M.O. 631c

AIR MINISTRY

METEOROLOGICAL OFFICE

Geophysical Memoirs No. 103

(THIRD NUMBER, VOLUME XIII)

UPPER WINDS OVER THE WORLD

PARTS I AND II

BY

H. HEASTIE, M.Sc. AND P. M. STEPHENSON, M.Sc.

LONDON: HER MAJESTY'S STATIONERY OFFICE

1960

U.D.C.
551. 587
551. 557. 2(4/9)

Geophys. Mem., London,
13, No. 103, 1960

TABLE OF CONTENTS

APPENDICES

LIST OF ILLUSTRATIONS

UPPER WINDS OVER THE WORLD

INTRODUCTION

An earlier Memoir[1]* presented the distribution and variability of upper winds over the world principally by means of seasonal charts of the average heights (contour charts) of selected isobaric surfaces from 700 to 130 millibars and corresponding charts of the standard vector deviation of wind. These charts were necessarily based on data obtained when the network of upper air observing stations was extremely sparse in many parts of the world, and though all the available data were used, the charts were largely built up from values estimated either statistically or by extrapolation. It was realized at the time of publication that these charts would in due course need revision. By about 1953 the increasing volume of upper air data made a realistic revision feasible, of which the present Memoir, incorporating revised and extended charts, is the outcome. The work was at first under the supervision of Miss E. E. Austin, later under J. K. Bannon. The preparation of the various sets of charts was carried out primarily as follows: Contours of isobaric surfaces by H. Heastie, assisted later by R. A. Ebdon; streamlines and isotachs by H. Heastie and P. M. Stephenson ; meridional cross-sections by P. M. Stephenson. The important and arduous work of assembling and sifting the data from many sources with diverse methods of presentation was carried out by many members of the staff, present and past, of the world climatological section of the Meteorological Office.

The charts of *Geophysical Memoirs No. 85*[1] were drawn separately for the four seasons, each of three months. However, changes within a season are often considerable and, to avoid the difficulty of maintaining proper weighting for all areas of the charts for each month of a season, the charts in this Memoir are for the mid-season months only, that is January, April, July and October. In some other respects also the charts of the present Memoir differ from the earlier ones.[1] They are as far as possible based on data obtained during a fixed period rather than a period varied to include earlier years in certain areas where data were otherwise scanty, thus reducing the errors arising from heterogeneity of the data. The five-year period 1949–53 was chosen mainly because January 1949 marked the beginnings of both the regular dissemination on a world-wide basis of monthly mean upper air data (CLIMAT TEMP messages[2]), and the publication in Western Germany of monthly mean 500-millibar contour charts[3] for a large part of the northern hemisphere. The charts in *Geophysical Memoirs No. 85*[1] are on Mercator's projection and therefore do not cover the polar regions. In view however of the increasing importance of the north polar regions for aviation as well as the increased amount of data available, separate sets of charts are included in this Memoir for the circumpolar region north of latitude 55°N. The streamline–isotach charts which in *Geophysical Memoirs No. 85*[1] covered the tropical regions only have been extended over the whole area from 90°N to approximately 60°S. It has been possible to extend the work to a somewhat higher level so that the charts for 130 millibars have been replaced by separate sets for each of the levels 150 and 100 millibars. A series of vertical cross-sections showing the distribution with pressure (height) and latitude of the monthly means of potential temperature and zonal component of wind have been added.

It was shown in the earlier Memoir[1] that the two parameters required for the estimation of the probable wind at any given place are the vector mean and standard vector deviation of wind. For latitudes outside the tropics the vector mean wind can be obtained by the geostrophic relation

* The index numbers refer to the bibliography on p. 17.

from charts of contours of absolute topography of pressure. Since the dynamical equations of atmospheric motion are non-linear, the mean motion cannot be deduced exactly from the mean pressure distribution. Crossley[4] has deduced that the use of the geostrophic relation on the charts of mean contours requires a correction but this is not likely to exceed 3 knots. The uncertainty in reading the contours is greater than this and so the geostrophic wind measured from the mean contours is a sufficiently accurate approximation to the vector mean wind.

