THE WEATHER AND CIRCULATION OF APRIL 1952[1]

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The circulation patterns of April 1952 were rather complex at both 700 mb. (fig. 1) and sea level (Chart XI). At both levels a deep mean trough extended from the Alaskan Arctic to the southeast Pacific, with greatest negative anomalies centered in the Gulf of Alaska. The low latitude trough observed just south of California may be considered as an eastward extension of the basic trough in the Gulf of Alaska. Thus, this trough tilted strongly from northwest to southeast. This was associated with a splitting of the westerlies and a southward transport of westerly momentum throughout the eastern Pacific. In eastern North America, on the other hand, the northern and southern streams of westerlies converged into a mean trough with strong tilt from northeast to southwest and extending from Florida to Iceland. The wave length between these two troughs, while long at high latitudes, was relatively short at low latitudes. An extensive ridge with positive 700-mb. height anomalies of 220 feet was located in central Canada, but the counterpart of the ridge in the southern United States was relatively weak and contracted.

[1] See charts I–XV following page 76 for analyzed climatological data for the month.

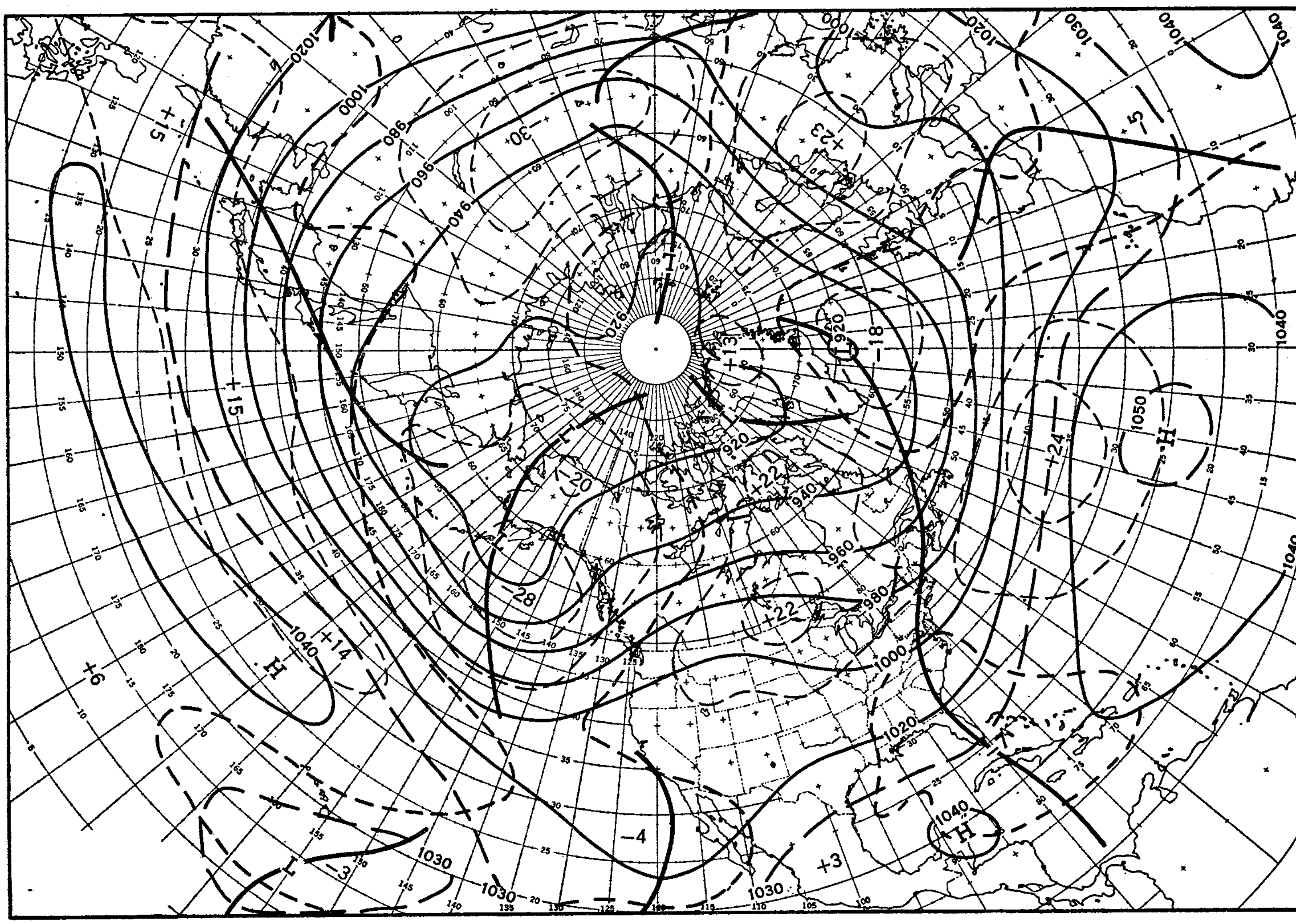


FIGURE 1.—Mean 700-mb. chart for 30-day period April 1–30, 1952. Contours at 200-ft. intervals are shown by solid lines, intermediate contours by lines with long dashes, and 700-mb. height departures from normal at 100-ft. intervals by lines with short dashes with the zero isopleths heavier. Anomaly centers and contours are labeled in tens of feet. Minimum latitude trough locations are shown by heavy solid lines.

Some of the more striking features of the month's circulation are illustrated in figure 2, showing the geographical distribution of mean 700-mb. geostrophic wind speed. The band of strongest westerlies (jet) throughout the central Pacific was concentrated between 40°N. and 45°N. latitude with a maximum monthly average of 20 m.p.s. This current underwent considerable diffluence or spreading in the eastern Pacific, with one portion proceeding northward through Canada and the other southward along the southern border of the United States. This split in the westerlies resulted in very weak gradients at middle latitudes of the United States as shown by the large distance between the 10,000-ft. and 10,200-ft. contours in figure 1. The two jet streams at 700 mb. converged in the area of confluence ahead of the mean trough in eastern North America. Here the westerlies again became unified into a very strong, concentrated band with maximum values of 17 m.p.s. at 40°N. in the western Atlantic. Farther eastward the westerlies again split, one portion going northward through Scandinavia and the other southward into Africa. Thus in the Western Hemisphere during April the unified wind belt found over each ocean split into two distinct and widely separated bands over the continents.

The characteristics of the mean circulation and wind portrayed in figures 1 and 2 are reflected in the observed tracks of individual daily cyclones (Chart X). The principal cyclone tracks are delineated in figure 3. In the Pacific the cyclones were quite concentrated in a track extending northeastward from the Japanese Islands to the Gulf of Alaska. The principal cyclone track, like the 700-mb. jet stream, split in North America, one branch passing across northern Canada and the other across the central United States. These branches rejoined just east of the mean trough along the east coast of North America. The maximum concentration of cyclones was near Newfoundland. A comparison of figures 2 and 3 shows that the principal cyclone tracks were slightly to the north of the strongest belt of westerly winds, in the regions of strong cyclonic shear [1]. Storms were relatively scarce throughout the northwestern and north central sectors of the United States, in the area of anticyclonic shear to the south of the strongest westerly wind belt.

The observed precipitation (Chart III) was above normal in a band extending from the southwestern United States northeastward to the North Atlantic States. This band of heavy precipitation corresponds to the area of maximum cyclone frequency shown in figure 3. Similarly, areas of subnormal precipitation in the Northwest, Southeast, and Northern Plains correspond to the areas where cyclones were scarce or absent. Despite the light precipitation observed in the Northern Plains, some of the worst floods of record were observed in the Missouri and upper Mississippi Valleys. These flood conditions were brought about chiefly by heavy snow melt and rapid ice breakup in the northern States at the beginning of April.

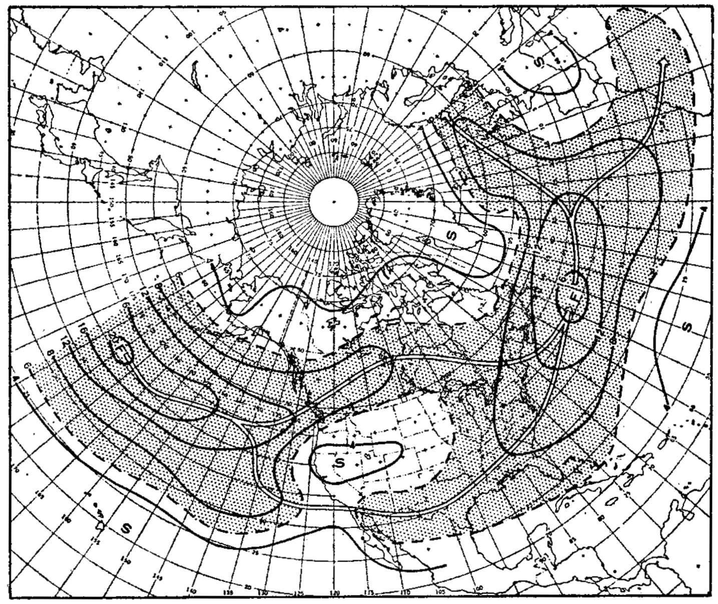


Figure 2.—Mean geostrophic (total horizontal) wind speed at 700-mb. for the 30-day period April 1-30, 1952. Solid lines are isotachs at intervals of 4 m/sec. with intermediate values dashed. Open double-arrowed lines delineate the axes of maximum wind speed (jets). Areas with speed in excess of 6 m/sec. are stippled. Centers of maximum and minimum wind speed are labeled "F" and "S" respectively.

