THE WEATHER AND CIRCULATION OF JANUARY 1953[1]

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THE WEATHER

The month of January 1953 was filled with extremes of weather over much of the Northern Hemisphere. Most notable of all were the disastrous floods beginning on the 31st which affected Great Britain and the lowland countries of Europe. These were reported to be the worst floods in that part of the world in 500 years. At last reckoning, more than 1,400 lives were lost and property damage was measured in billions of dollars. Contributing causes to this disaster will be discussed in another section.

In contrast to the floods in Europe, serious drought conditions developed in parts of the Hawaiian Islands. By the end of the month, the ground had become parched and grass in most areas was dead. It was reported that the leeward areas of Hawaii and Maui were most affected, and that several days of heavy rain were badly needed to prevent crop failure. Elsewhere in the Pacific, several shipwrecks and airplane crashes occurred in unusually strong winds. On the 9th, mountainous seas and gale winds capsized a ship 100 miles west of Pusan, Korea, with 233 lives lost. During the same week, gales caused the splitting in two of the Swedish ship *Avanti* northwest of Okinawa.

Over the United States, one of the warmest Januarys ever recorded was experienced (Chart I), with only the Florida peninsula showing slight negative temperature departures from normal. Unseasonably warm weather prevailed over most of the country during every week of the month. Average January temperatures at Helena and Missoula, Mont., and Salt Lake City, Utah, were the highest on record. In the Plateau region maximum temperatures rose to record or near-record levels on numerous days throughout the month and this was reported to be one of the warmest Januarys ever known. Cold polar outbreaks were generally weak and short-lived. The most severe one of the month occurred on the 15th and 16th in the Great Plains and Mississippi Valley. This was preceded by blizzard conditions in Iowa, South Dakota, and parts of neighboring States during which from 2 to 7 inches of drifting snow blocked many roads and forced some rural schools to close. Some of the lowest temperatures of the month followed this storm with −41° F. at Orr, Minn., and −36° at Danbury, Wis. Freezes which occurred in most of the Southeast on the 4th and 5th, and again on the 12th and 13th, did some damage to vegetables.

In general, precipitation averaged less than normal in the Southwest, Great Plains, and Mississippi Valley regions (Chart III). Elsewhere it was above normal, with over twice the normal amount in the Pacific Northwest, southern Florida, and sections of New England. The worst storm of the month for the East developed over Texas on the 8th and moved into the Southeast on the 9th, bringing heavy rains and thunderstorms to that area. Twenty-four-hour precipitation amounts at Birmingham and Key West exceeded 4 inches. This storm was responsible for several tornadoes that hit central Florida and left a mile wide swath of damage through the resort city of Sarasota. As the storm moved northeastward, heavy snow and ice in New York and New England disrupted electric power, transportation, and communication systems in large areas. The storm took 19 lives in New England and was reported as the biggest wintry storm to hit Boston in seven years. Another weather extreme occurred at Salt Lake City on the 14th as a cyclone developed on a cold front that had moved in from the Pacific. 14.7 inches of snow, a record 24-hour amount, fell, damaging roofs, trees, and power lines.

Due to repeated heavy rains, some minor flooding occurred in western Oregon and Washington during the second week, and considerable flooding north of Eureka with heavy flood damage in western Oregon was reported during the 3d week of the month.[2] A shallow but vicious norther which preceded a Texas cold spell blew deep into the Texas midlands on the 23d, dumping up to 10 inches of snow at Aiken, closing roads, stranding motorists, and snapping power and telephone lines, while drenching rains and winds of almost hurricane force battered the central and east Texas area.

GENERAL CIRCULATION CHARACTERISTICS

The mean 700-mb. circulation for January, 1953 (fig. 1) was quite similar to that for December 1952 [1] in many respects. Heights continued much greater than normal throughout the North Atlantic, with departures as high as +450 feet approximately 800 miles west of Great Britain. Over Europe, heights remained below normal, with one anomaly center of −330 feet over

[1] See Charts I to XV following page 30 for analyzed climatological data for the month.

[2] See adjoining article by Hughes and Roe for additional details.

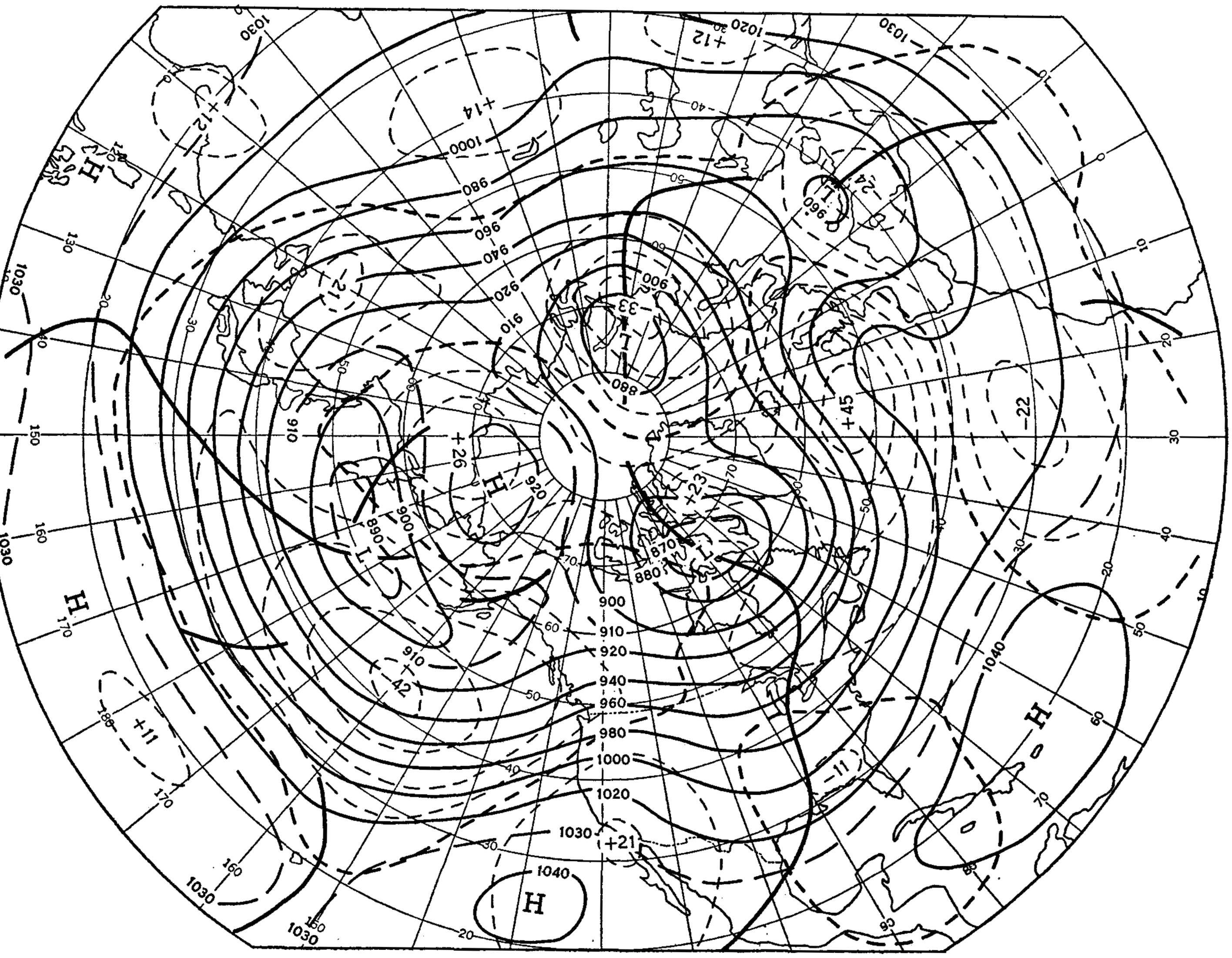


FIGURE 1.—Mean 700-mb. height contours (solid) and departures from normal (dashed) for December 30, 1952–January 28, 1953. Note greater than normal flow of warm maritime air into the United States.

extreme northwest Russia and another of −240 feet near Italy. These centers, coupled with the large positive anomaly west of Great Britain, created a much stronger northerly gradient than normal from the west coast of Europe eastward to Russia, a factor of considerable importance for the European flood.

Over North America, the major long wave trough was located in a position almost identical to that it had in December, extending from northern Labrador south-southwestward through the Great Lakes region, the Mississippi Valley, and the western Gulf of Mexico. Once again, heights averaged above normal in central and northern sections of this trough, and it was only over the southeastern States that heights fell to slightly below normal. The greatest negative anomaly observed anywhere in the United States (−100 feet) occurred over Alabama and Georgia in connection with this trough. Throughout the western United States anticyclonic conditions persisted, but this month the ridge was developed more strongly than normal with positive height anomalies reaching +200 feet, whereas in December, it was slightly weaker than normal. The strength of this ridge, coupled with stronger than normal southwesterlies blowing in from the Pacific, contributed to the abnormal warmth in the West (Chart I). The Pacific was again dominated by broad cyclonic flow at middle latitudes as heights continued below normal throughout most of the central and north Pacific and above normal at southerly latitudes. Greatest negative values (−400 feet) occurred near 43° N., 150° W. while greatest positive anomalies (+100 feet) were centered around 17° N., 175° W. Between these anomaly centers stronger than normal westerlies, displaced farther south than normal, contributed to the weakness of rain-bearing trade winds in the Hawaiian area and the resulting drought. Associated with the southerly displacement of the westerlies was the

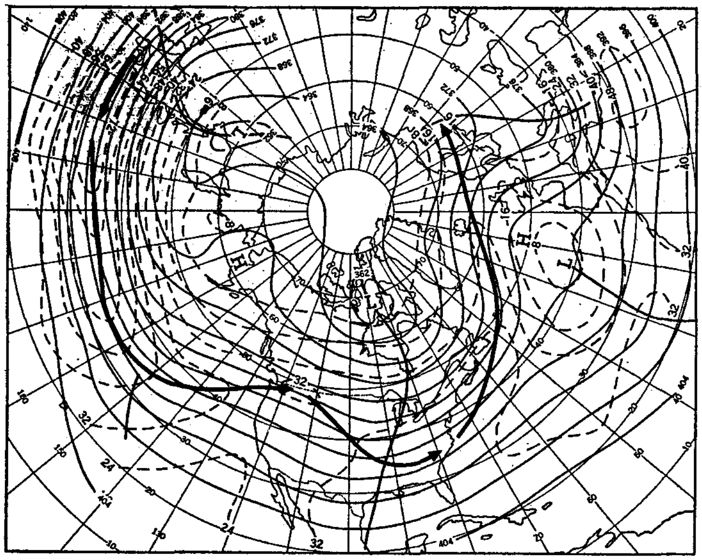


FIGURE 2.—Mean 200-mb. contours (solid) and isotachs (dashed) for December 30, 1952–January 28, 1953. Solid arrows indicate principal "jet" which reached 80 m. p. s. in the western Pacific.

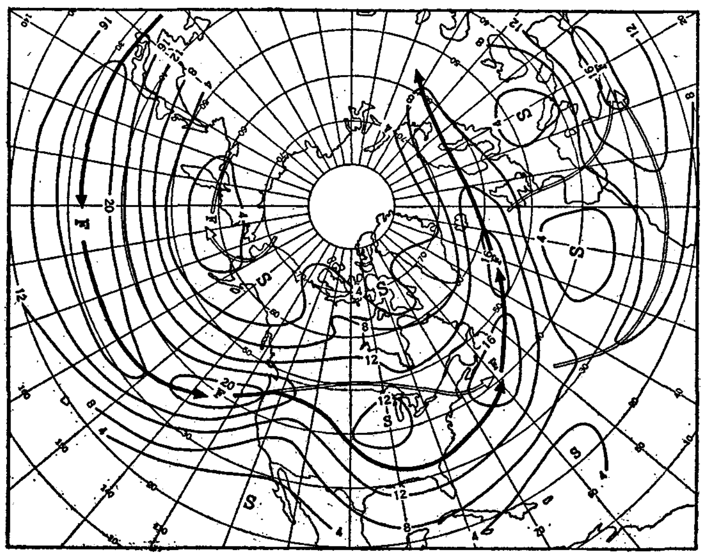


FIGURE 3.—Mean 700-mb. isotachs for December 30, 1952–January 28, 1953. Solid arrows indicate principal jet, while open arrows indicate secondary jets. Note split jet in United States, secondary jet in western Europe, and easterly jet in Bering Sea.