As the equator is approached the reliability of the method decreases and in this work it is considered that the limiting latitudes for the use of the geostrophic relation are 30°N and 30°S. Charts of streamlines and isopleths of vector mean wind speed (isotachs) are necessary for displaying the required information within this latitude belt. Though only an alternative to the contour charts in higher latitudes, they are more convenient in use and for this reason they have in the present work been extended over the whole area 90°N to 60°S. The contour and streamline–isotach charts and cross-sections with explanatory text constitute Parts I and II of the Memoir.

The charts of standard vector deviation of wind and an explanation of their use will be presented in Part III, to be issued separately.

PART I—AVERAGE HEIGHT OF ISOBARIC SURFACES

§ 1—GENERAL DESCRIPTION

Mean contour charts for the levels 700, 500, 300, 200, 150 and 100 millibars for the months of January, April, July and October are reproduced in Figures 2 to 49. For each month there is one set of charts on Mercator's projection and a set of corresponding charts for the north polar regions drawn on circumpolar base maps extending to 55°N. On the Mercator charts drawing of the contours has not been attempted beyond about 60°S because of the lack of data. In general the charts are based on data for the period 1949–53. The contours are drawn at intervals of 100 geopotential metres (gpm) for the most part ; a few mid-interval (50-gpm) contours are shown by broken lines where the normal 100-gpm contours do not represent the pattern adequately.

Appendix III contains average contour heights in geopotential decametres at grid points (that is at intersections of selected latitude and longitude lines) for the charts shown in Figures 2 to 49.

§ 2—DATA

Sources and period of data.—The sources of the data used in constructing the charts are briefly outlined below and listed in Appendix I. They consist entirely of the results of upper air soundings by radio-sonde and radar wind-finding equipment.

Up to 200 millibars, CLIMAT TEMP reports were available for a large number of stations. These are special reports compiled at the end of each month and broadcast with the ordinary synoptic messages. They include the monthly mean heights and temperatures for certain standard isobaric surfaces. Particulars of these messages are to be found in the publications giving details of the synoptic transmissions of the various meteorological services, for example, *Handbook of weather messages.*[2] The data tabulations published by the United States Weather Bureau[5] provided another main source. Data in manuscript form or on microfilm were supplied on request by the Directors of certain overseas meteorological services. Some gaps which remained were filled as far as possible from the daily charts prepared and synoptic data received in the Forecasting Division of the Meteorological Office, and from the published daily and monthly weather reports of other meteorological services. For ocean weather ships and land stations under Meteorological Office control the data were available in tabulated form from Hollerith punched cards. From this summary it will be seen that only unprocessed data were available for many stations, and the working up of the five-year mean values from these took a long time. For a few British controlled overseas stations wind data only were available, and these were used for guidance in drawing the mean contours.

As far as possible the period 1949–53 was strictly adhered to in selecting the data, but for some stations data were available for only part of this period. It was however necessary to use all the available data, irrespective of period, from stations in Antarctica as a guide to drawing the charts at their southern boundary.

Some indication of the reliability of the charts, as affected by the density of the observing network, is afforded by Figure 1. This shows the stations for which data were available for the Mercator charts. For the area north of 75°N on the circumpolar charts only about ten additional stations made observations, one at Cap Cheluiskin (Siberia), the others in northern Greenland and the Canadian archipelago.

Corrections applied to data.—As far as possible the data used were restricted to those observed during the hours of darkness in order to minimize errors due to the effect of solar radiation on the radio-sondes. However in high latitudes in summer, and in some areas at other seasons also, daylight observations only were available. Some of these observations, for example those of the United States of America, Finland and Denmark were corrected at source. Others were not so corrected, and it was not possible to apply corrections to them on a uniform system because of the differing types of radio-sonde used by the various meteorological services. For certain stations or groups of stations for which the type of sonde used and its radiation errors are known, the data were corrected or special procedures were adopted to minimize errors, as follows :

(i) Data from overseas stations using the British radio-sonde were corrected for radiation and lag from tables prepared by Scrase.[6]

(ii) Some stations in Canada use the United States Weather Bureau type of radio-sonde but the observations are not corrected. The appropriate corrections, obtained from the relevant United States Weather Bureau publication[7] were applied to the data during the process of preparation for this Memoir.