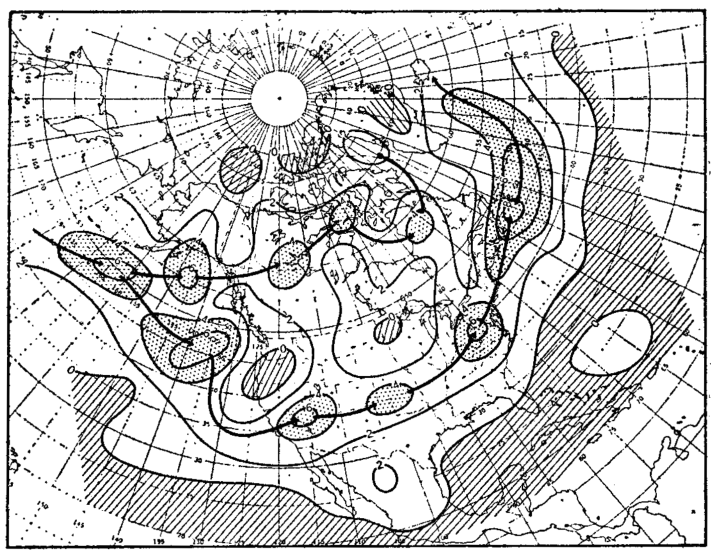


Figure 3.—Geographical frequency of tracks of cyclones observed during month of April 1952 within approximately equal-area boxes of size 5 middle-latitude-degrees of longitude by 5° of latitude. The isopleths are drawn at intervals of 2. Areas with more than 4 cyclone passages are stippled, and areas of zero frequency are hatched. The principal cyclone tracks are indicated by double-arrowed lines, which are broken in regions of maximum frequency. All data obtained from Chart X.

The anomalies of surface temperature given in Chart I-B show that relatively warm weather prevailed over western and northern portions of the United States, but below-normal temperatures were observed in south central and southeastern sections. The most extreme positive temperature departures (over 10° F.) were found in North

Dakota and Minnesota in the region where the positive 700-mb. height anomalies were greatest, +220 feet in figure 1. During spring there is generally a good positive correlation between the anomalies of 700-mb. height and surface temperature [2]. Furthermore, strong westerlies in Canada afforded little opportunity for intrusions of polar continental air masses from the north. Predominance of warm air is also suggested by the southwesterly components of 700-mb. geostrophic flow relative to normal between the positive anomaly center in the northern United States and the negative center in the Gulf of Alaska. Maximum temperatures of 90° F. or more were frequent at a number of stations in this sector. On the 26th Bismarck, N. Dak. recorded 92° F. and on the 27th Bemidji, Minn. recorded 91° F., their highest temperatures of record for April.

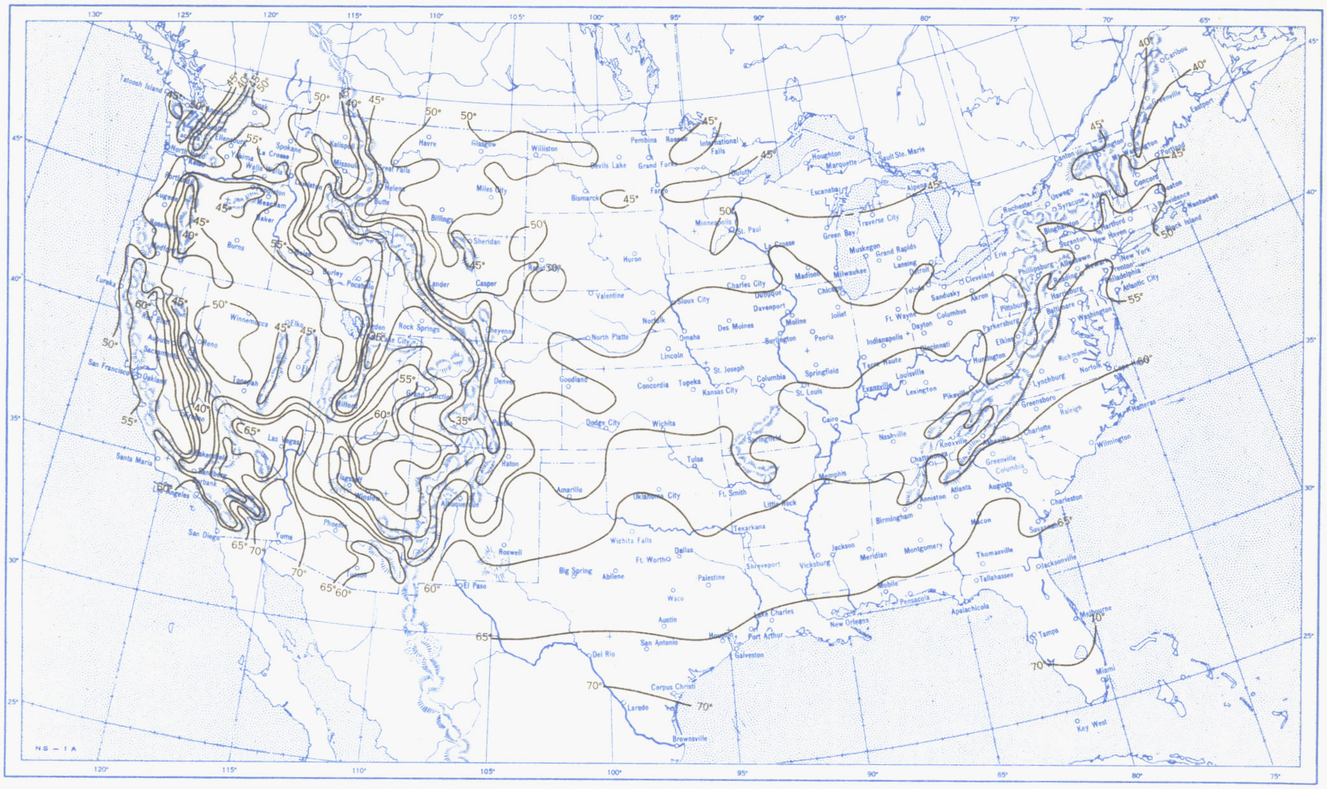
The area of below-normal temperatures in south central and southeastern United States was associated with below-normal heights at 700 mb. (fig. 1). Furthermore, strong northerly components of flow (relative to normal) are shown at sea level (Chart XI inset) between the positive anomaly center in central United States and the negative one at Hatteras. Such northerly wind components are frequently associated with below-normal surface temperature anomalies.

The circulation patterns of April 1952 did not exhibit the extreme anomalies of the previous month [3]. In many regions the April circulation was markedly different, almost opposite in phase, from that observed during March. This was particularly true in eastern portions of the United States and Pacific, where mean ridges during March were replaced by mean troughs during April. As a result, the pattern of surface temperature anomaly in the United States was strikingly different during the 2 months (compare Chart I-B of *Monthly Weather Review* for March and April 1952).