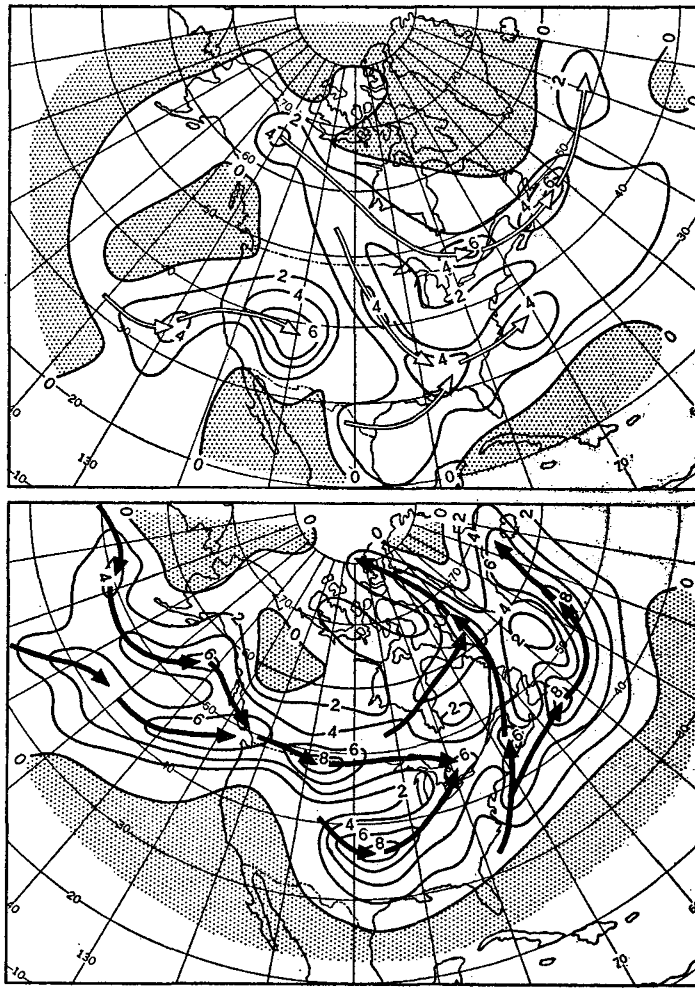


FIGURE 4.—Geographical frequency of anticyclonic passages (above) and cyclonic passages (below) within approximately 5° squares for January 1953. Well defined anticyclonic tracks are indicated by solid arrows and cyclonic tracks by open arrows. (All data obtained from Charts IX and X).

development of an upper level High over western Alaska, the northern Bering Sea and extreme northeastern Siberia. Positive height anomalies as much as 260 feet occurred in connection with this High.

Comparing figures 2 and 3, it is seen that there is very close parallelism between the main jet streams at 700 mb. and 200 mb., with the latter stream, in general, being located slightly to the north of the former. Of particular interest is the strong jet stream at middle latitudes in the Pacific, with winds for the month averaging as high as 25 meters per second at 700 mb. and 80 meters per second at 200 mb. An easterly "jet" around the upper level High in the vicinity of the Bering Sea (fig. 2) is also noteworthy. As the 700-mb. jet stream crossed the United States, it split into two distinct branches, one traversing the northern border and one passing through the Gulf States. The cyclone tracks (fig. 4B) across North America followed the split jet fairly closely. Storms entered North America in the vicinity of Washington and British Columbia, with one favored path being located along the northern border of the United States and the other from the southern Plains area northeastward through the eastern Great Lakes and New England. These storm paths were quite consistent with locations of heaviest precipitation (Chart III). Anticyclone tracks (fig. 4A) were not so closely related to the jet. After moving out of Canada, one path curved southeastward just north of the Great Lakes while the other moved southeastward into southeastern United States. A third path from the eastern Pacific into the Great Basin is especially noteworthy.

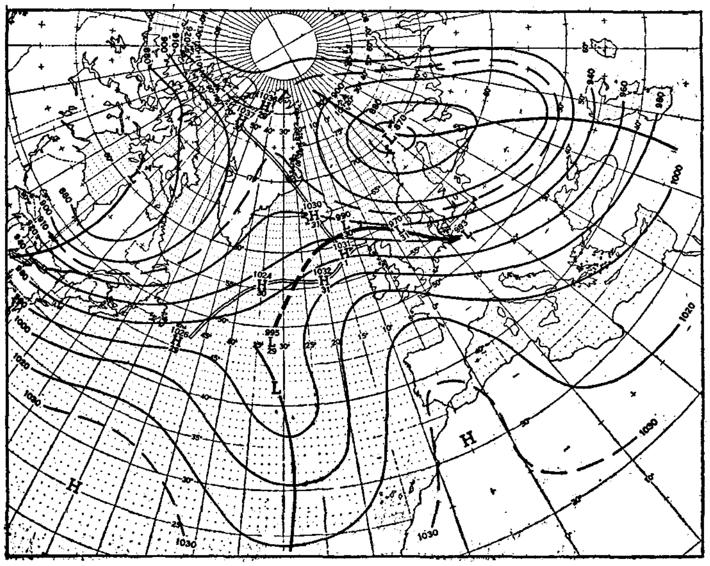


FIGURE 5.—Five-day mean 700-mb. contours for January 28–February 1, 1953. Solid and open arrows are paths of surface Low and Highs, with intensity in millibars, above, and day of month below.

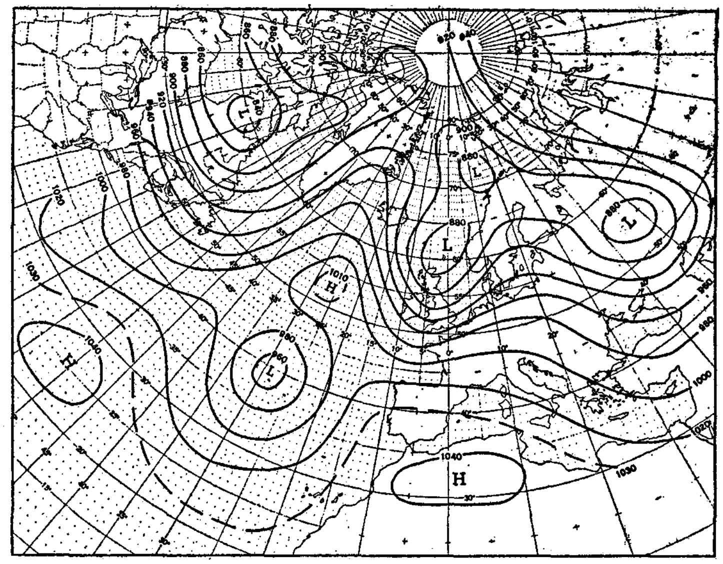


FIGURE 6.—700-mb. contours for 0300 GMT, January 21, 1953. Unusually strong gradient between Iceland and Great Britain is evident.

SOME FACTORS ASSOCIATED WITH THE GREAT EUROPEAN FLOOD

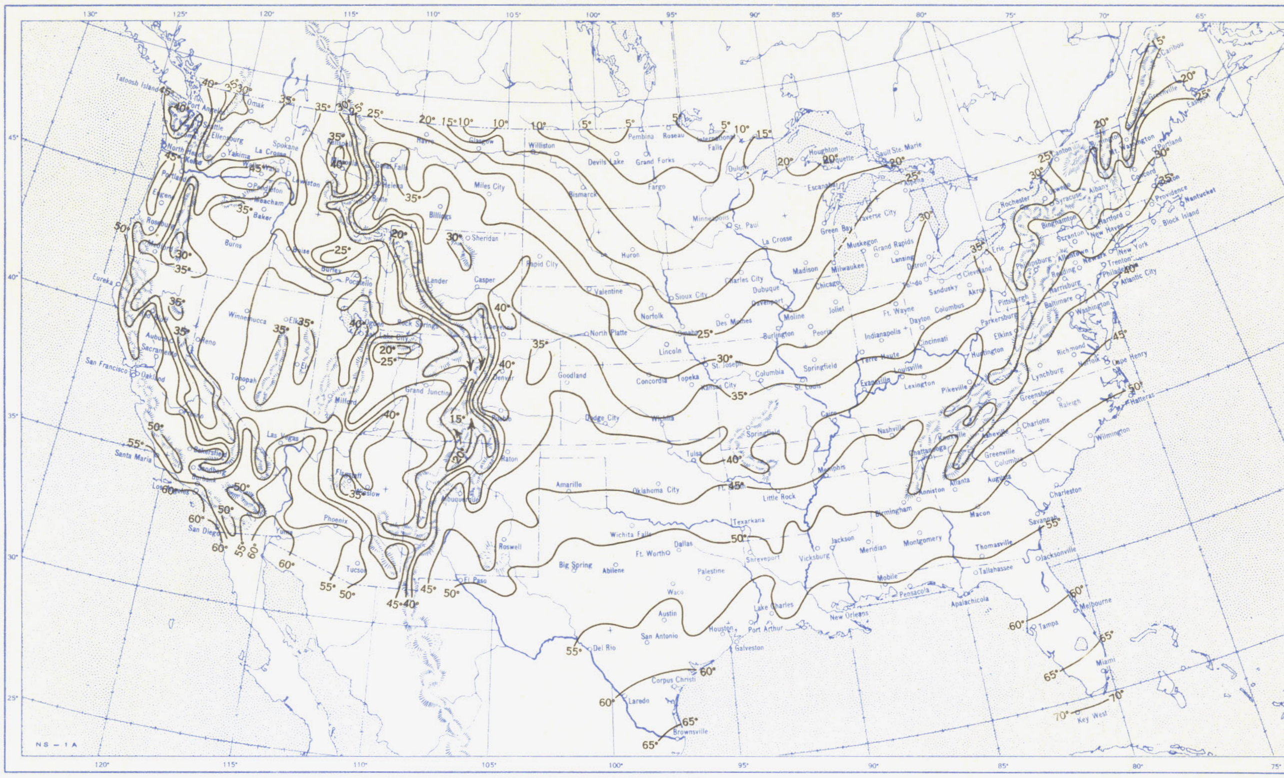
Astronomical and meteorological factors combined to produce the worst flood in modern history in western Europe on January 31 and February 1. The inundation was caused by strong northerly to northwesterly winds, reported to have reached 114 m. p. h. at times, reinforcing a high tide which was exceptionally high as a result of the full moon. Two distinct critical stages, timed with high tide, occurred. The first, varying from late evening of the 31st in Scotland to morning of the 1st in the Netherlands, was, in general, the most disastrous, since winds were strongest. The second stage occurred during the afternoon and evening of the 1st. It was reported that 12-foot waves occurred with the first and 9-foot waves with the second high tide in the Low Countries.

Figure 5 shows the 5-day mean 700-mb. height for the period January 28–February 1, 1953, together with the paths of the surface Low and Highs which produced this catastrophe. Figure 6 shows the daily 700-mb. map for 0300 GMT, January 31, approximately 12 hours before the first floods occurred. Noteworthy on the latter chart is the exceedingly strong gradient between Iceland and France, and the intense trough between western Russia and Turkey. The Low responsible for the flood began in the vicinity of the Azores on the 29th, exact position being doubtful due to lack of reports. By the morning of the 30th (EST), it had moved northeastward, apparently steered by the long wave ridge, and was located between Iceland and Scotland, with central pressure 990 mb. During the next 24 hours it recurved sharply to the southeast, again consistent with the flow indicated by the mean contours, and deepened to 970 mb. It was during this period that the northerly and northwesterly winds increased tremendously. Both the daily and mean 700-mb. charts suggest a strong confluence of warm air moving northeastward from the Atlantic and cold air moving southeastward from Greenland, an important factor in this deepening [2]. By the morning of the 1st, the storm had filled to 983 mb. and had continued its motion southeastward into northern Germany. During the storm passage, a cold polar High, which had moved southeastward from Greenland, combined with a maritime High, which had moved northeastward from the Atlantic, in the vicinity of Scotland. The juxtaposition of these Highs with the low center contributed to the strong northerly gradient in the rear of the storm.