(iii) Other stations in Canada use the Canadian radio-sonde. Their data, uncorrected, were adjusted in the light of a paper by Henry[8], who has estimated the corrections necessary to bring the stations using the Canadian Instrument into agreement with those using the United States Weather Bureau instrument, the corrections to the latter being known. South African data, derived from observations with the Canadian instrument were adjusted in the same way.

(iv) Data for the U.S.S.R. were available only up to 300 millibars ; above this level the contour heights were computed using mean temperatures from an earlier Memoir by Goldie, Moore and Austin.[9] In the preparation of that Memoir uncorrected observations made in daylight and in darkness were used so that it is reasonable to suppose that the radiation error is halved. Guterman[10] has discussed the radiation correction of the radio-sonde used in the U.S.S.R. and from his work it has been deduced that the maximum error in the 100-millibar contour heights is less than 20 metres. For lower levels the error will of course be smaller. No attempt has been made to include this correction in Figures 2 to 49.

§ 3—METHOD OF CONSTRUCTING THE CIRCUMPOLAR CHARTS

General.—It was found necessary to draw a separate set of charts for each year because :

(i) The Russian data were very sparse ; some of the monthly means were based on few observations and very few stations were available with equal reliability for all five years. Hence the only way to make use of all available data was to consider each year separately.

(ii) Some of the CLIMAT data were obviously incorrect (possibly due to errors in transmission) and could most easily be checked on a yearly basis.

(iii) At the upper levels, data were biased owing to loss of observations and, moreover, the number of data (particularly at 100 millibars) increased steadily through the period 1949–53.

Further, in drawing the individual charts, the area was divided into two sectors for which somewhat different procedures had to be adopted. For the first sector from 180°W to 20°E, comprising the eastern Pacific, North America, the North Atlantic and western Europe, the data were reasonably adequate for the straightforward drawing of the charts. For the remaining sector from 20°E to 180°E, comprising European and Asiatic Russia and the western Pacific, data were sparse and special procedures, described below, had to be adopted. The two sectors are referred to in the paper as the western and eastern sectors respectively.

January charts for 700, 500 and 300 millibars.—When all available data were plotted, it proved possible to draw the mean contours with some degree of confidence except over Russia in Asia. To assist in drawing this area of the chart, use was made of the monthly mean 500-millibar contour charts published in Western Germany.[3] These particular charts were used since reference to the corresponding daily charts suggested that more data from Russia in Asia were available in Germany than in the United Kingdom. Values of 500-millibar height were read off these charts for each of the five Januaries at a set of grid points covering the eastern sector and plotted on the working charts of 500-millibar contours. With the aid of these grid values and the Russian data available the drawing of the five 500-millibar contour charts was completed.

Similar assistance at 700 millibars over Russia was not obtainable, so charts of 700–500-millibar thickness were next plotted for the available data for each January. It proved possible to draw these charts completely, though the isopleths over Russia were tentative. Values of 500 millibar height and of 700–500-millibar thickness were then read off at a set of grid points covering the eastern sector. By subtraction, five sets of grid values of 700-millibar height were obtained and plotted on the working charts. The drawing of the five 700-millibar contour charts was then completed. Finally, for each year, the two contour charts and the thickness chart were examined together and minor adjustments made over Russia to produce the most plausible mutually consistent patterns.

The 300-millibar contour charts were then constructed in a similar manner, that is charts of 500–300-millibar thickness were drawn first and, over the eastern sector, grid values added to the 500-millibar height grid values to obtain five sets of 300-millibar height grid values. Again, for each year, the three contour charts and two thickness charts were examined together and minor adjustments made where necessary.

The average contour charts of the 700-millibar, 500-millibar and 300-millibar surfaces for the period 1949–53 were then constructed from the mean values for the individual years at a set of grid points.

