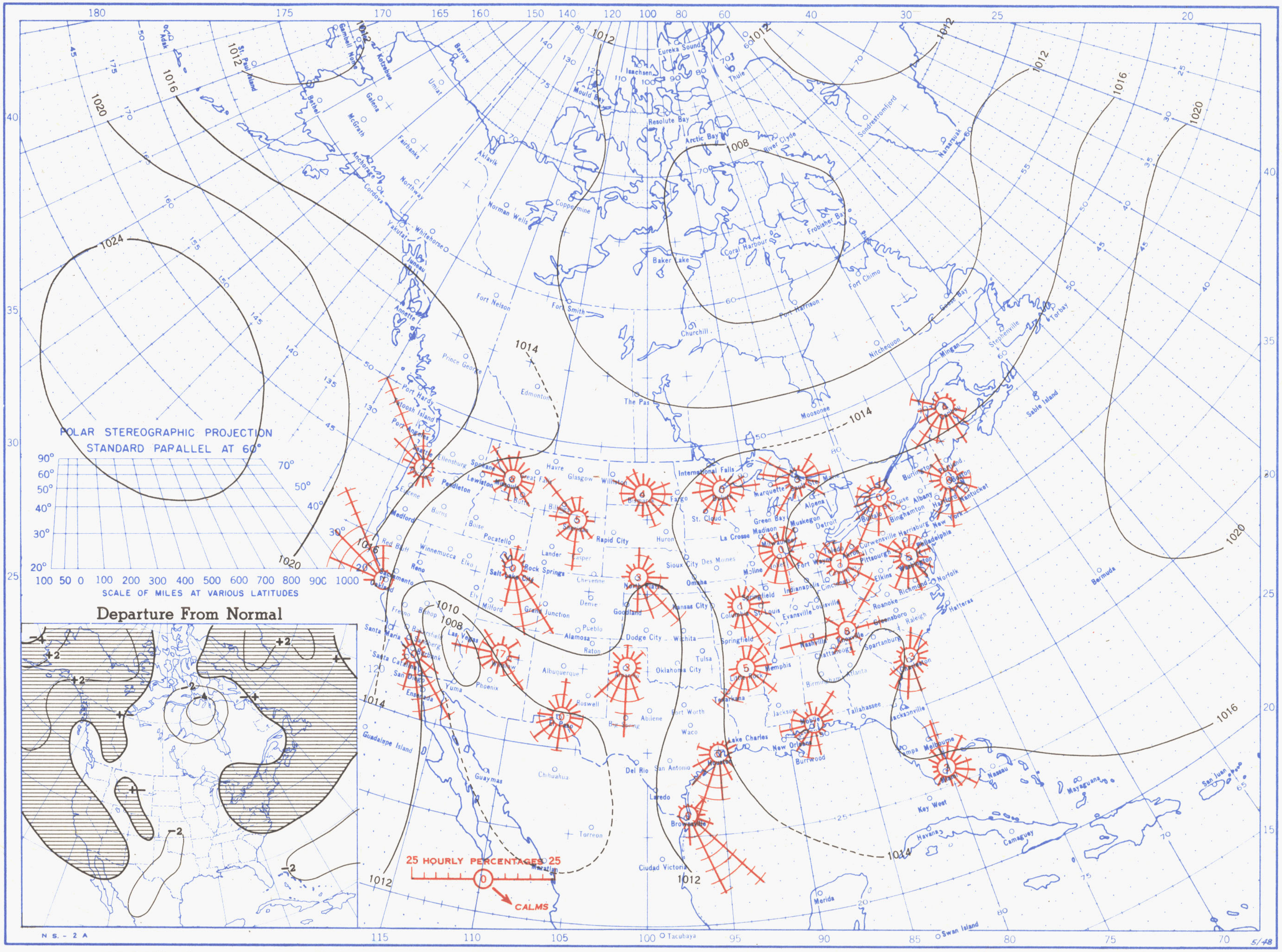
Circle indicates position of center at 7:30 a. m. E. S. T. Figure above circle indicates date, figure below, pressure to nearest millibar. Dots indicate intervening 6-hourly positions. Squares indicate position of stationary center for period shown. Dashed line in track indicates reformation at new position. Only those centers which could be identified for 24 hours or more are included.

Chart X. Tracks of Centers of Cyclones at Sea Level, August 1952.