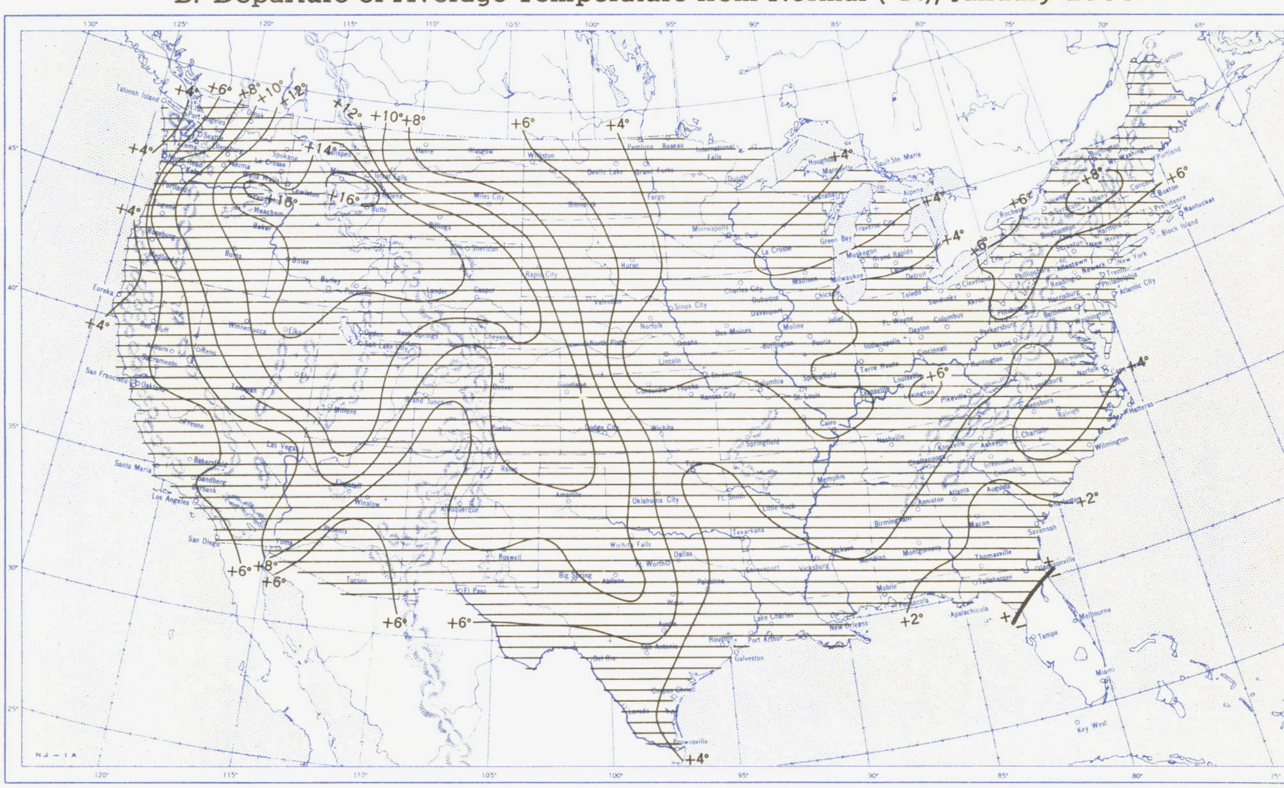
REFERENCES

1. H. F. Hawkins, Jr., "The Weather and Circulation of December 1952," *Monthly Weather Review*, vol. 80, No. 12, December 1952, pp. 246–249.
2. R. C. Sutcliffe, "Rapid Development Where Cold and Warm Air Masses Move Toward Each Other," *Synoptic Division Technical Memorandum No. 12*, Air Ministry, Great Britain, 1940.

Chart I. A. Average Temperature (°F.) at Surface, January 1953.

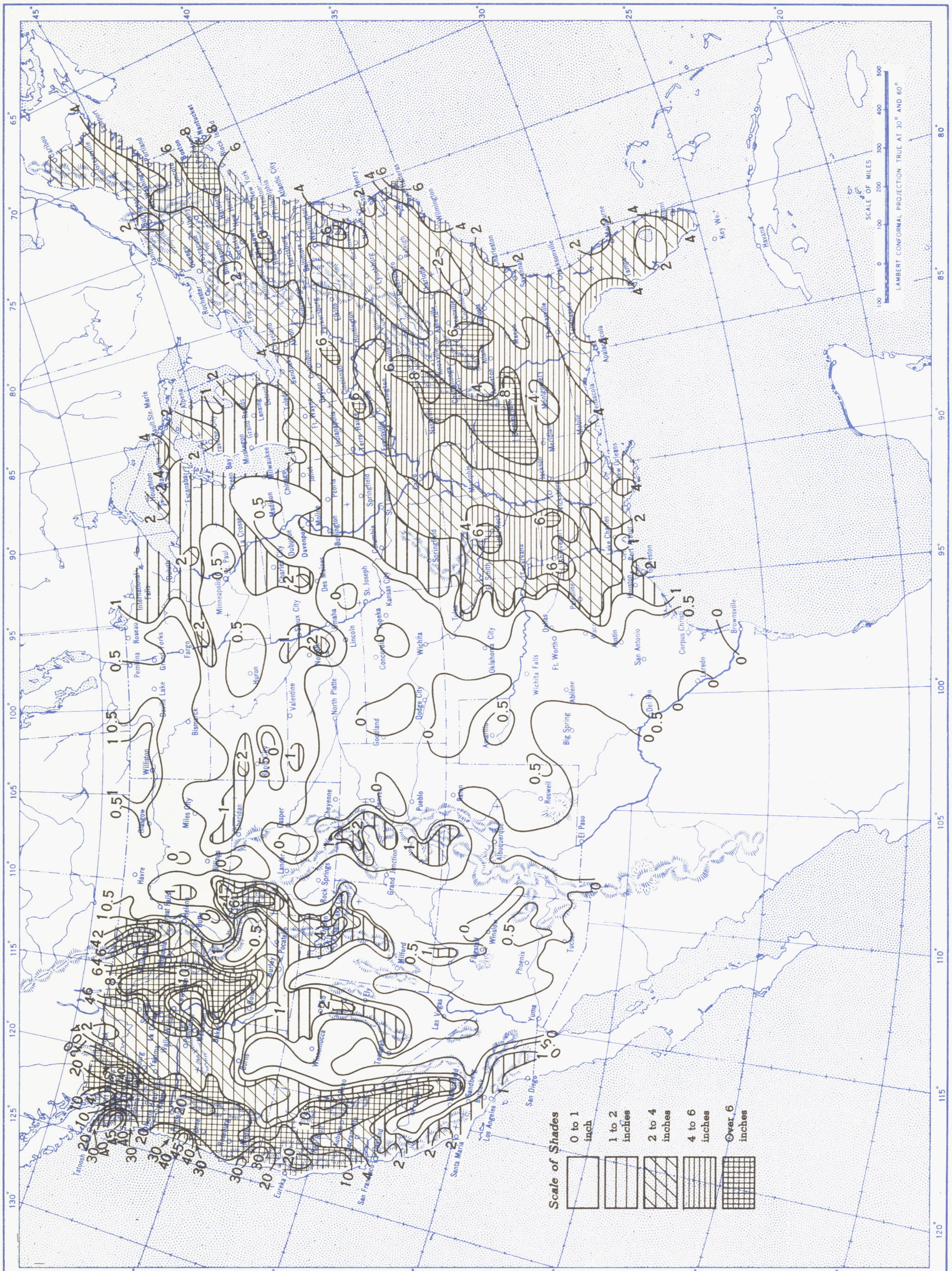


B. Departure of Average Temperature from Normal (°F.), January 1953.



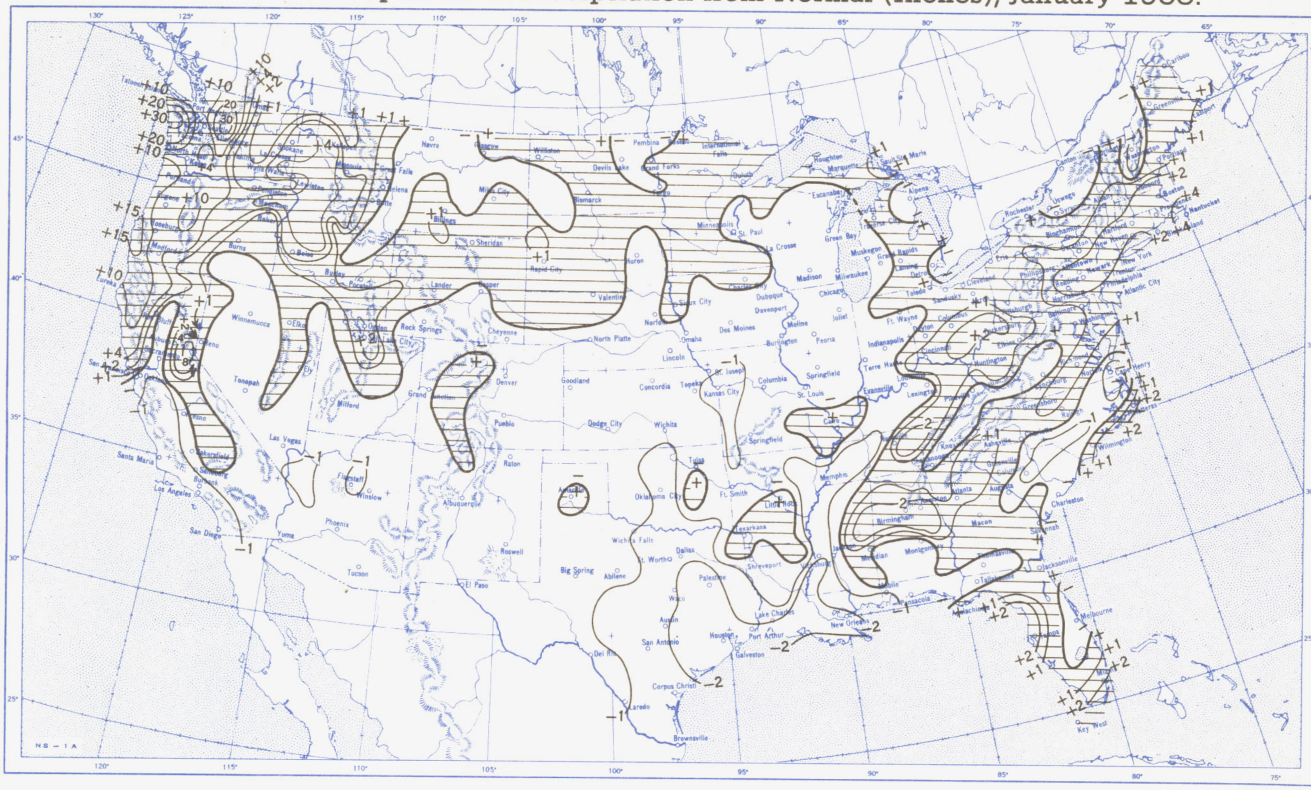
A. Based on reports from 800 Weather Bureau and cooperative stations. The monthly average is half the sum of the monthly average maximum and monthly average minimum, which are the average of the daily maxima and daily minima, respectively.
B. Normal average monthly temperatures are computed for Weather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

Chart II. Total Precipitation (Inches), January 1953.