January charts for 200 millibars: effect of the tropopause.—A new problem arose at the 200-millibar level, since no useful data were available over Russia. It was decided, therefore, to construct for the eastern sector a chart of average 300–200-millibar thickness by making use of temperature lapse rates derived from the charts of average temperature of standard isobaric surfaces already prepared in the Meteorological Office.[9] These charts are based on data for a different period from that of the present Memoir; the use of heterogeneous data may introduce some error, probably small but unavoidable. A further complication arose because the average pressure at the tropopause was between 300 and 200 millibars almost everywhere over the area covered by the chart. However, by making use of the charts of average pressure and temperature at the tropopause[9], a " correction for tropopause " to be applied to the thickness obtained from the mean temperature of the layer (assumed to be the mean of the temperatures at 200 and 300 millibars), was evaluated in the following manner. For any point on the chart let

T_T, p_T be the average temperature and pressure at the tropopause respectively,

T_1, T_2 the average temperature at two standard isobaric surfaces p_1 and p_2, where $p_1 > p_T > p_2$ and

$\Delta\phi$ the difference in geopotential between the two isobaric surfaces.

Then $\Delta\phi = RT'_m \log_e \frac{p_1}{p_2}$ in c.g.s. units

where R is the gas constant for dry air and T'_m is the mean virtual temperature (in degrees Absolute) of the layer.

Writing $T'_m \simeq \frac{T_1 + T_2}{2}$, that is, ignoring the presence of the tropopause, a first approximation $\Delta\phi'$ to $\Delta\phi$ may be at once evaluated from the standard tables, for example *Smithsonian meteorological tables*.

Taking into account the tropopause, a better approximation to $\Delta\phi$ is given by the expression

$$R\frac{T_1 + T_T}{2}\log_e p_1/p_T + R\frac{T_T + T_2}{2}\log_e p_T/p_2 .$$

The correction for tropopause, C, is defined as

$$C = -\Delta\phi' + \left(R\frac{T_1 + T_T}{2}\log_e p_1/p_T + R\frac{T_T + T_2}{2}\log_e p_T/p_2\right).$$

This may be rewritten

$$C = -R[\tfrac{1}{2}(T_1 - T_2)\log_e p_T/p_2 + \tfrac{1}{2}(T_2 - T_T)\log_e p_1/p_2] .$$

With $p_1 = 300$ millibars and $p_2 = 200$ millibars,

$$-C \simeq 33{\cdot}72(T_1 - T_2)\log_{10} p_T/200 + 6(T_2 - T_T) \text{ in geopotential metres.}$$

The thickness of the layer is then evaluated as $\Delta\phi + C$.

Charts of 300–200-millibar thickness were first drawn for the five years separately over the area where data were available, that is the western sector, and an average chart constructed from the means of grid values. Charts of 300-millibar temperature were then drawn over the whole area for the separate years and a five-year average chart constructed from them. From this chart, the temperature lapse rates mentioned above[9] and the correction for tropopause, values of average 300–200-millibar thickness were calculated at a set of grid points covering the eastern sector. However, when these were plotted on the chart of average 300–200-millibar thickness already drawn for the western sector, the pattern produced was most irregular and unconvincing.

It was then decided to investigate the average 200-millibar temperature chart. Over the western sector this was constructed from five charts for the individual years and the remaining sector completed by use of grid values derived from average 300-millibar temperatures and temperature lapses[9] from 300 to 200 millibars. Over the eastern sector the grid values of 200-millibar temperature and 300–200-millibar thickness were then adjusted by a somewhat laborious method of trial and error to obtain the most satisfactory mutually consistent patterns. The resulting average 300–200-millibar thickness chart was then added to the average 300-millibar contour chart to obtain the average 200-millibar contour chart.

January charts for 150 millibars.—A further problem arose at the 150-millibar level. While there were, of course, no data over the eastern sector, even over the western sector, where at lower levels the network of data had been adequate, the number of data varied through the period from poor in 1949 to good in 1953. The quality of the data was also more suspect owing to loss of observations with height.