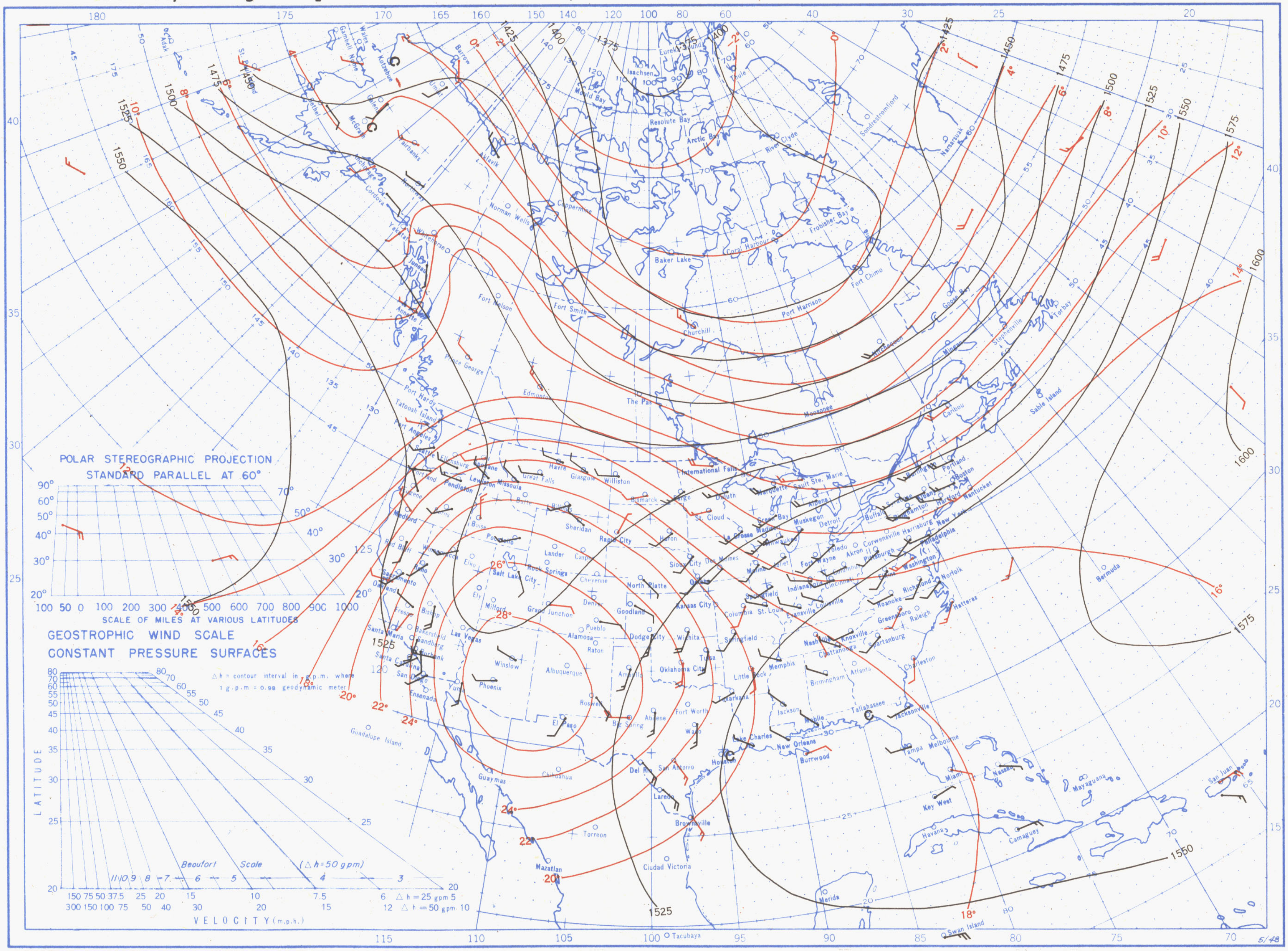
Circle indicates position of center at 7:30 a. m. E. S. T. See Chart IX for explanation of symbols.

Chart XI. Average Sea Level Pressure (mb.) and Surface Windroses, August 1952. Inset: Departure of Average Pressure (mb.) from Normal, August 1952.