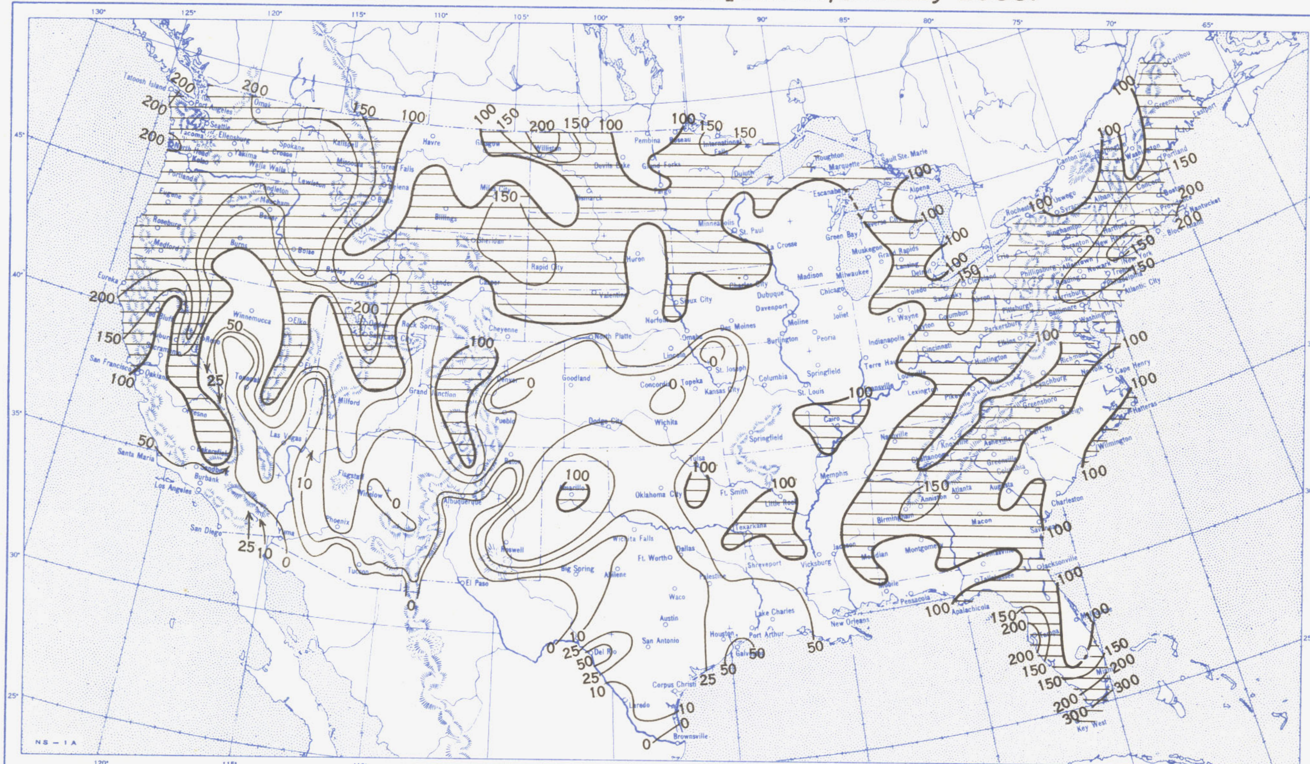


Based on daily precipitation records at 800 Weather Bureau and cooperative stations.

Chart III. A. Departure of Precipitation from Normal (Inches), January 1953.

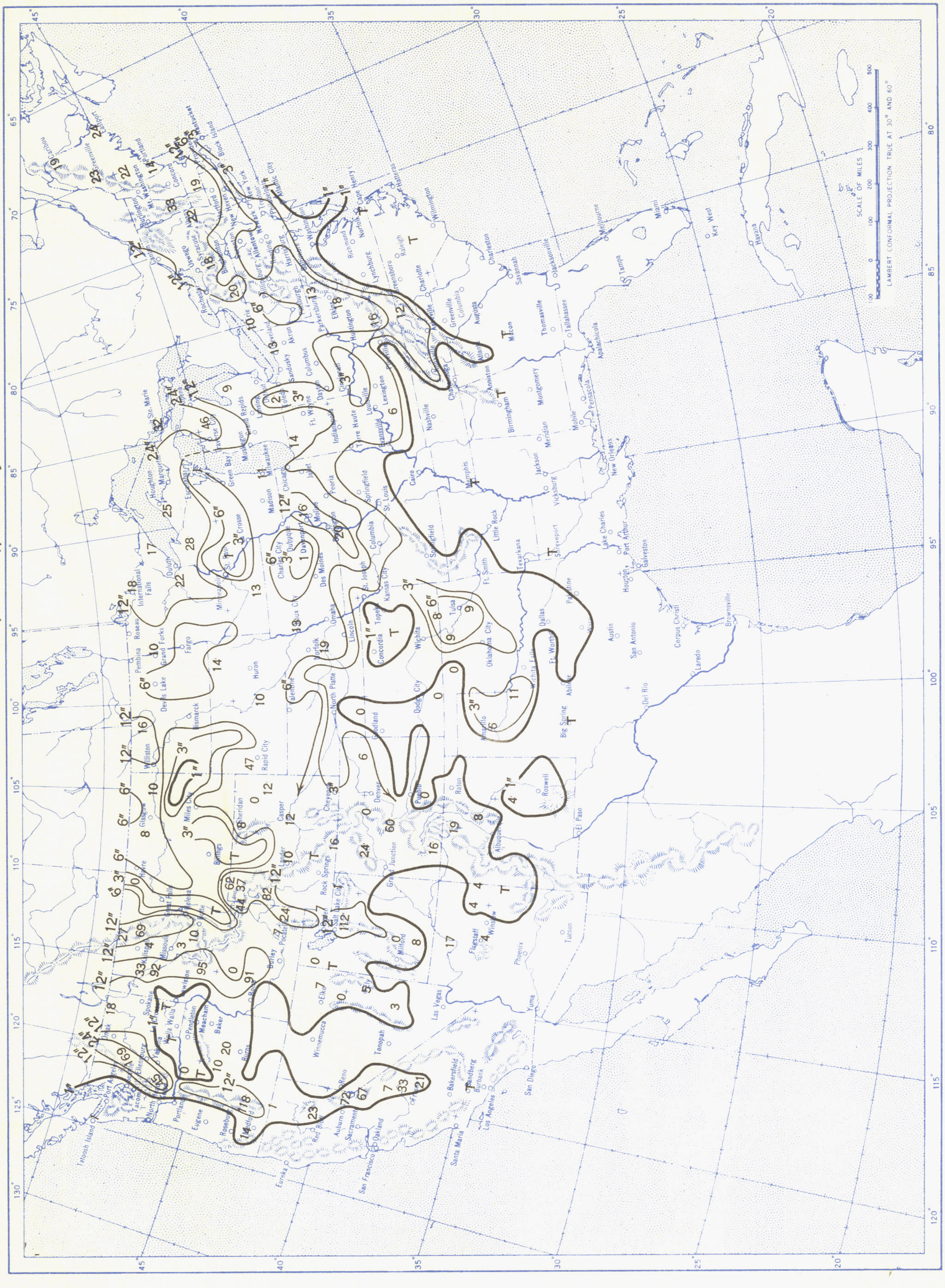


B. Percentage of Normal Precipitation, January 1953.



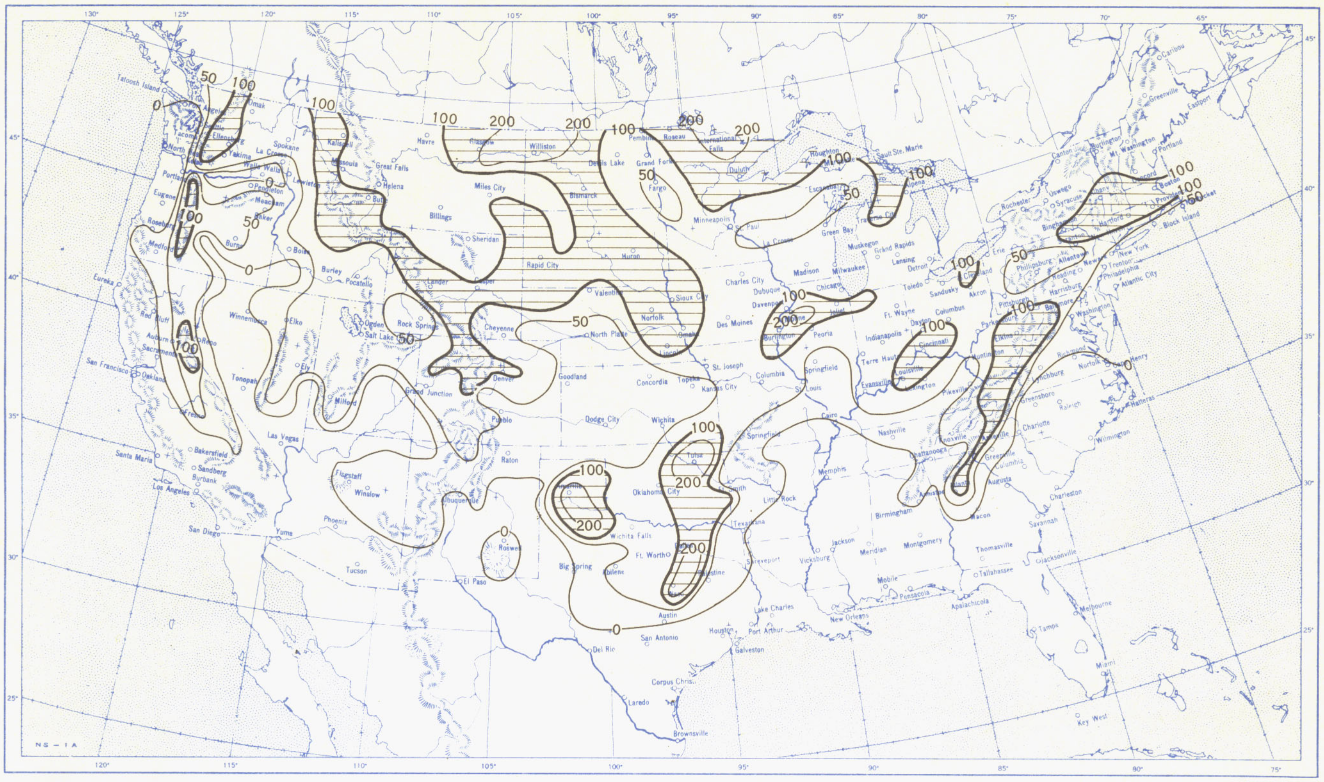
Normal monthly precipitation amounts are computed for stations having at least 10 years of record.

Chart IV. Total Snowfall (Inches), January 1953.

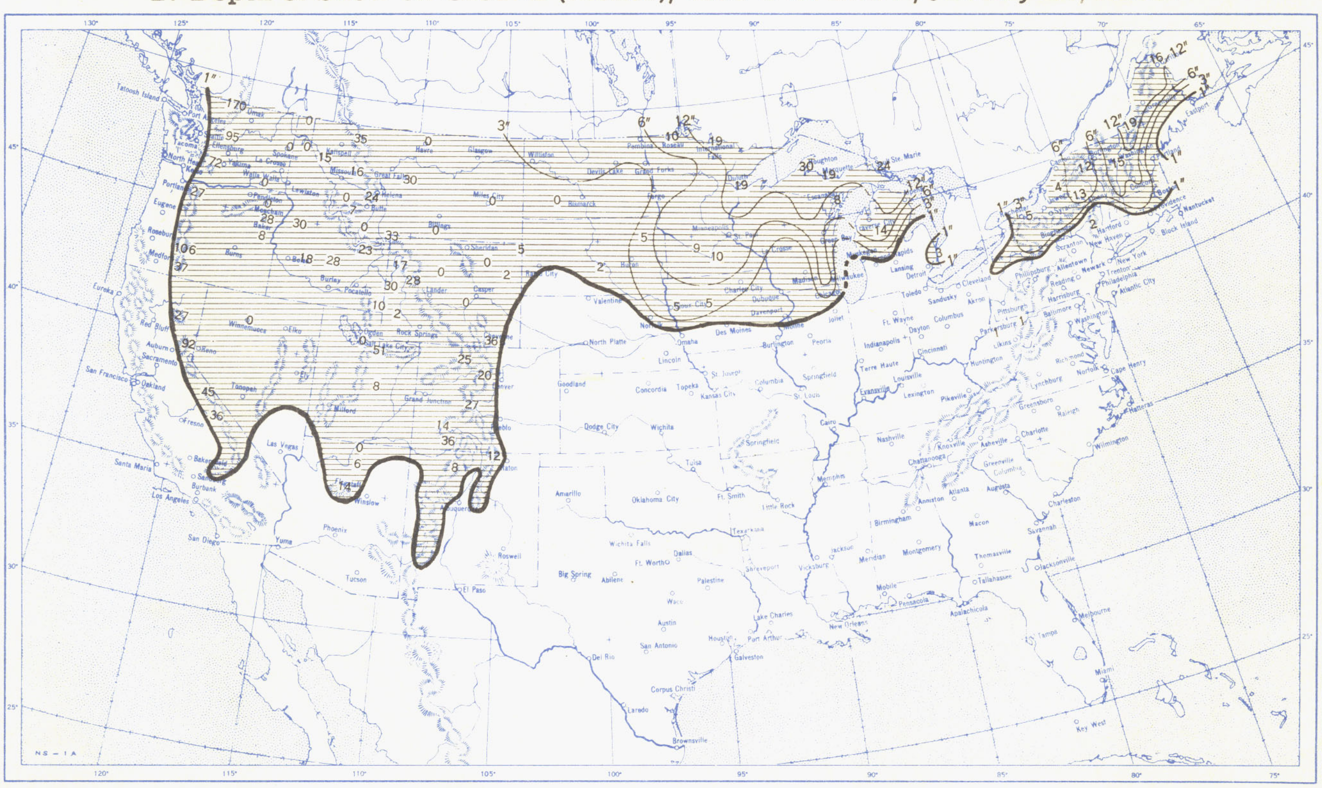


This is the total of unmelted snowfall recorded during the month at Weather Bureau and cooperative stations. This chart and Chart V are published only for the months of November through April although of course there is some snow at higher elevations, particularly in the far West, earlier and later in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

Chart V. A. Percentage of Normal Snowfall, January 1953.