To make the best use of the data available, it was decided to construct charts of 200–150-millibar thickness for the individual years over the western sector. In the first place, all data were ignored and thickness charts for the individual years were computed from the appropriate charts of 200-millibar temperature and the average temperature lapse from 200 to 150 millibars.[9] The mean temperature of the layer was assumed to be the 200-millibar temperature less half the temperature lapse from 200 to 150 millibars. These computed charts were used in conjunction with the available data to construct the working charts of thickness for the individual years. By reading off grid values and taking means a chart of average 200–150-millibar thickness was obtained over the western sector. The remaining sector was then completed by computing grid values of average thickness from values of average 200-millibar temperature and temperature lapse from 200 to 150 millibars. Minor amendments were made in adjusting the two halves of the chart and in smoothing the pattern. A revised set of grid values was then read off over the whole chart and added to the 200-millibar height grid values to obtain the average 150-millibar contour chart.

January charts for 100 millibars.—The data at this level presented problems similar to those for 150 millibars and a similar technique was employed. The grid values of average 200–150-millibar thickness were converted into grid values of average temperature of the layer and by combining these with grid values of average 200-millibar temperature, a chart of average 150-millibar temperature was produced. Over the western sector, grid values of 150-millibar temperature for the individual years were computed by a similar process applied to the corresponding yearly charts. It was now possible to construct a chart of average 150–100-millibar thickness in a manner exactly analogous to that described above for the 200–150-millibar thickness. Finally this last chart was added to the average 150-millibar contour chart to obtain the average 100-millibar contour chart.

Final adjustments to January charts.—The average charts of contours, temperatures, thicknesses and temperature lapses were now examined as a whole and certain anomalies over northern Russia were apparent. Data of any sort from this area were very sparse and of doubtful interpretation, so it was felt that some adjustment over this area was allowable. By redrawing the chart of average tropopause pressure and altering the temperature lapses above 300 millibars in the light of those over Canada, it was found possible to remove, at the same time, the major anomalies in contour height and temperature lapse. The charts were then redrawn over Russia from the 200-millibar level upwards.

A few slight adjustments were subsequently made in the light of the streamline–isotach charts as described in Section 7.

April, July and October charts.—The method employed was the same as that used in the construction of the January charts, although there was one slight complication over Siberia. In general, the data available from the U.S.S.R. were even scantier than in January and for April, July and October 1949 there were no data at all from Siberia. For each of these months the monthly mean 500-millibar contour chart published in Western Germany[3] was accepted over Siberia and the 700–500-millibar thickness chart constructed over this area by correlating the 700–500-millibar thickness with the 500-millibar contour height along the meridians 20°E, 40°E, . . . 180° for the four years 1950–53. As the grid values obtained fitted in reasonably well with the rest of the chart drawn from data and as the nine values obtained for the pole lay within a ten-metre range the method was regarded as satisfactory. The 500–300-millibar thickness chart and the 300-millibar temperature chart were similarly computed by correlating the 500–300-millibar thickness with the 700–500-millibar thickness and the 300-millibar temperature with the 500–300-millibar thickness. A further check on the drawing over the U.S.S.R. was obtained by comparing the average 300-millibar temperature chart with that given by Goldie, Moore and Austin.[9]

§ 4—METHOD OF CONSTRUCTING THE MERCATOR CHARTS

General.—In constructing the circumpolar charts it was found necessary to draw a separate chart for each year. For the Mercator charts however the available data were fairly evenly spread over the five years ; moreover in the tropics, which are a substantial area of these charts, the changes in contour height from year to year are small. It was therefore concluded that satisfactory charts could be drawn from data averaged over the five-year period. North of latitude 55°N the Mercator charts were of course drawn to agree with the circumpolar charts. A few final adjustments to the contours were made in the light of the streamline–isotach charts as described in Section 7.

700-millibar charts.—There were large areas with no available data, especially in the southern hemisphere. To obtain a pattern over these areas grid values of 700-millibar contour height were evaluated as follows. A chart of mean sea level pressure in the southern hemisphere was constructed using grid values of mean pressure for the period 1949–53[11] and this chart was extended to about 20°N using data available in the Meteorological Office ; the whole chart was then converted to one of 1,000-millibar contour height using appropriate values of surface temperature. Grid values of 1,000–700-millibar thickness were then evaluated using values of mean temperature[9] and applying a correction for the humidity of the layer. The grid values of 700-millibar contour height were then calculated and a chart sketched from them ; the final 700-millibar contour chart was then drawn, primarily from the actual data but using the sketched map as a guide.