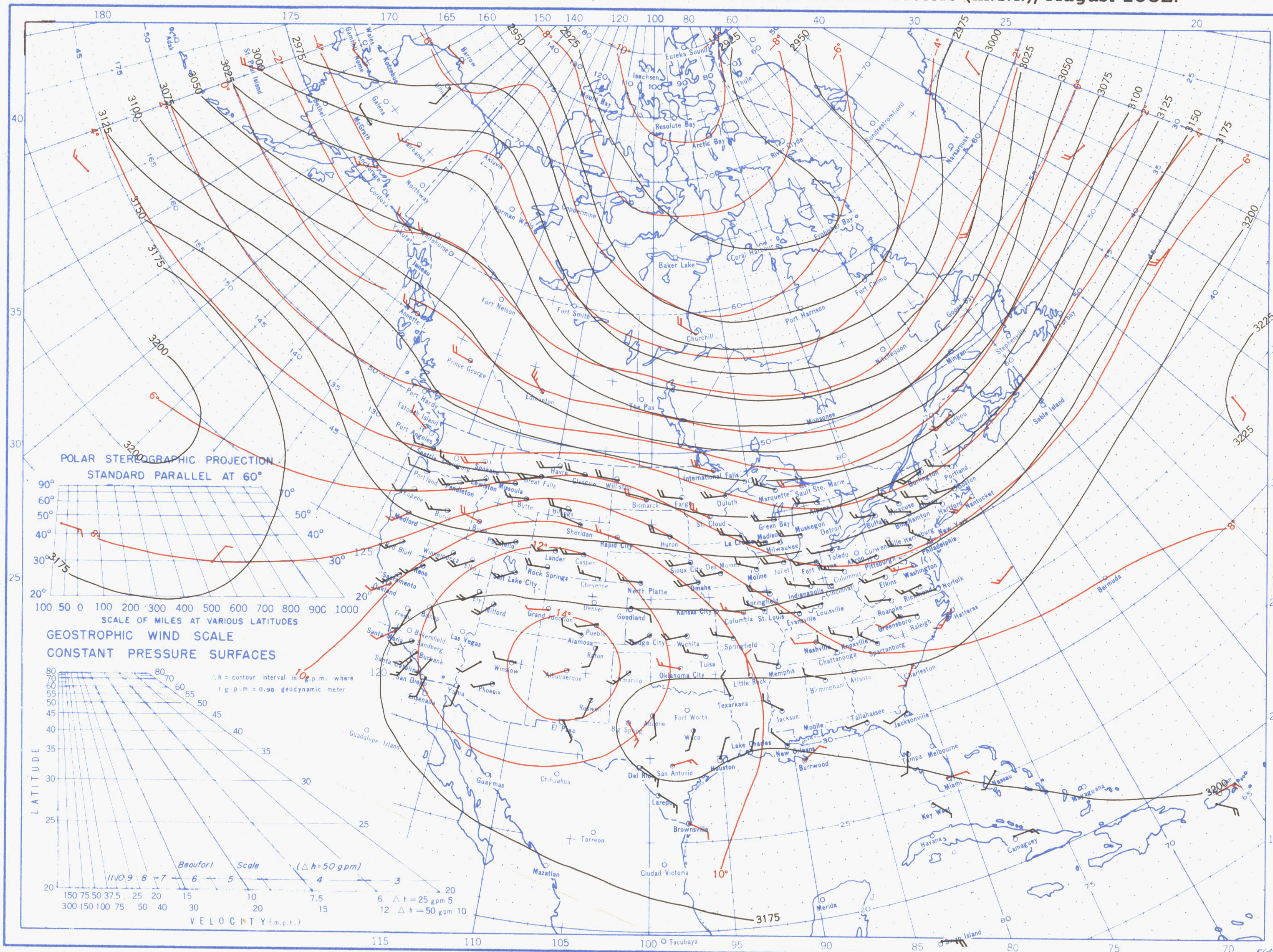
Average sea level pressures are obtained from the averages of the 7:30 a. m. and 7:30 p. m. E. S. T. readings. Windroses show percentage of time wind blew from 16 compass points or was calm during the month. Pressure normals are computed for stations having at least 10 years of record and for 10° intersections in a diamond grid based on readings from the Historical Weather Maps (1899-1939) for the 20 years of most complete data coverage prior to 1940.

Chart XII. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 850-mb. Pressure Surface, Average Temperature in °C. at 850 mb., and Resultant Winds at 1500 Meters (m.s.l.), August 1952.