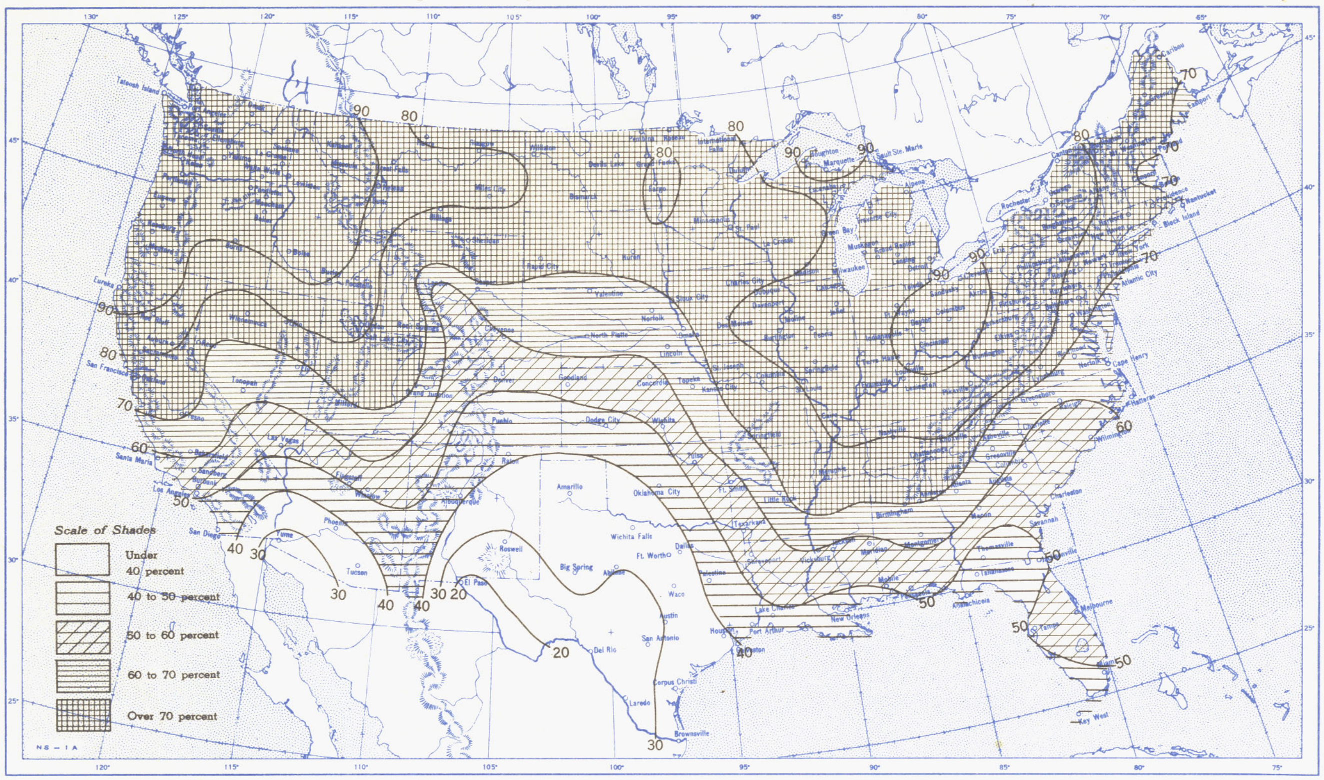


B. Depth of Snow on Ground (Inches), 7:30 a. m. E. S. T., January 27, 1953.

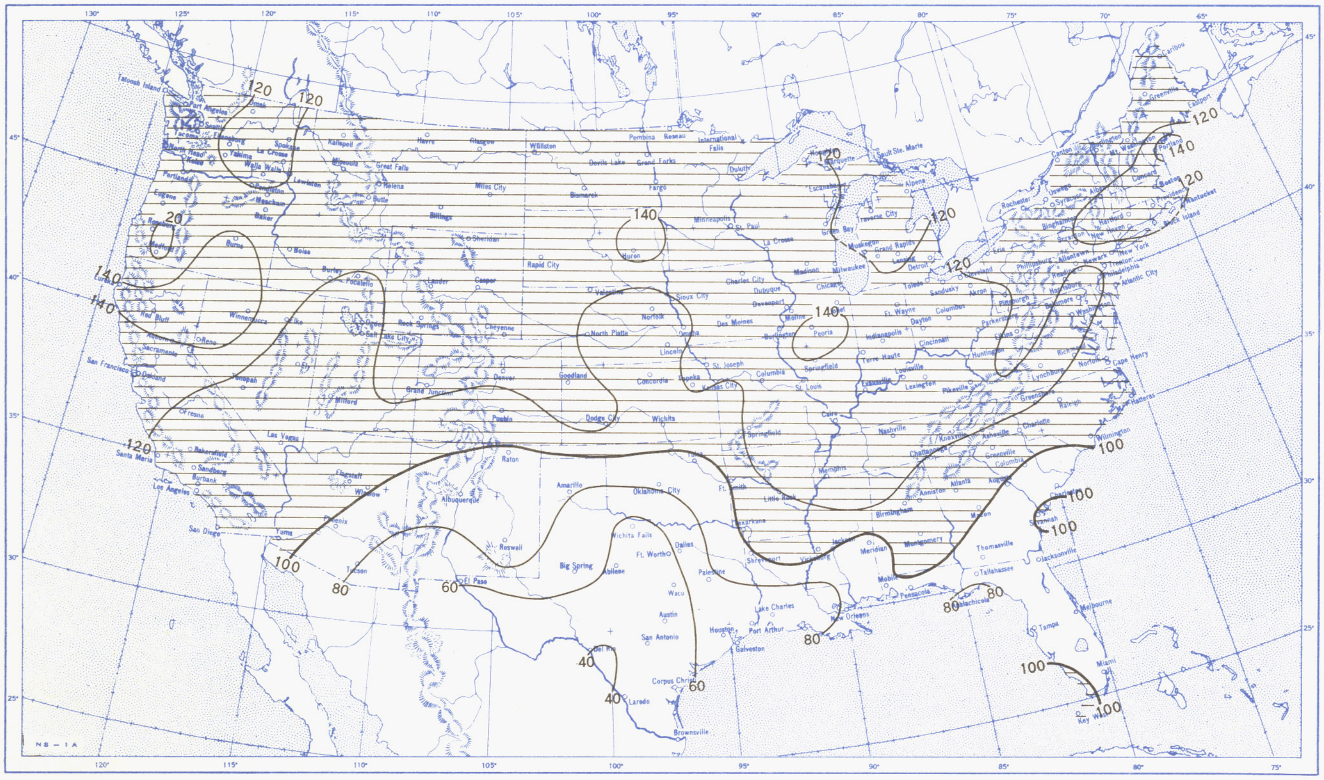


A. Amount of normal monthly snowfall is computed for Weather Bureau stations having at least 10 years of record.
B. Shows depth currently on ground at 7:30 a. m. E.S.T., of the Tuesday nearest the end of the month. It is based on reports from Weather Bureau and cooperative stations. Dashed line shows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

Chart VI. A. Percentage of Sky Cover Between Sunrise and Sunset, January 1953.