500- and 300-millibar charts.—These were constructed in the same way as the 700-millibar charts, primarily from the data but with the help of charts of 700–500-millibar and 500–300-millibar thickness drawn from grid values calculated from the appropriate mean temperatures.[9]

200-millibar charts.—Above 300 millibars the data from many stations became less reliable owing to the loss of observations with height. Charts of 300-millibar temperature and lapse of temperature from 300 to 200 millibars were therefore drawn using 1949–53 data where available and the charts of *Geophysical Memoirs No. 101*[9] elsewhere. From these a chart of 200-millibar temperature was constructed. Minor adjustments were then made to these three charts to ensure consistency, and to remove minor irregularities arising from the gridding technique. The charts of 300-millibar and 200-millibar temperature were then used in conjunction with charts of average temperature and pressure at the tropopause[9] to evaluate grid values of the correction for tropopause (see Section 3). The values so obtained for the southern hemisphere did not lead to a reasonable pattern and a new set was evaluated partly based on analogy with the northern hemisphere and partly on data for Australia and New Zealand. Grid values of 300–200-millibar thickness were then calculated as in Section 3 and used with the available data to construct a chart of 300–200-millibar thickness. This combined with the 300-millibar contour chart, together with actual 200-millibar data was used to construct the average 200-millibar contour chart.

150- and 100-millibar charts.—These were constructed in the same way as the 200-millibar charts, using grid values of 200–150-millibar and 150–100-millibar thickness where necessary. No correction was involved for the lower tropopause. In January the upper tropopause is mostly above the 100-millibar surface, but it does fall to 115 to 120 millibars over Tasmania and New Zealand and perhaps elsewhere, though data are lacking. However a check using New Zealand data suggested that the necessary corrections was probably less than 10 metres everywhere, and it was therefore ignored. In April, July and October, however, the upper tropopause lies below the 100-millibar level over large areas of the chart and there is frequently a large temperature inversion just above it so that a correction was necessary. For each station, therefore, the thickness of the 100–150-millibar layer was calculated firstly by using the mean of the 150-millibar and 100-millibar temperatures and secondly from the difference of the contour heights. The difference between these two thicknesses were then plotted on a chart and isopleths drawn; extrapolation where necessary was carried out on the assumption of a high correlation between the thickness difference and tropopause pressure (for which charts are given in a previous Memoir[9]). Grid values of this thickness difference were then read off and interpolated as a correction for tropopause where direct observations were not available.

PART II—AVERAGE WINDS IN THE UPPER AIR

§ 5—GENERAL

The contour charts of Part I enable the mean wind to be determined outside the tropics on the assumption of geostrophic flow. As a form of presentation they are quite satisfactory for wind direction but less so for wind speed ; for example the variations of chart scale and Coriolis parameter make it difficult to see where the strongest winds occur and careful measurement with a geostrophic scale is necessary. There are advantages in presenting the information implicit in the contour charts by means of streamline–isotach charts. Such charts are reproduced in Figures 50 to 97. They have been extended over the tropics, where the geostrophic assumption is inadmissible, by the direct use of upper wind observations.

§ 6—DATA

No satisfactory network of upper wind data for the period covered by the contour charts (1949–53) was available. The procedure adopted therefore was to measure the wind speed from the contour charts over the greater part of the extratropical regions, assuming geostrophic flow, while making use of all available wind data elsewhere, that is for the region between 30°N and 30°S (approximately), for South America and New Zealand. This involved using data for varying periods and, in some cases, data for a season of three months instead of for a mid-season month.

The main sources of data were the tabulations published by the United States Weather Bureau[12] together with climatological publications, technical notes and manuscript data of other meteorological services. Altogether reports from about one hundred stations (pilot balloon and radar) were used but only about half of them supplied information up to 100 millibars. The stations providing data at 700 millibars and 100 millibars are shown in Figures 98 and 99 respectively and a complete list of stations with details of reports and sources is given in Appendix III.