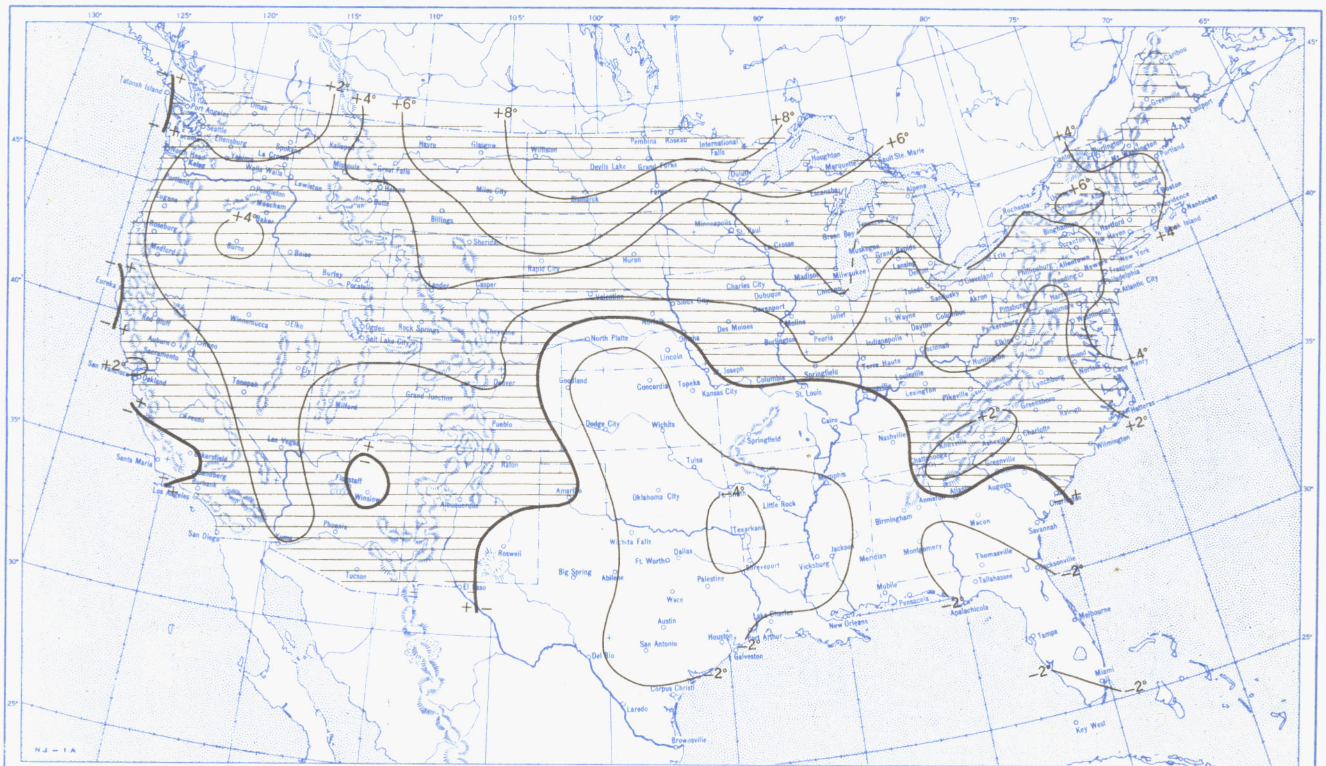
REFERENCES

1. W. H. Klein, "The Weather and Circulation of December 1951", *Monthly Weather Review*, vol. 79, No. 12, December 1951, pp. 218-221.
2. D. E. Martin and W. G. Leight, "Objective Temperature Estimates from Mean Circulation Patterns", *Monthly Weather Review*, vol. 77, No. 10, October 1949, pp. 275-283.
3. D. E. Martin, "The Weather and Circulation of March 1952", *Monthly Weather Review*, vol. 80, No. 3, March 1952, pp. 47-49.

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



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

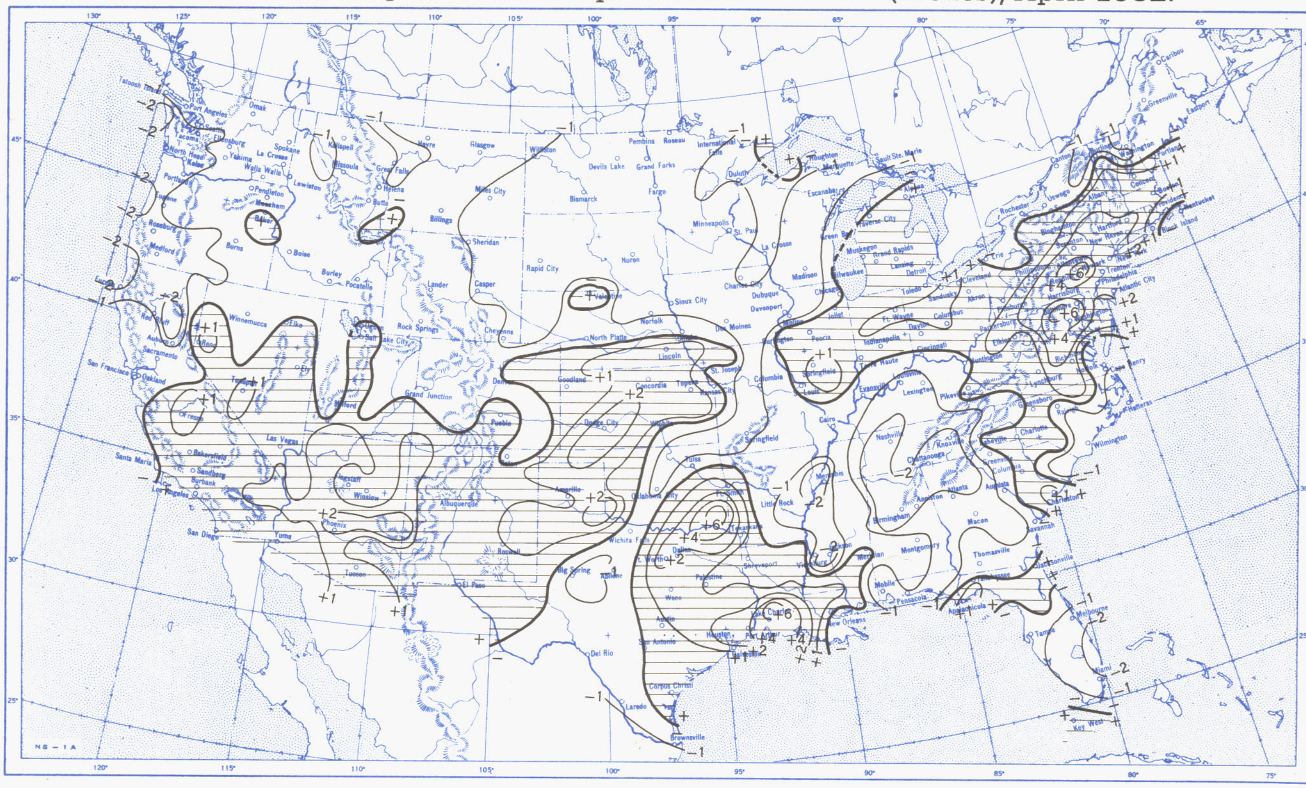


A. Based on reports from 800 Weather Bureau and cooperative stations. The monthly average is half the sum of the monthly average maximum and monthly average minimum, which are the average of the daily maxima and daily minima, respectively.
B. Normal average monthly temperatures are computed for Weather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

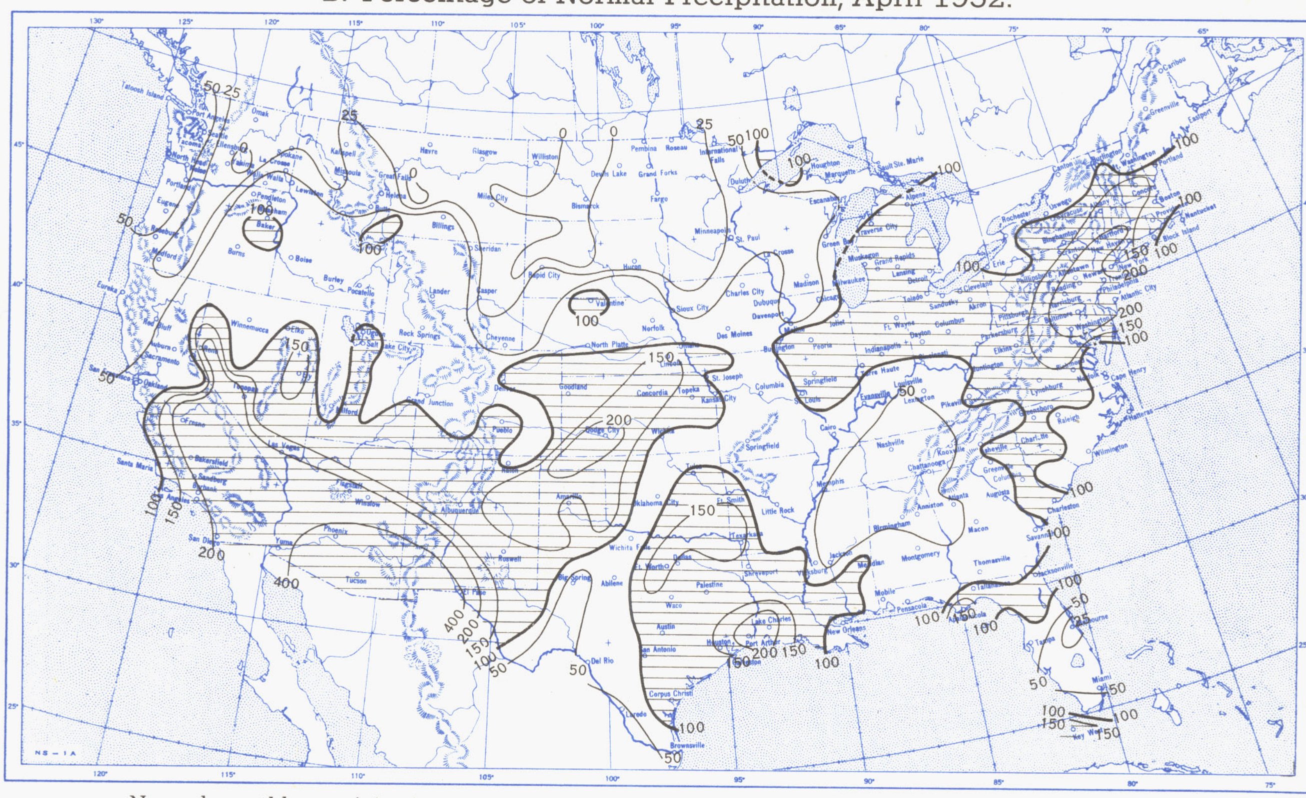
Chart II. Total Precipitation (Inches), April 1952.