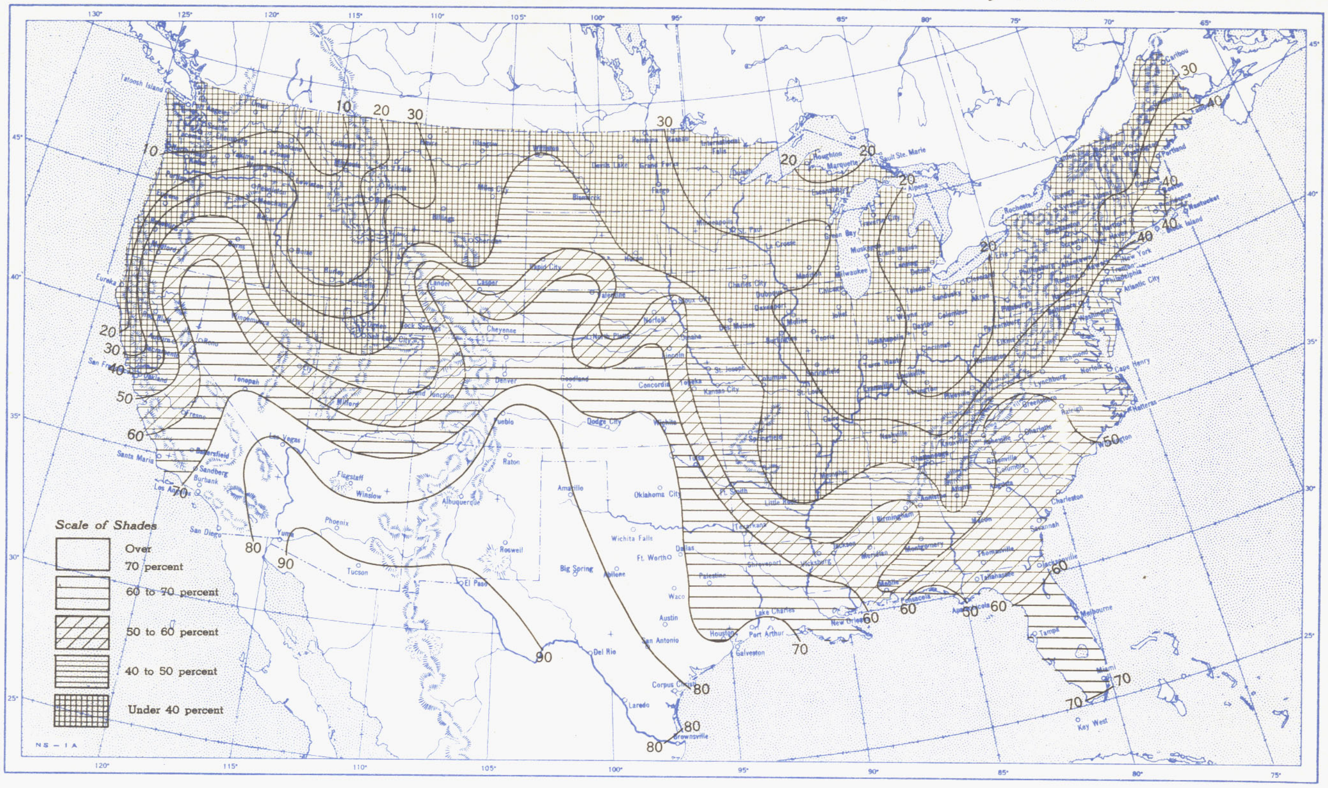


B. Percentage of Normal Sky Cover Between Sunrise and Sunset, January 1953.

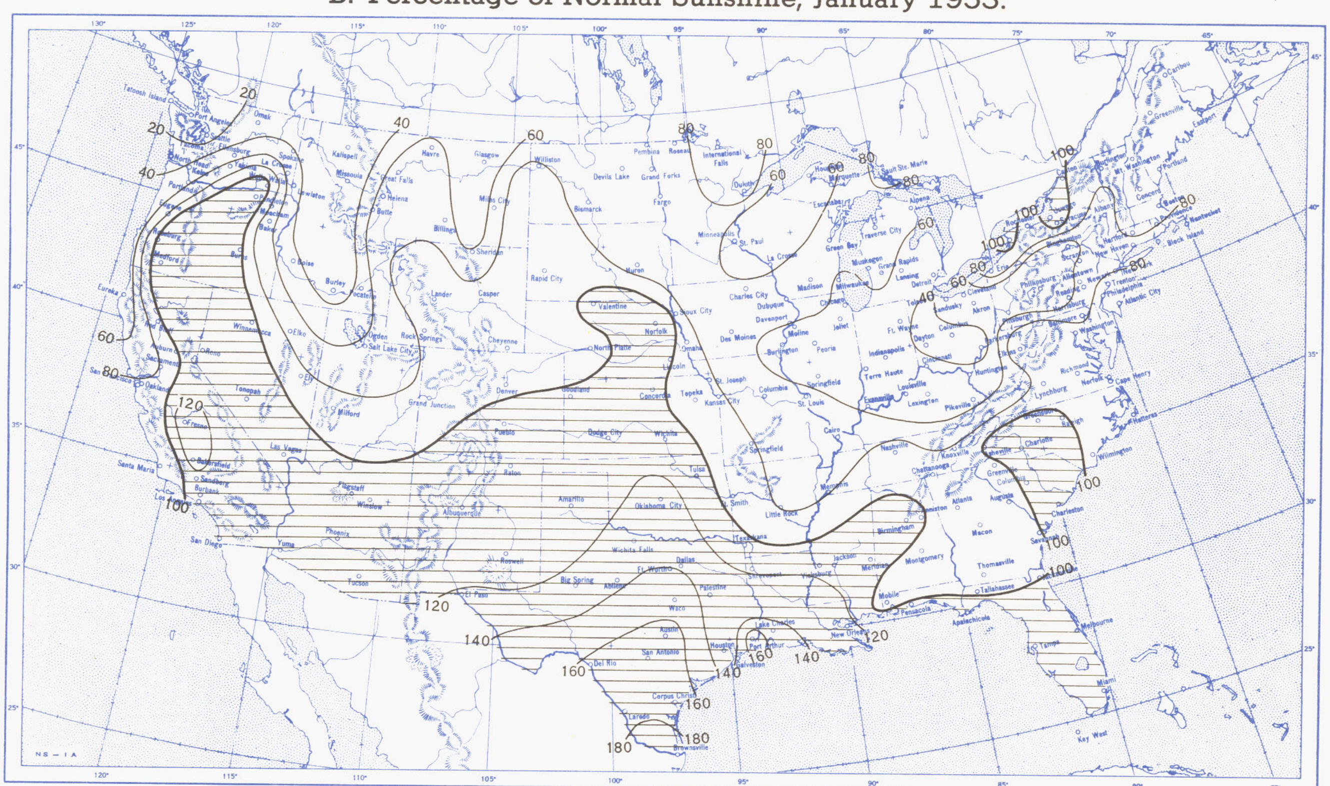


A. In addition to cloudiness, sky cover includes obscuration of the sky by fog, smoke, snow, etc. Chart based on visual observations made hourly at Weather Bureau stations and averaged over the month. B. Computations of normal amount of sky cover are made for stations having at least 10 years of record.

Chart VII. A. Percentage of Possible Sunshine, January 1953.



B. Percentage of Normal Sunshine, January 1953.



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, January 1953. Inset: Percentage of Normal Average Daily Solar Radiation, January 1953.

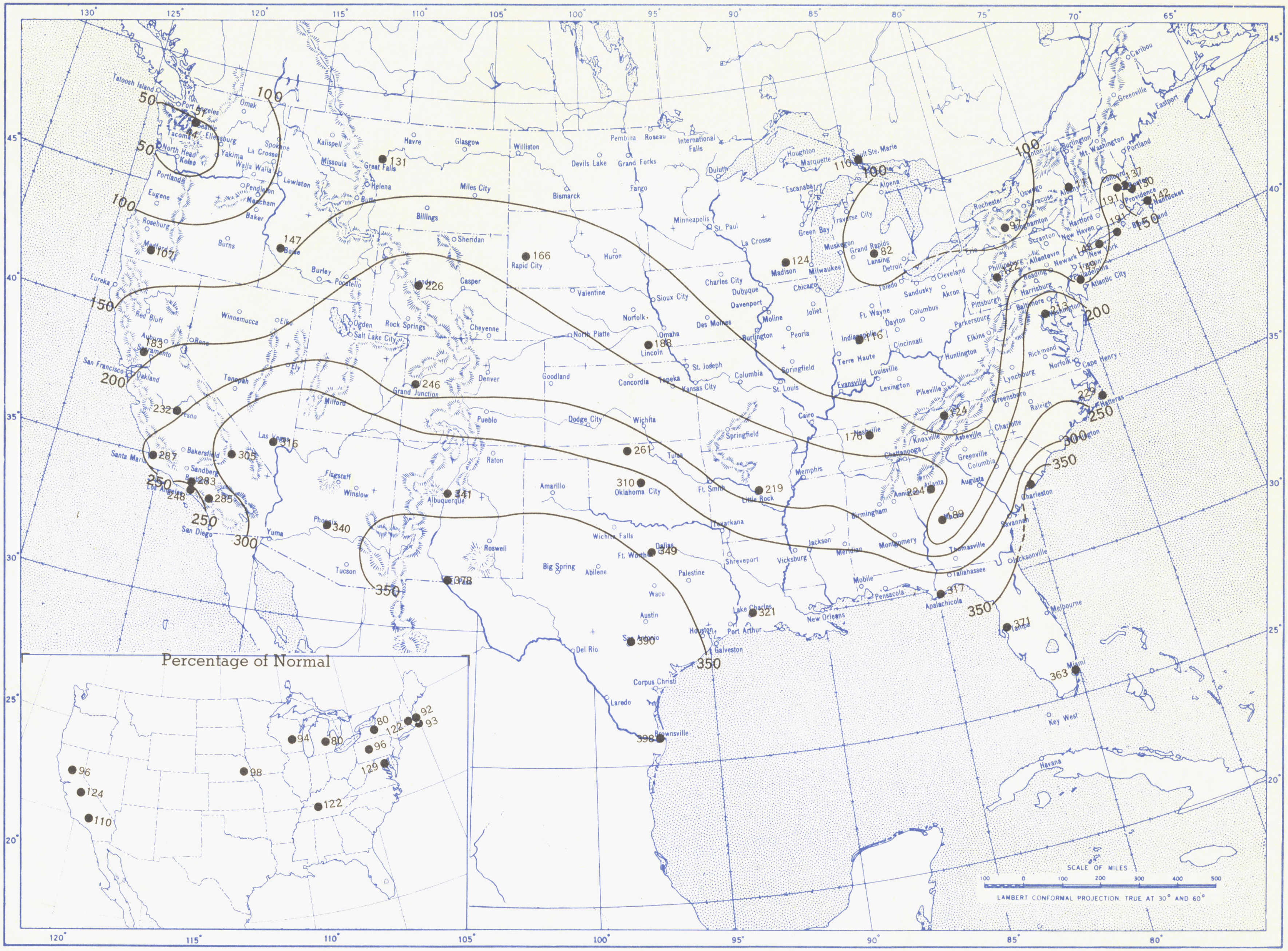
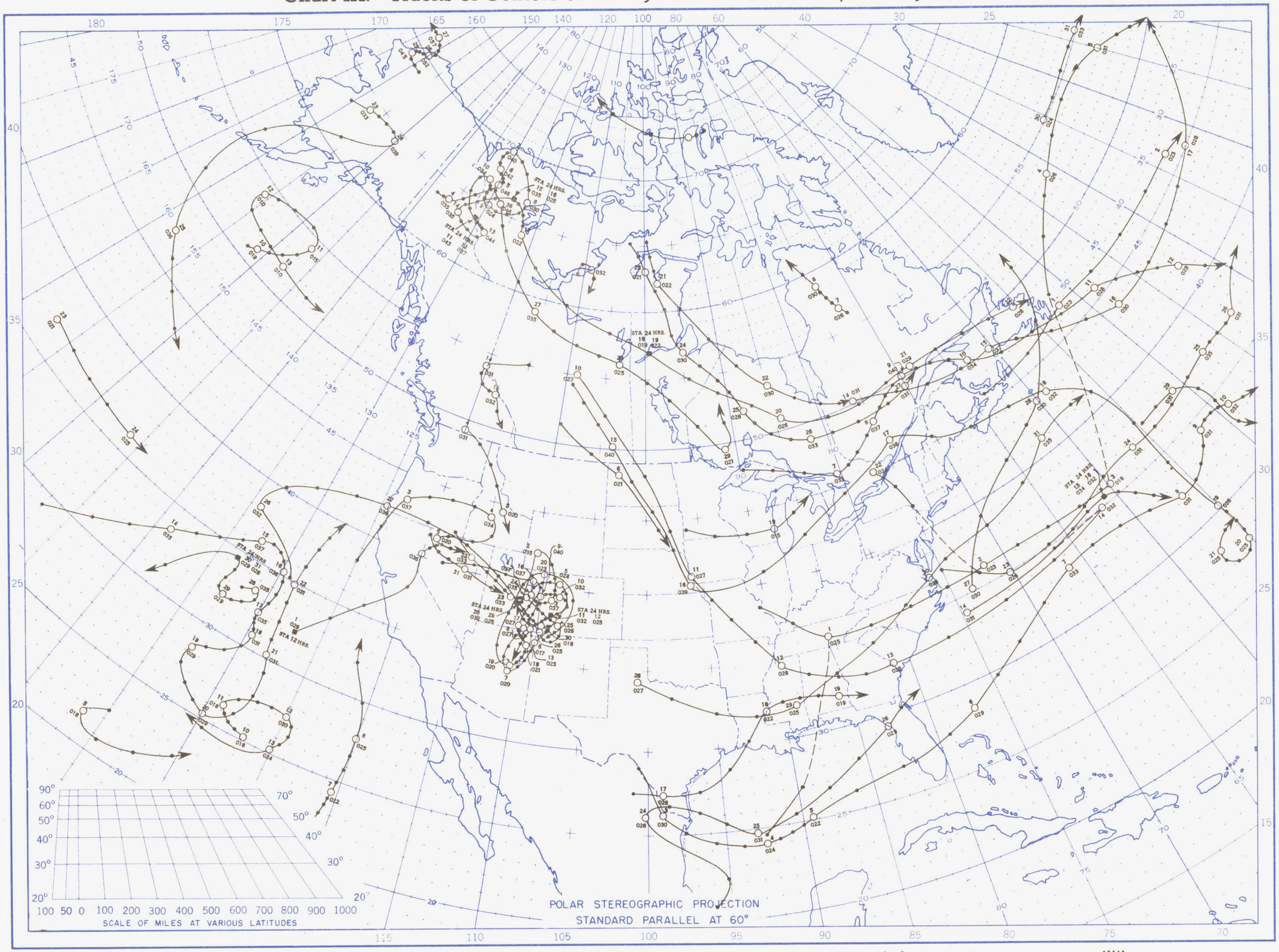