§ 7—METHOD OF CONSTRUCTING THE CHARTS

Isotachs.—Outside the belt 30°N to 30°S the isotachs were derived from the corresponding contour charts by means of a geostrophic wind scale. The wind speed was first determined at a network of points and preliminary isotachs sketched in. Where the patterns thus obtained were indefinite or doubtful, further measurements of wind speed were made at a closer network of points. In some areas, mainly those of strong wind, reasonable smoothness of the isotach pattern required adjustment to the contours for consistency, but in all cases this adjustment was slight, less than one millimetre on the scale of chart used. In measuring the geostrophic wind from the Mercator charts corrections were made for the curvature of the circles of latitude but not for the curvature of the contours ; this procedure is justified because the correction is appreciable (about 10 knots) only for the strongest winds which are, as a rule, nearly zonal.

Between 20°N and 20°S the isotachs were drawn from wind data alone, while in the two zones lying between 20° and 30°N and S they were drawn using both wind data and geostrophic winds ; in general there was little difficulty in effecting reasonable transitions across these two zones.

Streamlines.—Outside the zone 30°N to 30°S the streamlines have been identified with the contours. Between 20°N and 20°S the streamlines were drawn by the well known method to conform to plotted wind directions, while for the zones 20° to 30° N and S, geostrophic and actual winds were again used. Published streamlines and wind data for India[13] and Indonesia[14] were incorporated into the drawing.

Use of cross-sections.—As checks on the vertical disposition of certain features of the wind field, for example the transition zones between the mid-latitude westerlies and low-latitude easterlies, the zonal winds read from the charts were compared with those given by the vertical cross-sections of Figures 100 to 131. These cross-sections also helped in determining the positions of the strong wind belts. Further, in extratropical regions the vertical wind shears shown by the cross-sections could be compared with those determined from the charts thus providing further checks of mutual consistency.

General.—As for the contours, the main set of charts are on Mercator's projection, extending from 70°N to approximately 60°S and separate charts are included for the north polar regions. The isotachs are drawn at 10-knot intervals. The streamlines however are not isopleths and the placing and number of those drawn are to some extent subjective. In extratropical regions it is simple to select a number of contours which will adequately represent the flow pattern. In the tropics, however, with generally light winds, data of varying period and reliability and large areas with no data at all, the problem of deciding how many streamlines to draw or how many separate circulations to indicate is difficult. An attempt has been made in the present charts to show the main features of the wind circulation without suggesting more complexities than the data justify.

§ 8—DISCUSSION

January.—Figures 50 to 55 show the wind distribution between 75°N and 60°S. In extratropical regions the flow is predominantly westerly but with much more marked meridional excursions in the northern than in the southern hemisphere. The strongest winds occur in belts which more or less encircle the earth mainly in the subtropics of the two hemispheres, but over limited sectors there are separate belts of strong wind in higher latitudes; within these belts the strongest winds occur near the 200-millibar level.

At this level in the northern hemisphere (Figure 53), one strong wind belt extends from Florida across the southern North Atlantic to North Africa and on across northern India to east of Hong Kong where it loses its identity. This wind belt, which is associated with the subtropical jet stream appearing on the daily charts, has a well defined maximum speed of about 100 knots over north Arabia, but it is much weaker over the southern North Atlantic. A second strong wind belt extends from southern Japan across the North Pacific Ocean and the northern U.S.A. to the North Atlantic and north-west Europe where it becomes diffuse and difficult to identify as a definite feature. This belt is associated with the polar front jet stream. Two wind maxima occur in this belt, a very intense one of about 140 knots near south Japan and another of about 90 knots over eastern U.S.A. ; these two pronounced wind maxima occur at the bases of the two main long-wave troughs near eastern Asia and over North America in regions where intense polar front jet streams are frequently observed on the daily charts. Over the eastern North Atlantic and north-west Europe the weaker section of the wind belt reflects the large fluctuations in position and orientation of the polar front jet stream in this region, where individual jet streams occur almost daily.