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

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



B. Percentage of Normal Precipitation, April 1952.



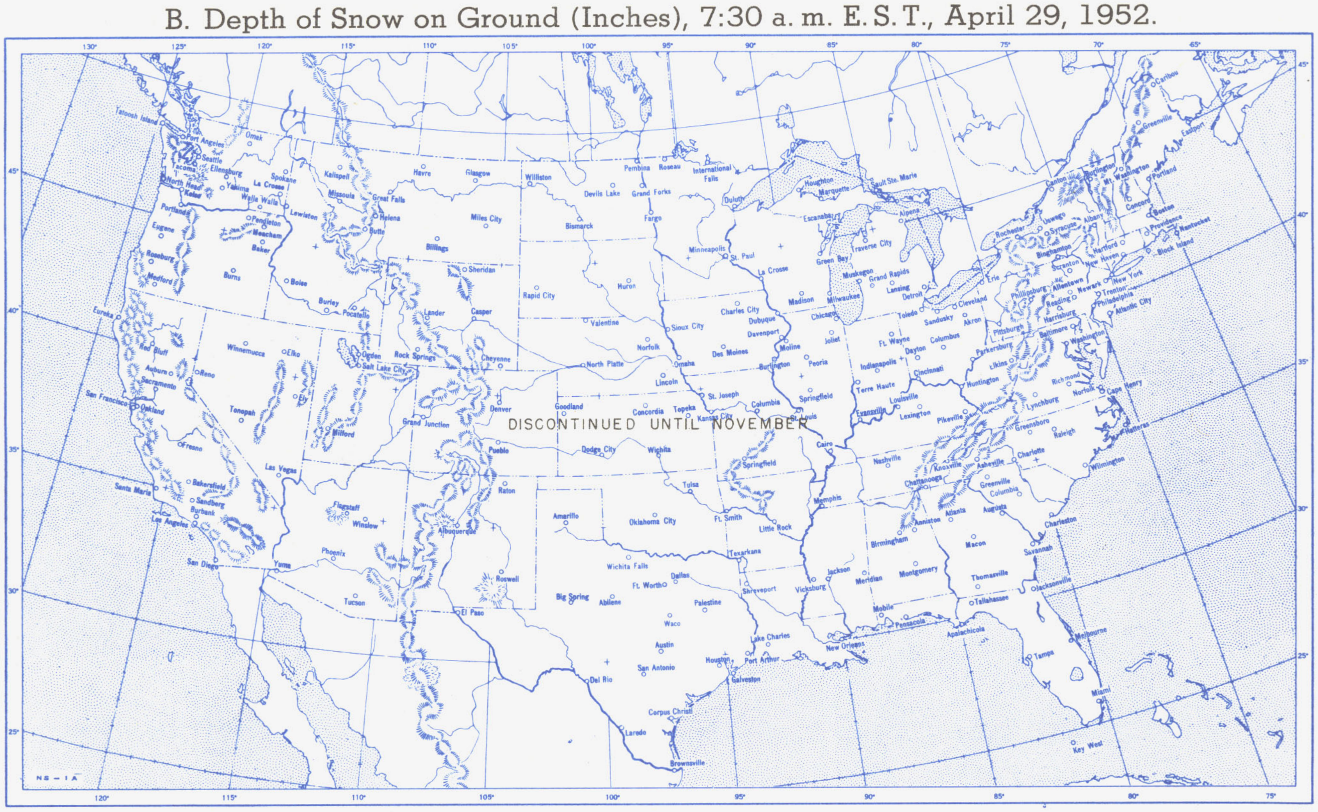
Normal monthly precipitation amounts are computed for stations having at least 10 years of record.

Chart IV. Total Snowfall (Inches), April 1952.

This is the total of unmelted snowfall recorded during the month at Weather Bureau and cooperative stations. This chart and Chart V are published only for the months of November through April although of course there is some snow at higher elevations, particularly in the far West, earlier and later in the year.

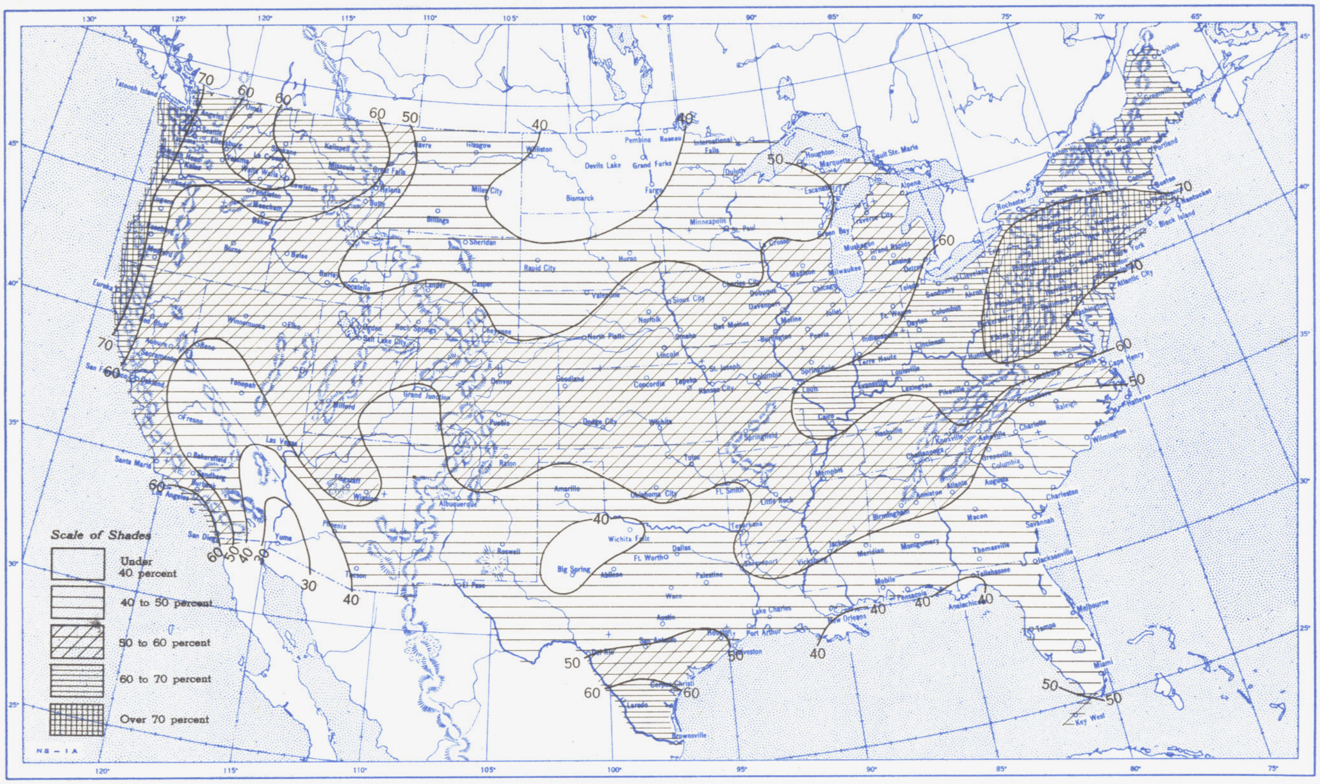
Chart V. A. Percentage of Normal Snowfall, April 1952.

B. Depth of Snow on Ground (Inches), 7:30 a. m. E. S. T., April 29, 1952.



A. Amount of normal monthly snowfall is computed for Weather Bureau stations having at least 10 years of record. B. Shows depth currently on ground at 7:30 a. m. E.S.T., of the Tuesday nearest the end of the month. It is based on reports from Weather Bureau and cooperative stations. Dashed line shows greatest southern extent of snowcover during month.

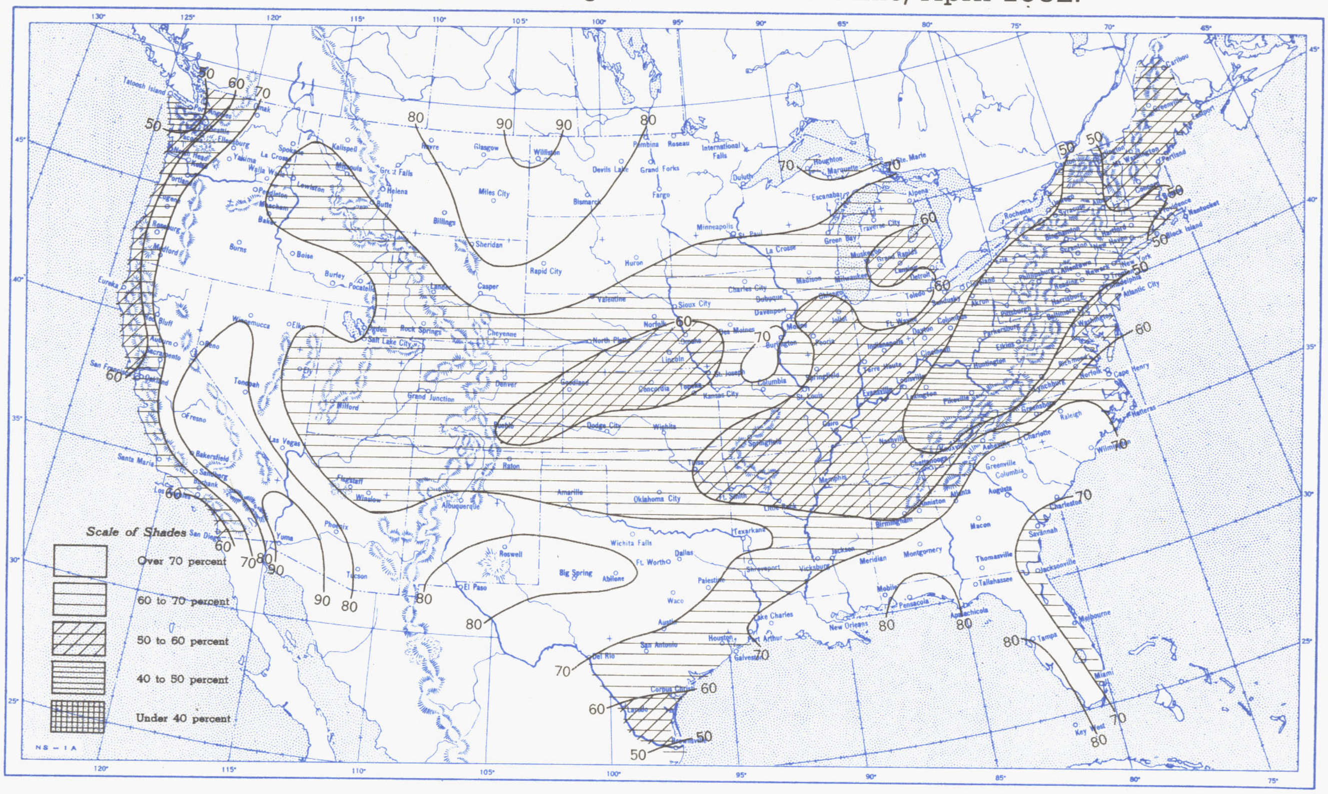
Chart VI. A. Percentage of Sky Cover Between Sunrise and Sunset, April 1952.