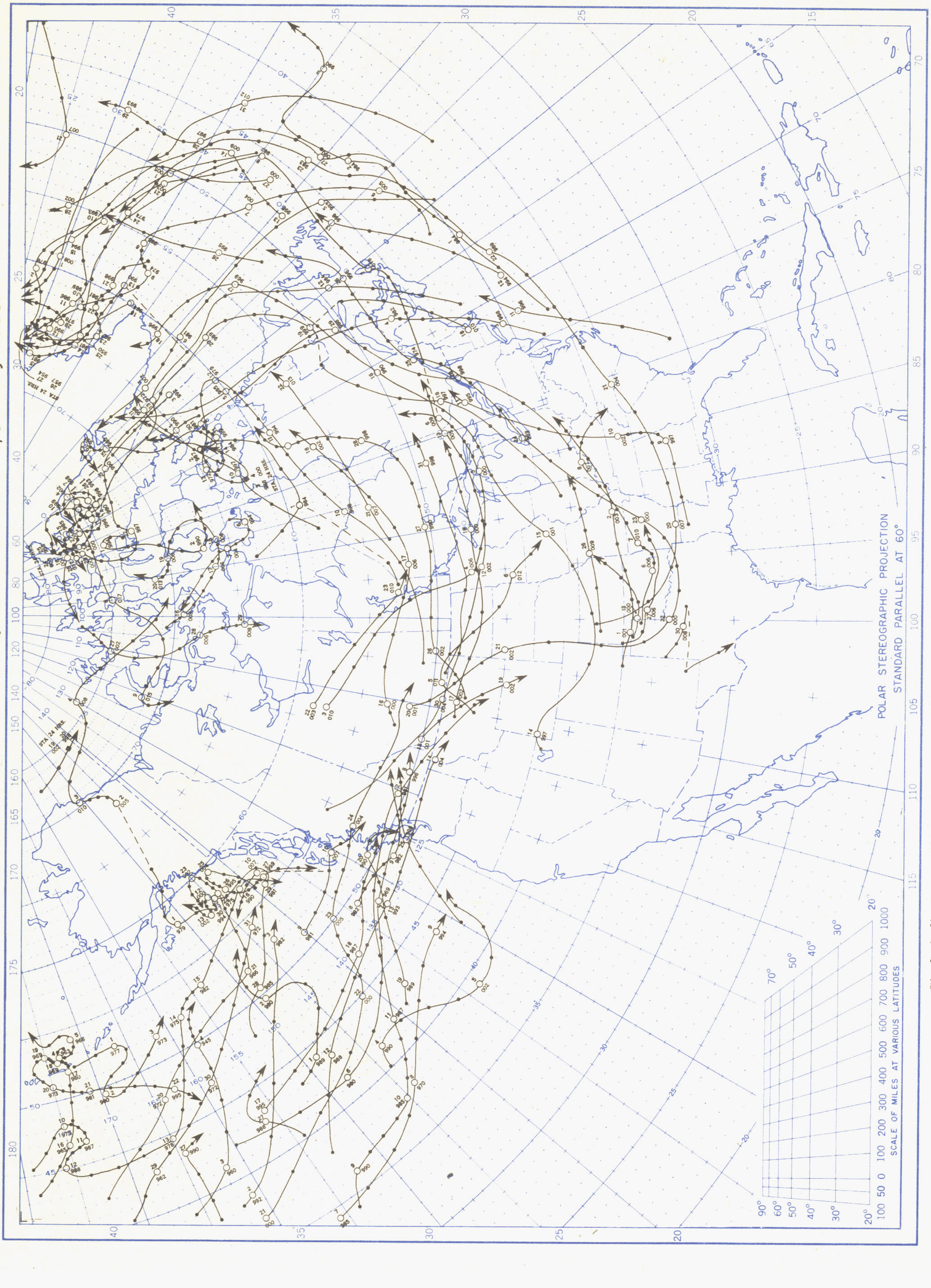
Chart shows mean daily solar radiation, direct + diffuse, received on a horizontal surface in langleys (1 langley = 1 gm. cal. cm.$^{-2}$). Basic data for isolines are shown on chart. Further estimates are obtained from supplementary data for which limits of accuracy are wider than for those data shown.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

Chart IX. Tracks of Centers of Anticyclones at Sea Level, January 1953.



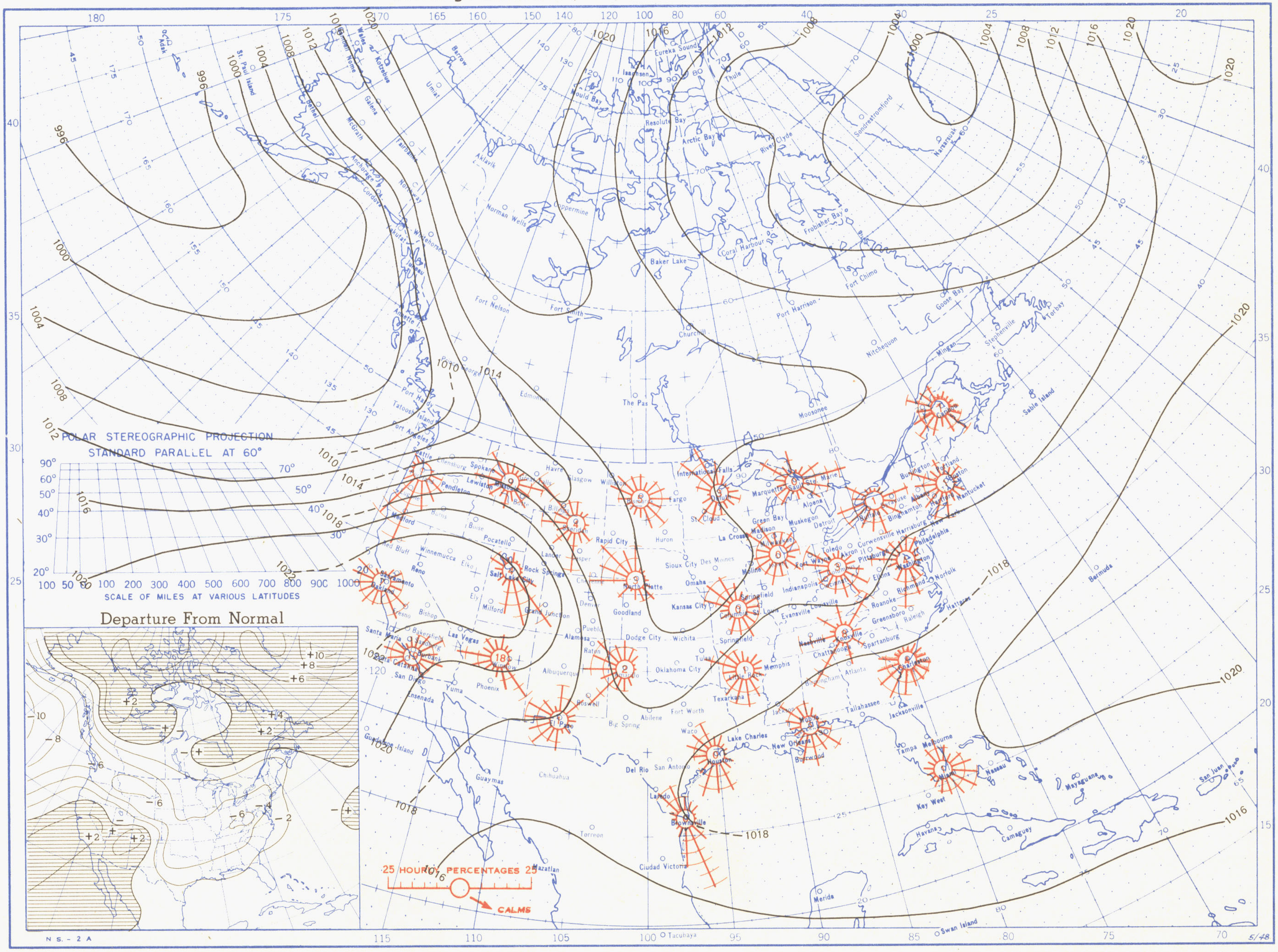
Circle indicates position of center at 7:30 a. m. E. S. T. Figure above circle indicates date, figure below, pressure to nearest millibar. Dots indicate intervening 6-hourly positions. Squares indicate position of stationary center for period shown. Dashed line in track indicates reformation at new position.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

Chart X. Tracks of Centers of Cyclones at Sea Level, January 1953.



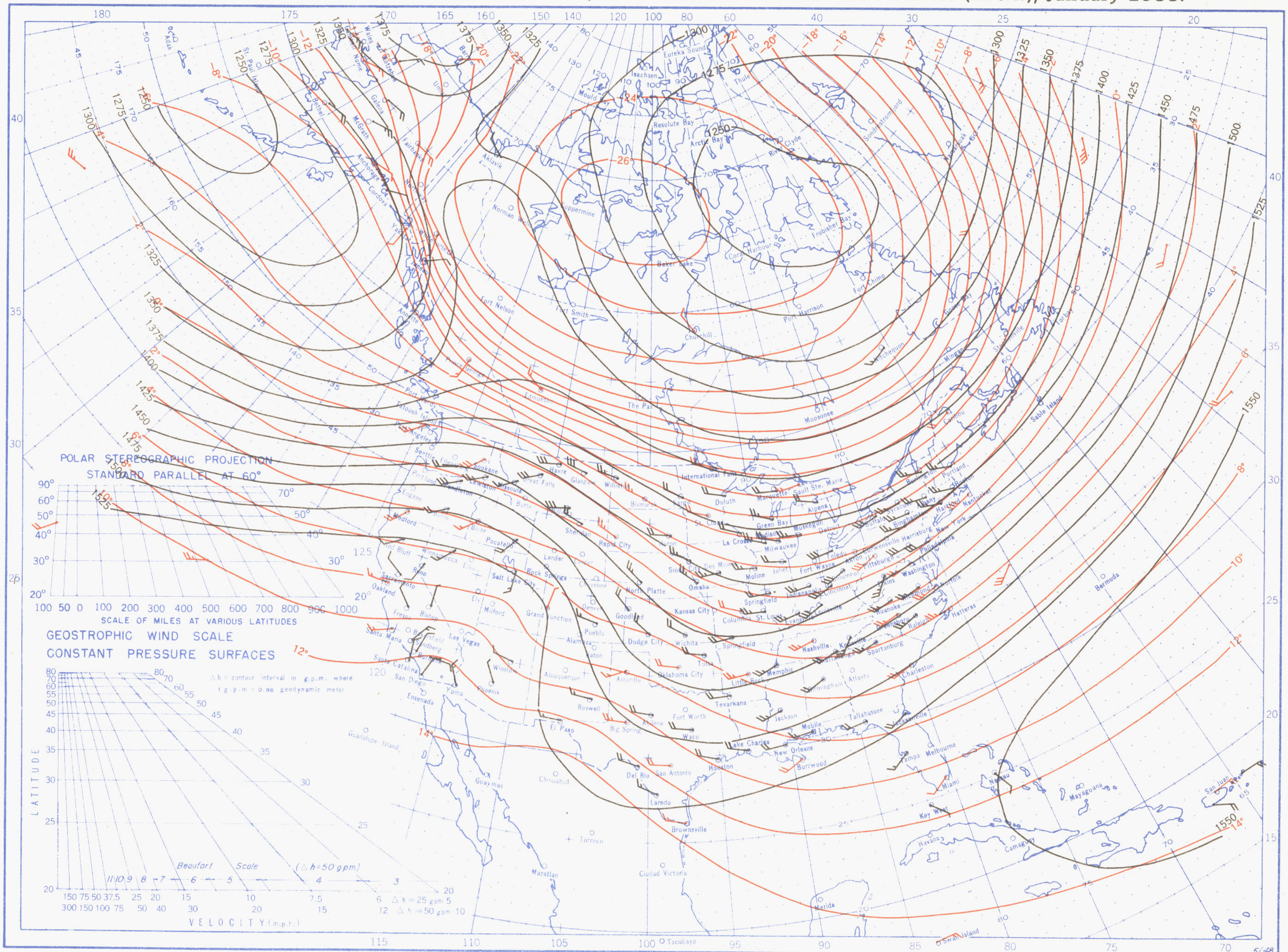
Circle indicates position of center at 7:30 a. m. E. S. T. See Chart IX for explanation of symbols.