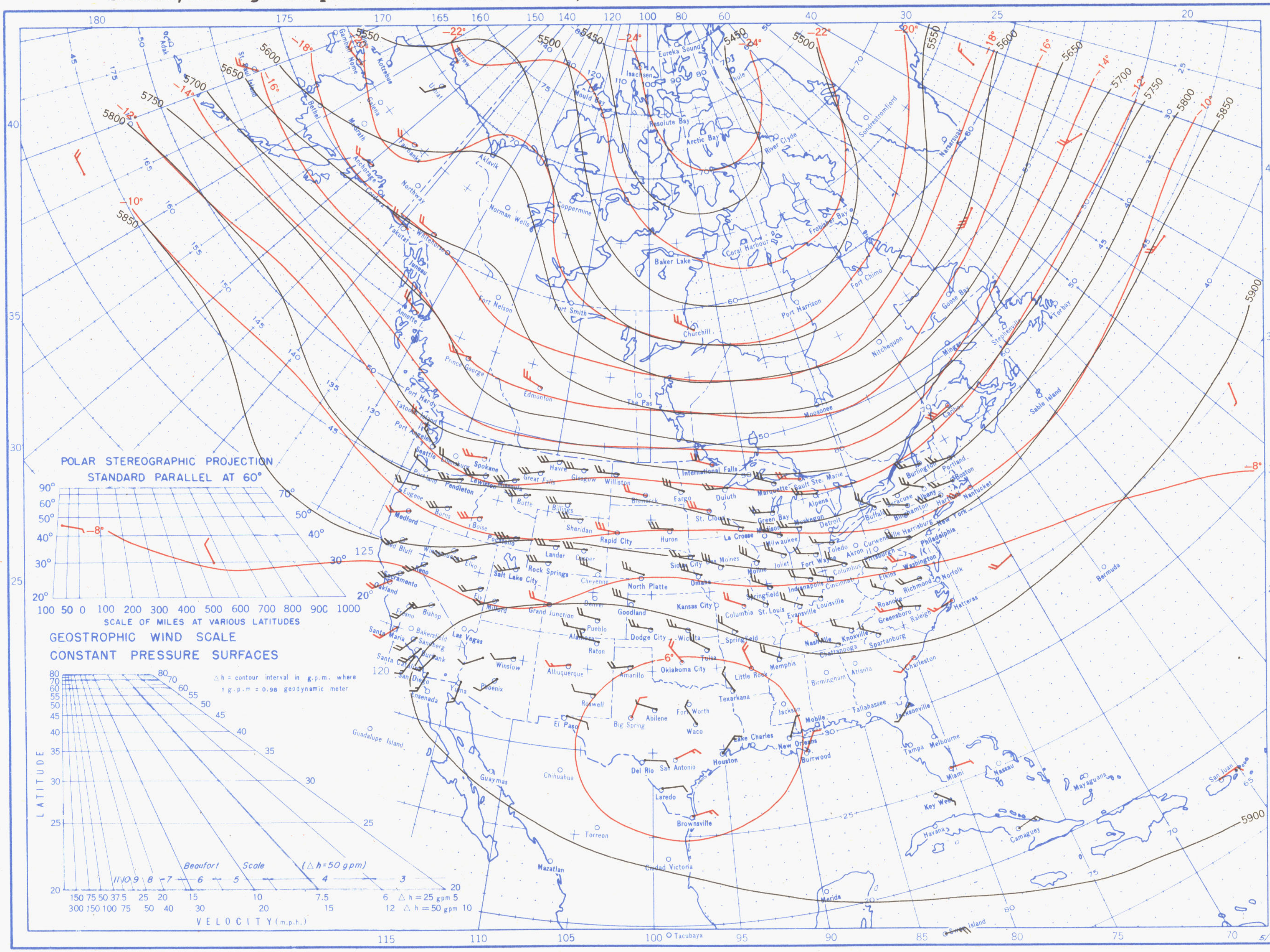
Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins taken at 0300 G. M. T.

Chart XIII. Average Dynamic Height in Geopotential Meters (1 g.p.m.. = 0.98 dynamic meters) of the 700-mb. Pressure Surface, Average Temperature in °C. at 700 mb., and Resultant Winds at 3000 Meters (m.s.l.), August 1952.