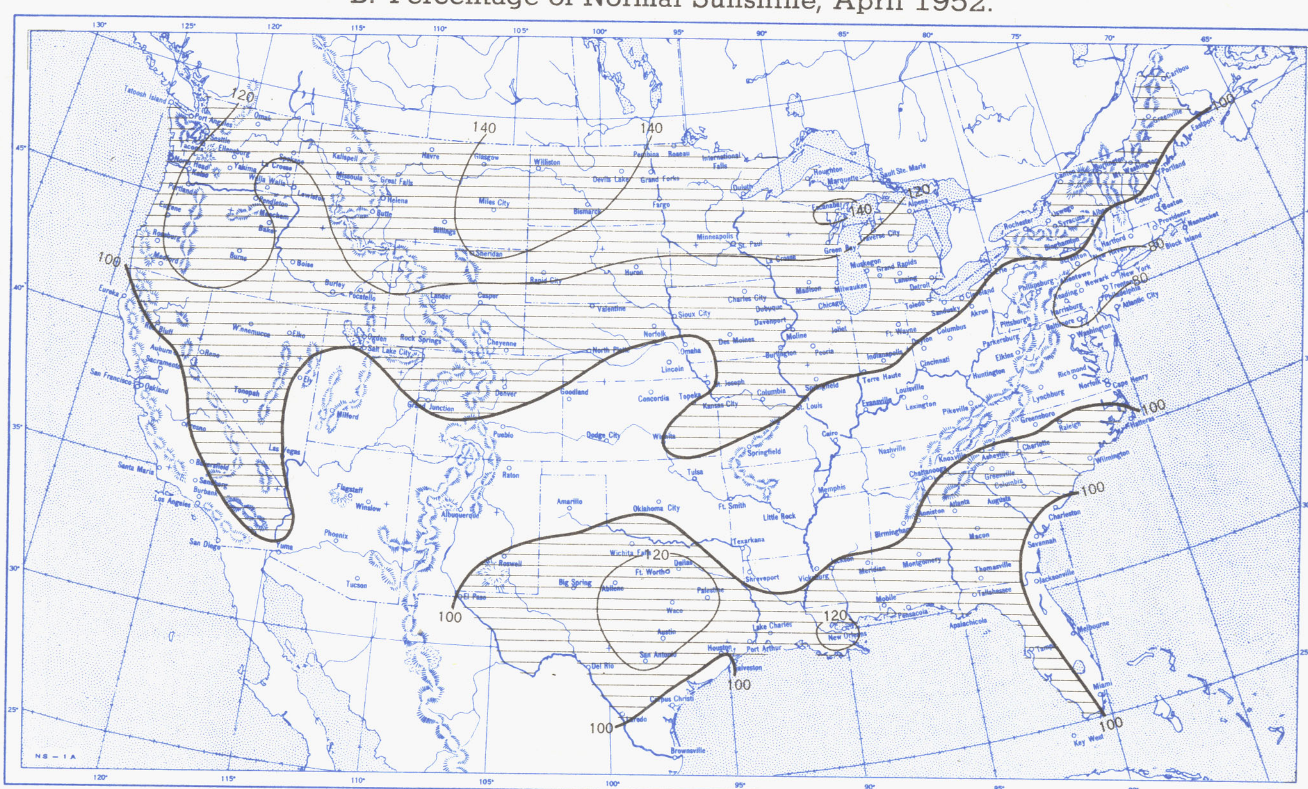
B. Percentage of Normal Sky Cover Between Sunrise and Sunset, April 1952.

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, April 1952.



B. Percentage of Normal Sunshine, April 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, April 1952. Inset: Percentage of Normal Average Daily Solar Radiation, April 1952.

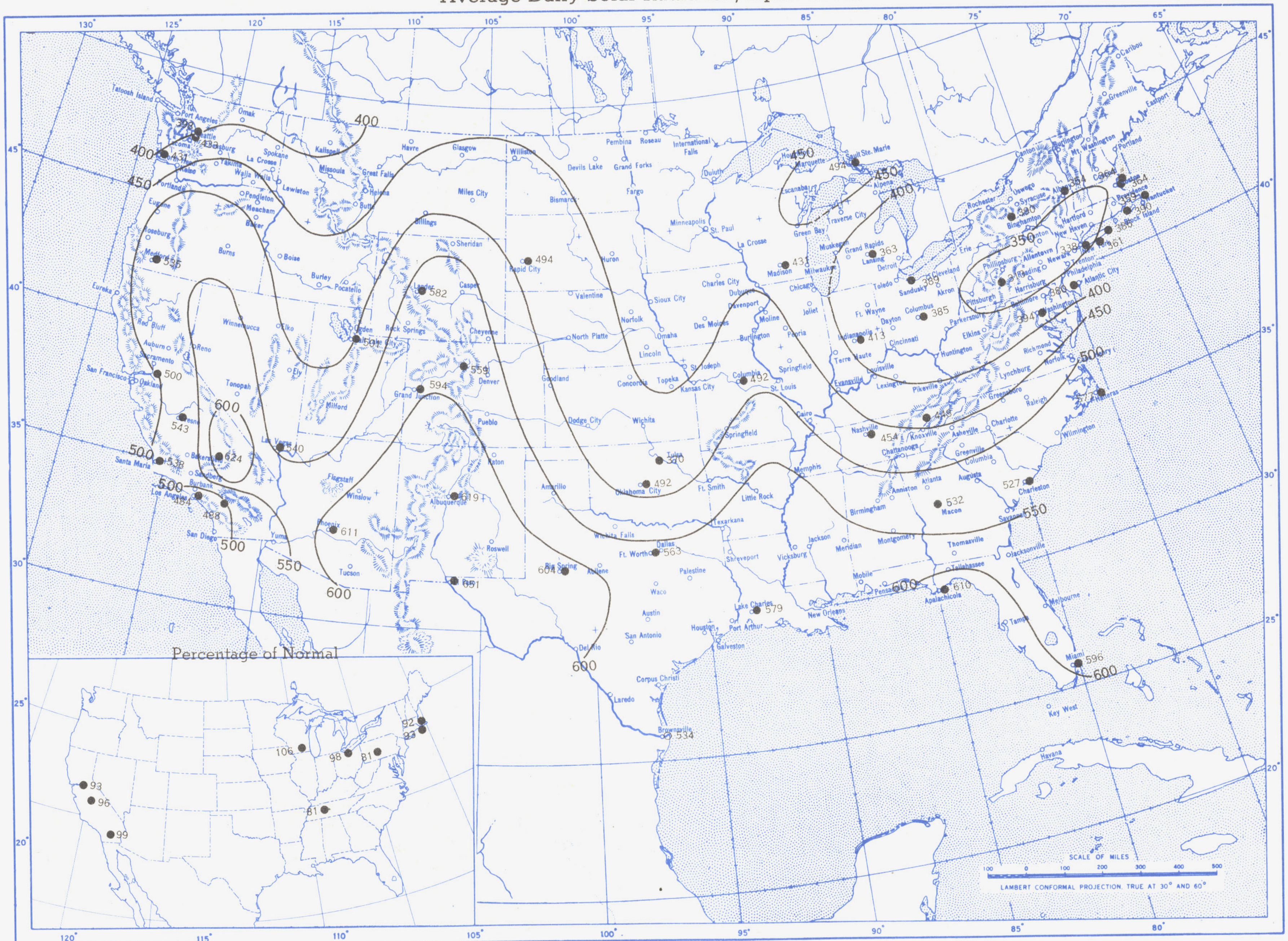
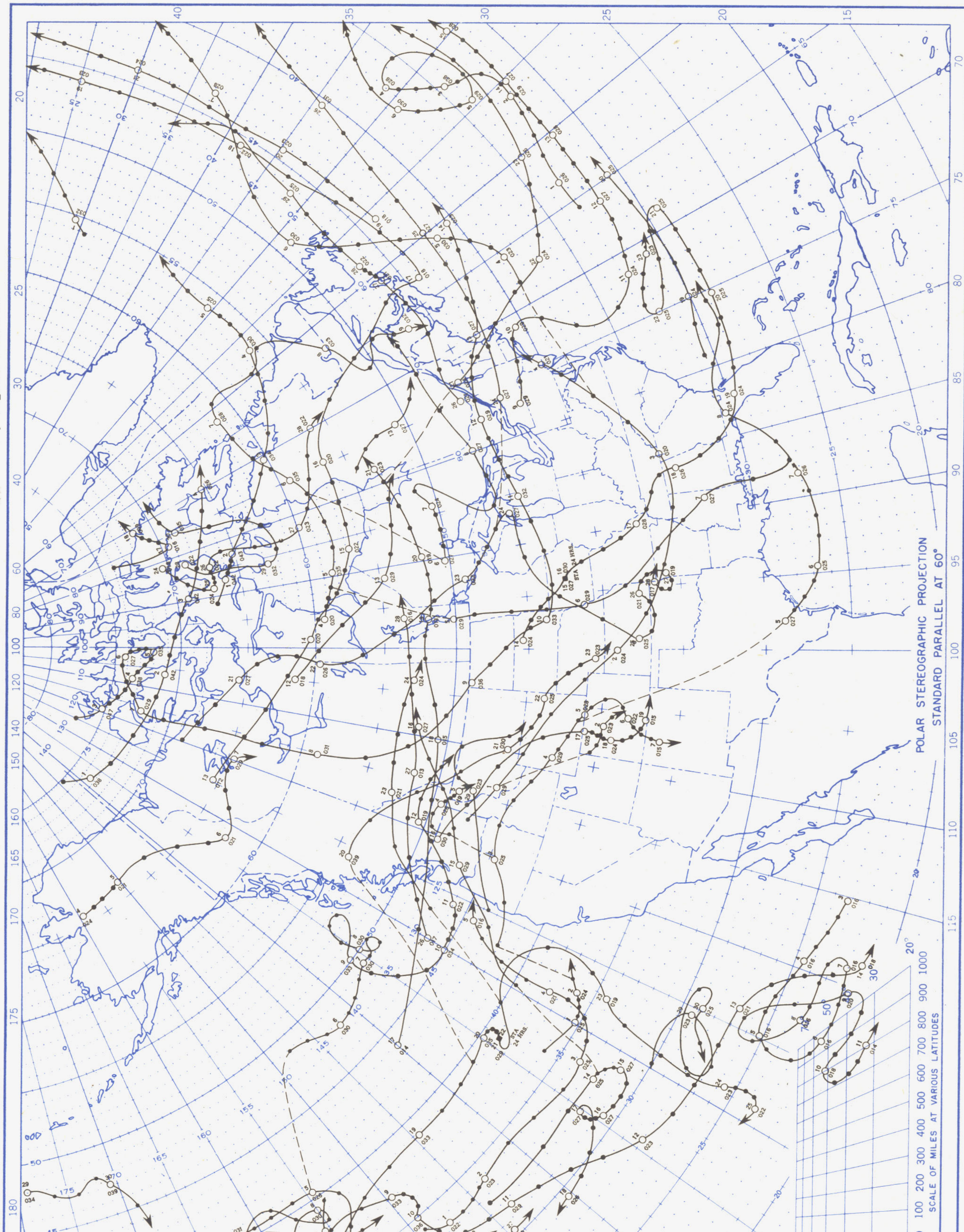