Chart XI. Average Sea Level Pressure (mb.) and Surface Windroses, January 1953. Inset: Departure of Average Pressure (mb.) from Normal, January 1953.



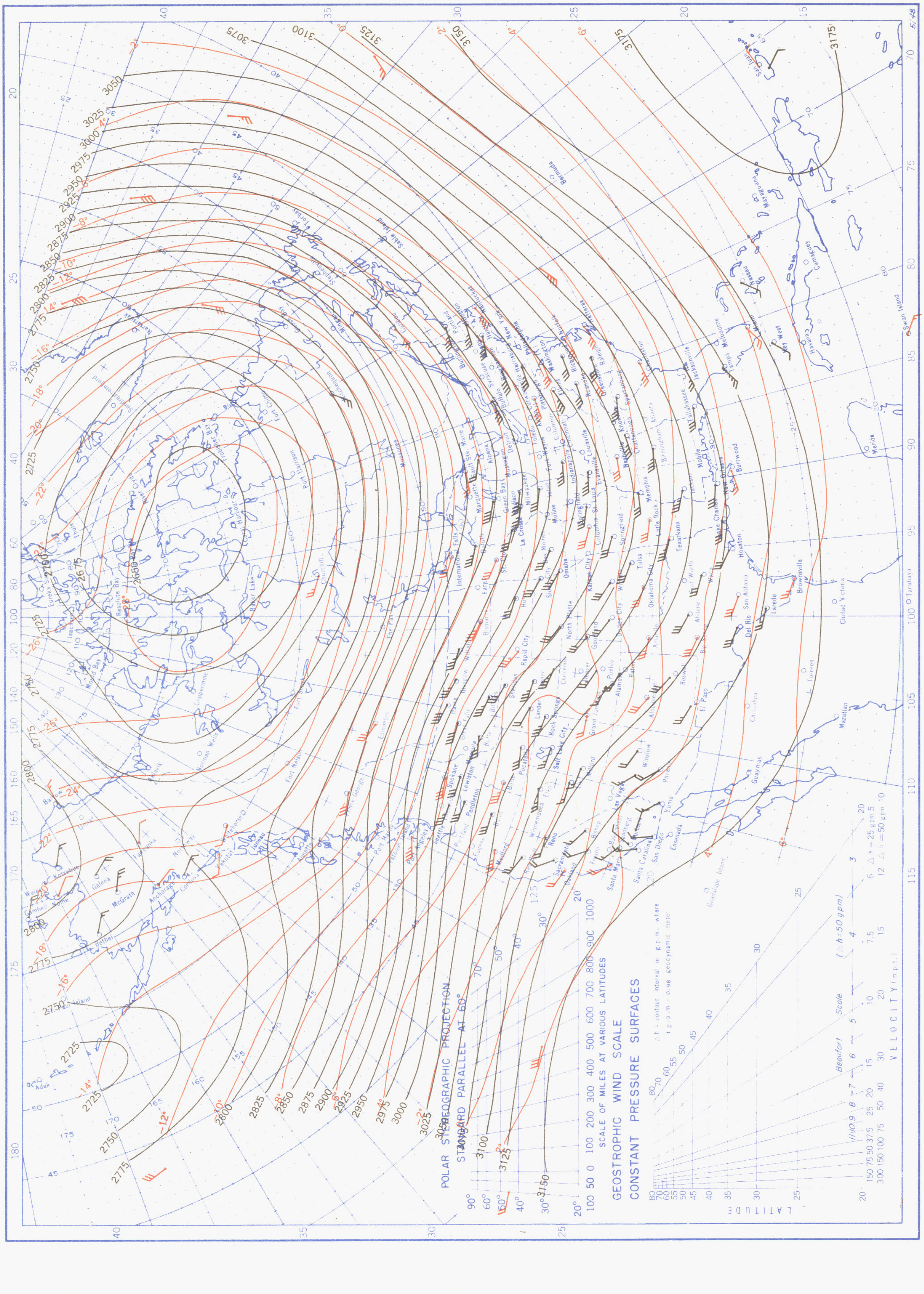
Average sea level pressures are obtained from the averages of the 7:30 a. m. and 7:30 p. m. E. S. T. readings. Windroses show percentage of time wind blew from 16 compass points or was calm during the month. Pressure normals are computed for stations having at least 10 years of record and for 10° intersections 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.), January 1953.



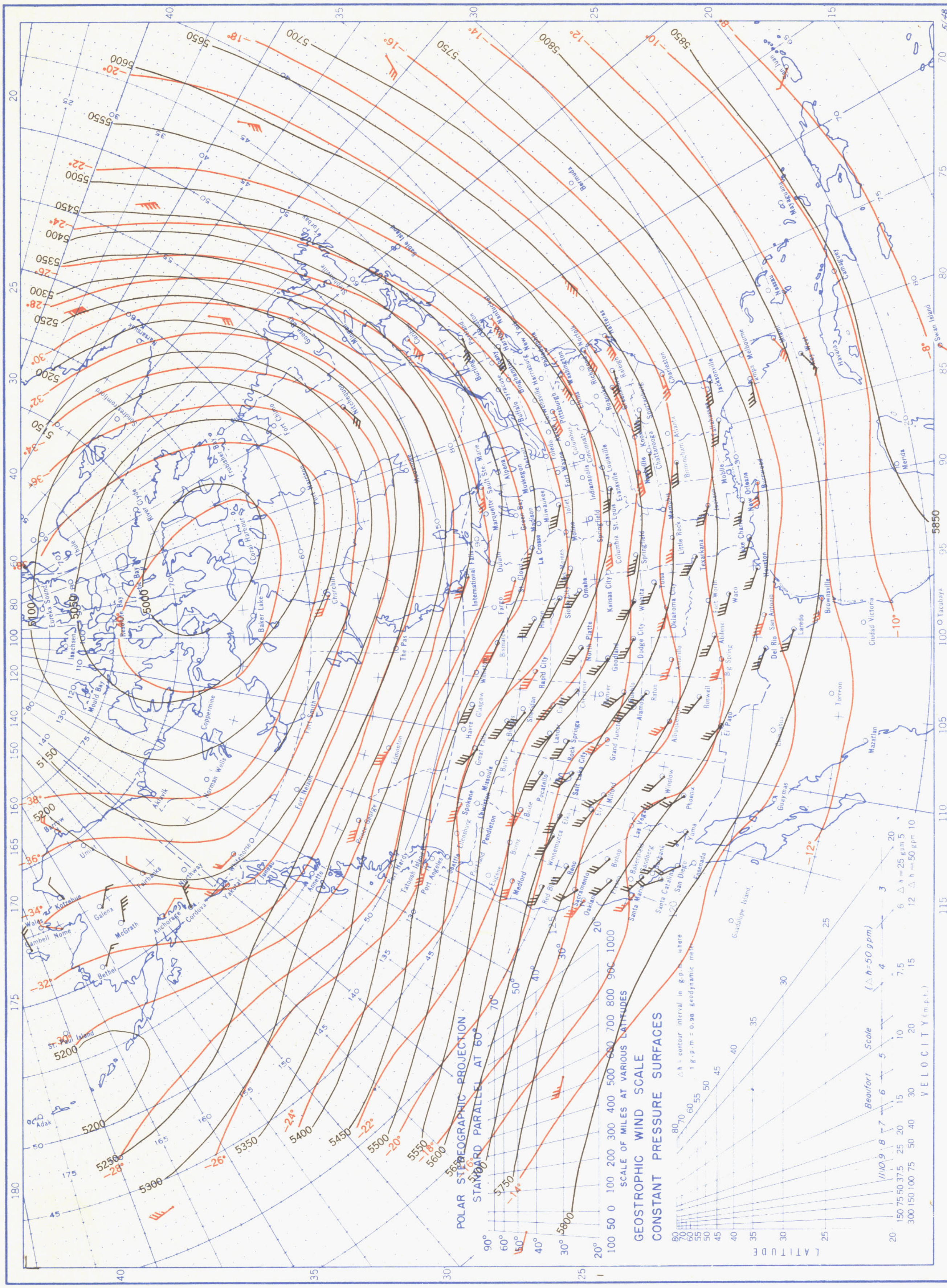
Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins taken at 0300 G. M. T.

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.), January 1953.



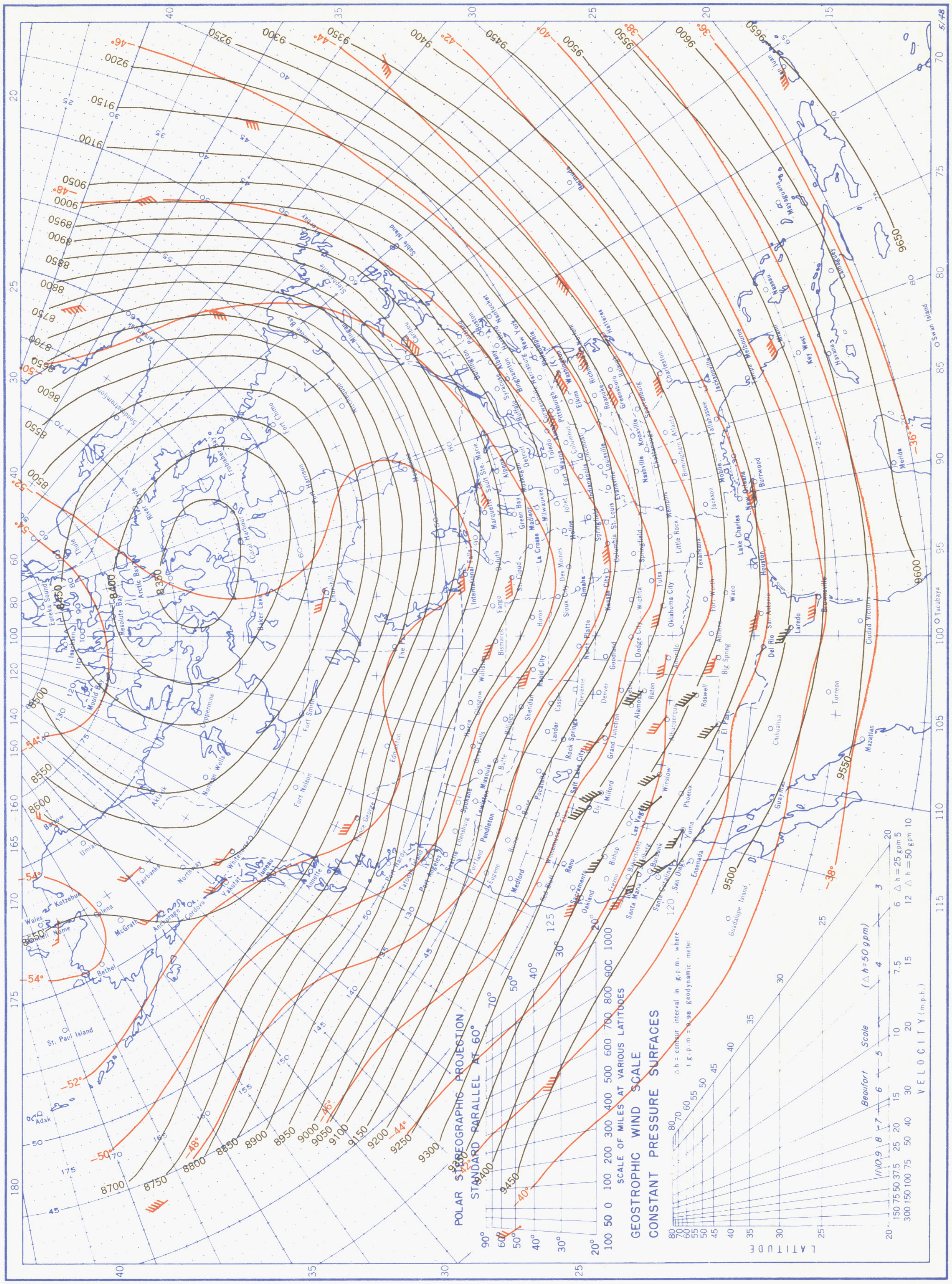
Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins taken at 0300 G. M. T.

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.), January 1953.



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.), January 1953.



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.