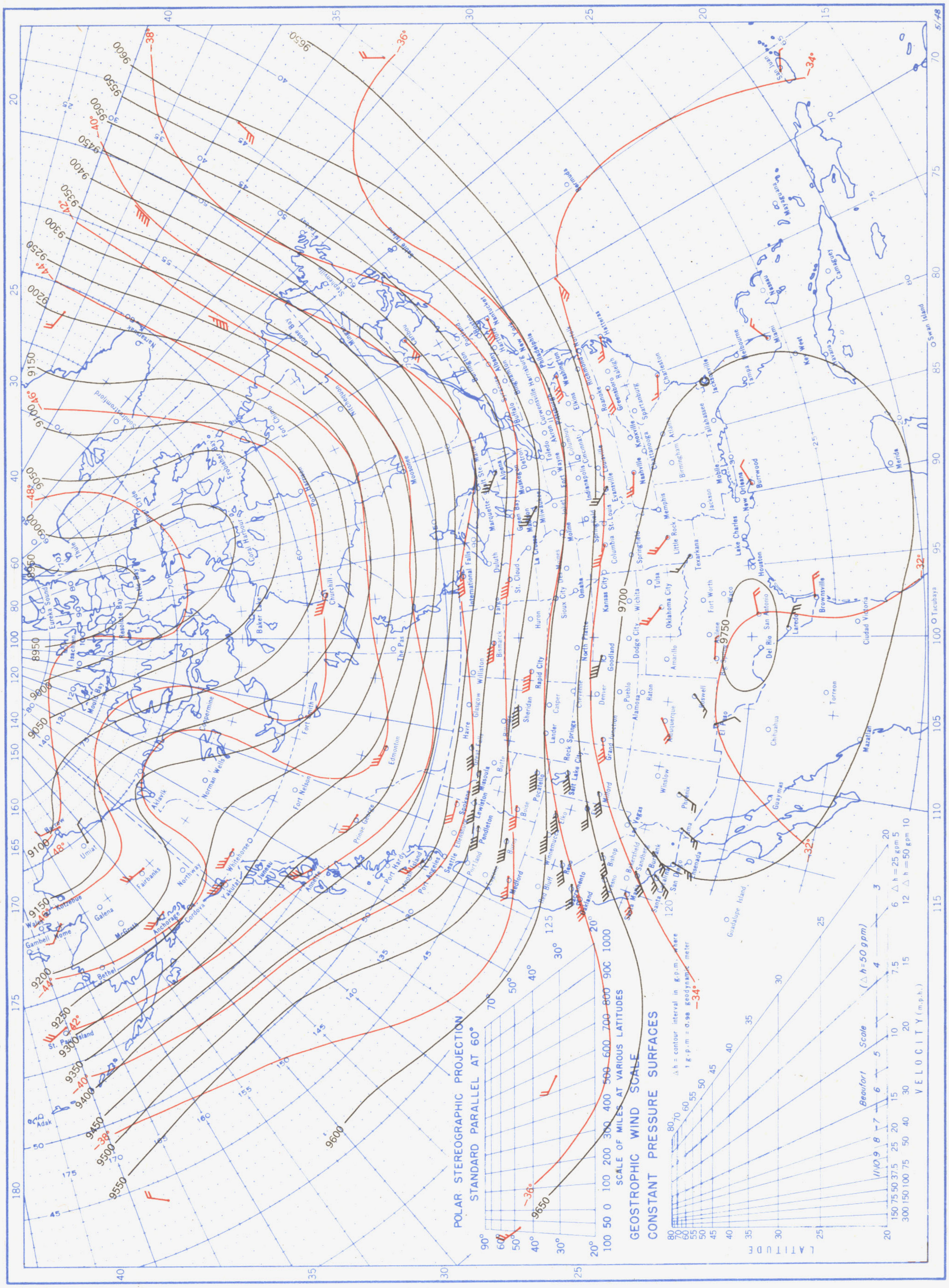
Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins taken at 0300 G. M. T.

Chart XIV. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 500-mb. Pressure Surface, Average Temperature in °C. at 500 mb., and Resultant Winds at 5000 Meters (m.s.l.), August 1952.



Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins at 0300 G. M. T.

Chart XV. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 300-mb. Pressure Surface, Average Temperature in °C. at 300 mb., and Resultant Winds at 10,000 Meters (m.s.l.), August 1952.



Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins at 0300 G. M. T.