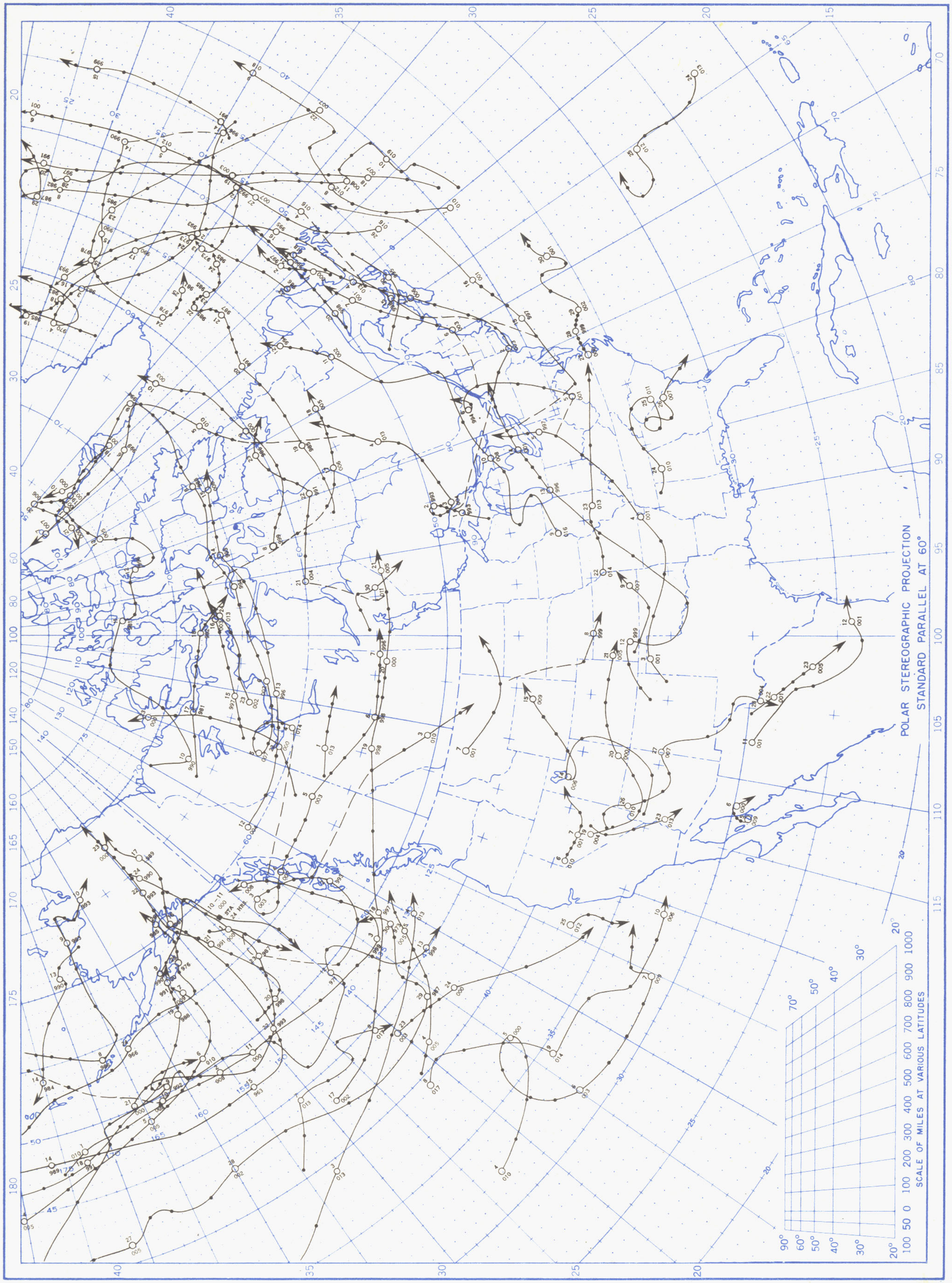
Chart shows mean daily solar radiation, direct + diffuse, received on a horizontal surface in langleys (1 langley = 1 gm. cal. cm.$^{-2}$). Basic data for isolines are shown on chart. Further estimates are obtained from supplementary data for which limits of accuracy are wider than for those data shown.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

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



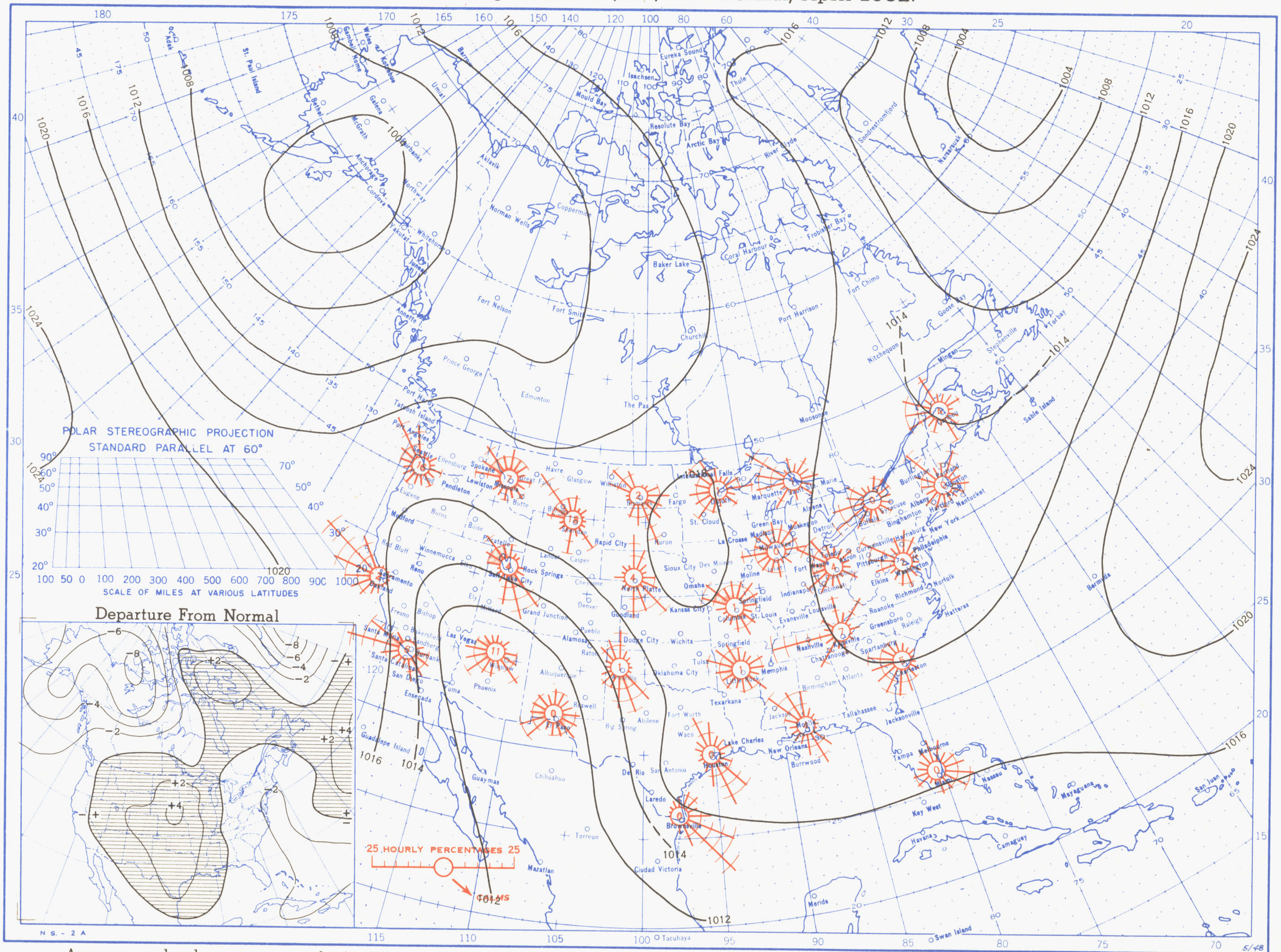
Circle indicates position of center at 7:30 a. m. E. S. T. Figure above circle indicates date, figure below, pressure to nearest millibar. Dots indicate intervening 6-hourly positions. Squares indicate position of stationary center for period shown. Dashed line in track indicates reformation at new position.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

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



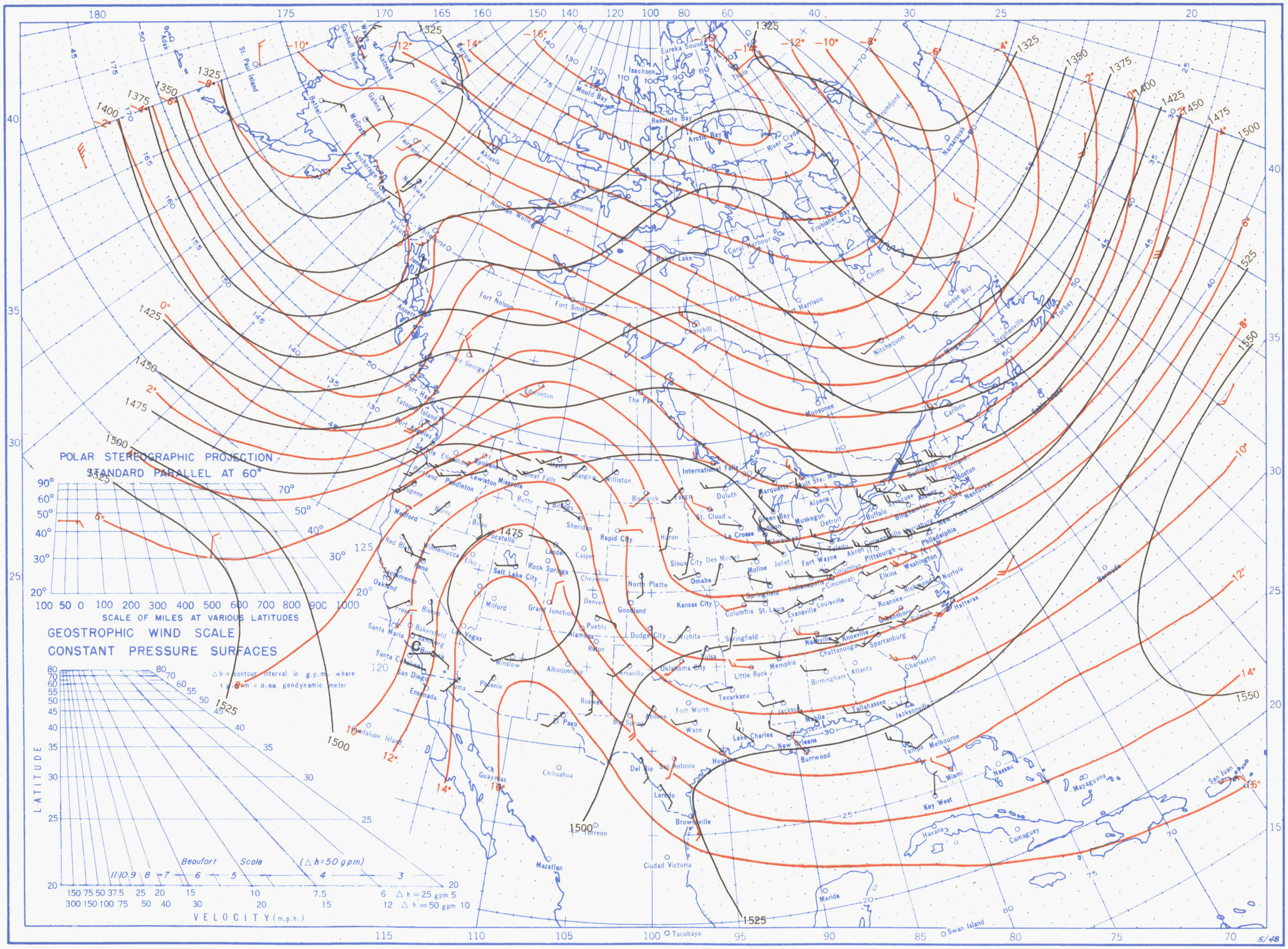
Circle indicates position of center at 7:30 a. m. E. S. T. See Chart IX for explanation of symbols.

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



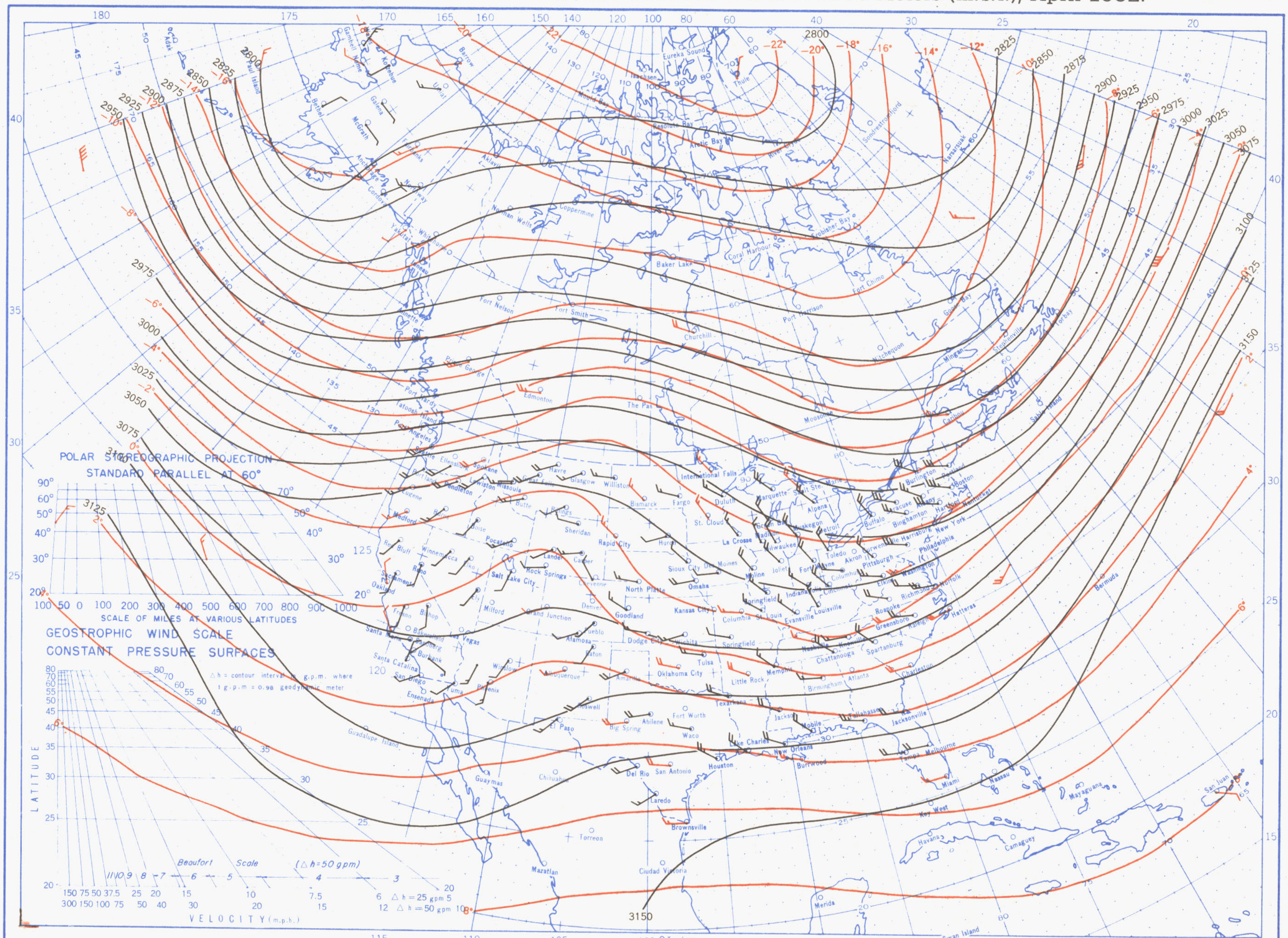
Average sea level pressures are obtained from the averages of the 7:30 a. m. and 7:30 p. m. E. S. T. readings. Windroses show percentage of time wind blew from 16 compass points or was calm during the month. Pressure normals are computed for stations having at least 10 years of record and for 10° intersections 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.), April 1952.



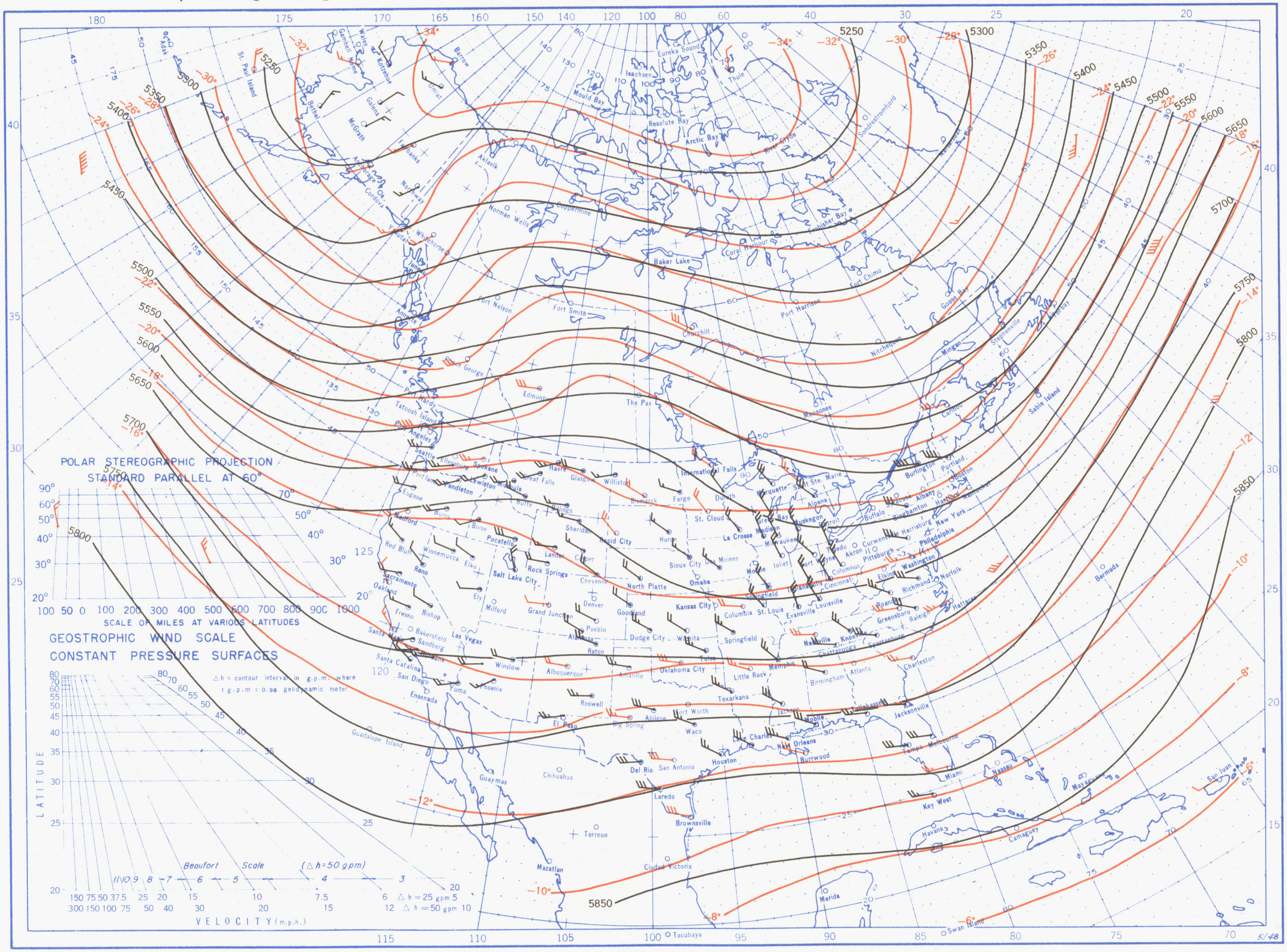
Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins taken at 0300 G. M. T.

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.), April 1952.



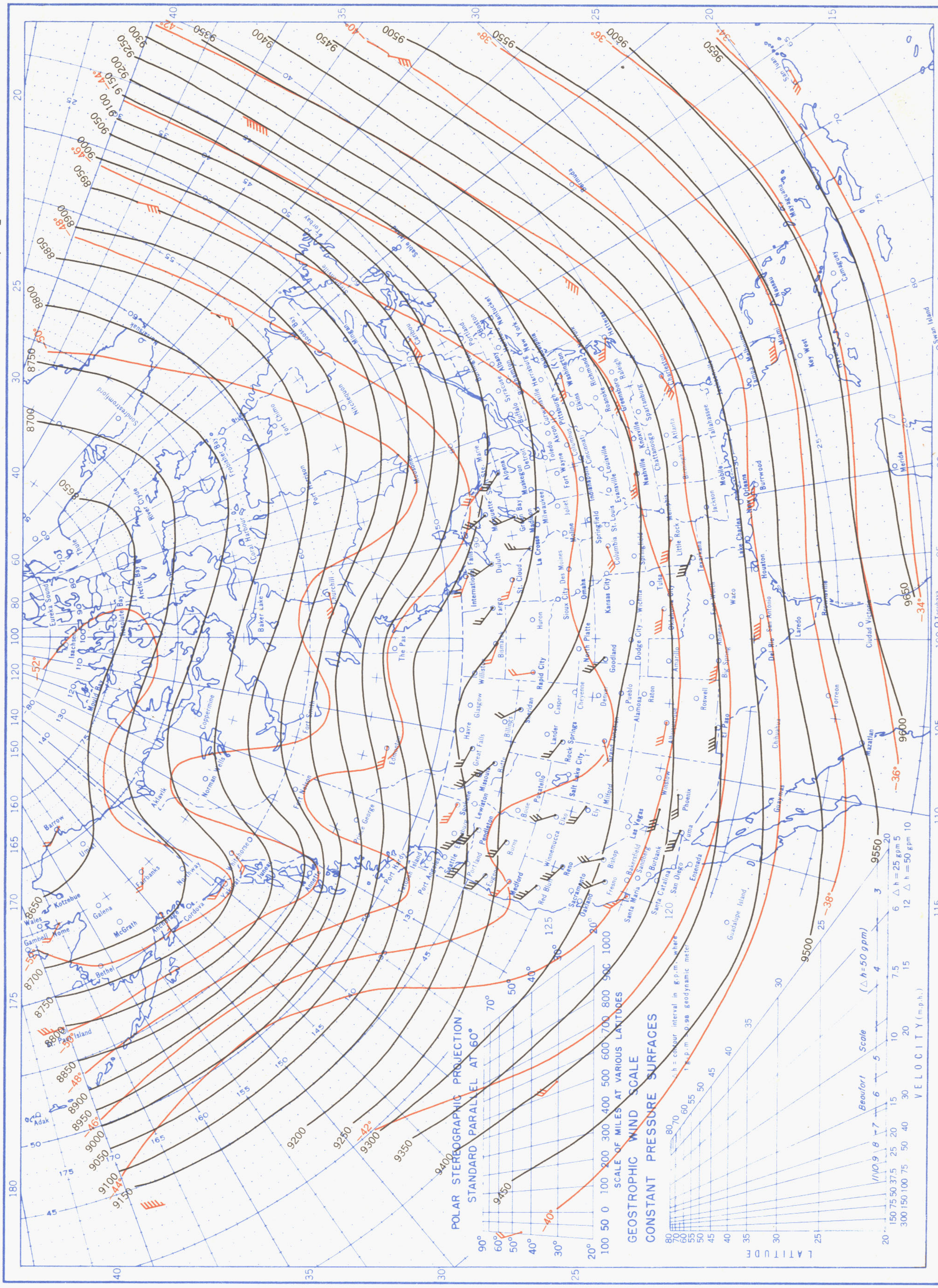
Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins taken at 0300 G. M. T.

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.), April 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.), April 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.