The wind patterns at 700, 500, 300, 150 and 100 millibars have many features which are similar to the flow at 200 millibars but there are some significant differences. The subtropical strong wind belt weakens considerably and becomes much less extensive or non-existent below about 300 millibars ; there is no trace of this strong wind belt over the southern North Atlantic below 300 millibars, whilst to the east of India the stream effectively merges into the more powerful polar front strong wind belt. However, the subtropical strong wind belt maintains its identity at 150 and 100 millibars (Figures 54 and 55) but with decreasing maximum winds. On the other hand the polar front strong wind belt can readily be identified at all levels. It is interesting to note that at 100 millibars two subsidiary strong wind belts occur over Canada and over the Sea of Okhotsk some 15° north of the polar front strong wind belt (the Canadian subsidiary strong wind belt can also be discovered even at 150 and 200 millibars). It is probable that these subsidiary strong wind belts reflect the occurrence of stratospheric jet streams in the baroclinic zone which is often created in the stratosphere in the southern parts of the Canadian and Siberian troughs as a result of a very cold Arctic stratosphere.

In extratropical regions of the southern hemisphere the flow pattern is very much simpler. One principal belt of strong winds is shown at all levels, lying mainly between 45°S (off South Africa) and 55°S (near New Zealand). A wind maximum of 90 knots occurs at 200 millibars (Figure 53) over the ocean to the south and south-east of South Africa. At 300 millibars (Figure 52) and higher levels a subsidiary zone of strong winds is shown at about 30°–35°S and 180°W, though perhaps the significant feature is rather an area of slacker winds around New Zealand: the relatively slack wind field near and to the east of New Zealand suggests that the jet streams in this region vary a good deal in latitudinal position. The strength of the wind flow in the southern hemisphere in January (that is southern hemisphere summer) is clearly less than the flow in the northern (winter) hemisphere. Furthermore, the zone between 40°S and 65°S contains very little land and a much simpler flow pattern than occurs in the northern hemisphere might be expected. However, away from Australia and New Zealand, wind data from only five stations in this zone were available and to some extent simplicity of pattern may be attributed to the sparsity of data.

In the tropics the winds are mainly easterly but there is a good deal of complexity and difference in detail between the various sectors and levels. In general the axis of this easterly flow lies slightly farther north in the eastern than in the western hemisphere. However, wind speeds are much less than in extratropical regions and only at two charted levels (150 and 100 millibars) is a speed of 30 knots exceeded. One main belt of easterlies is clearly seen at all levels, extending from the western Pacific across Malaya and the equatorial parts of the Indian Ocean, Africa and the Atlantic. In the eastern Pacific at 700 millibars this belt is quite narrow being bounded to the south by a belt of westerlies near the equator from Sumatra to New Guinea (Schmidt[14]). Farther south however there is a subsidiary belt of easterlies from northern Australia to Java. In other sectors the main belt of easterlies extends almost to 20°S. The highest wind speeds occur in two sectors : in the first sector, off south-east Asia, the wind speed increases with height but exceeds 30 knots only at the two highest levels ; in the second sector, over Africa, the speed exceeds 20 knots from 300 to 150 millibars but falls below 20 knots again at 100 millibars. At 700 and 500 millibars (Figures 50 and 51) these easterlies continue across South America but at higher levels they do not appear to penetrate farther than the coast of Brazil.

Over the eastern and central Pacific the easterlies appear only at the two lowest levels. At 700 millibars one stream flows across the eastern Pacific from Albrook Field* (Panama) to near Canton Island, but is there interrupted ; the observed winds at Johnson Island and Nandi show light westerly components. At 500 millibars an easterly flow is shown from Colombia to the

* The less well known places named in the text are marked on Figure 98.

Philippines but its continuity in the central Pacific is doubtful ; at Canton Island and Christmas Island the winds observed (though only over short periods) are westerly, but easterly at Jarvis Island.

At 300 millibars the winds at Johnson Island, Christmas Island and Apia all have westerly components and it appears almost certain that there is westerly flow in the tropics between 180° and 160°W. No data are available at this level from the tropical Pacific east of 140°W but it seems probable that the westerlies blow across the Pacific to the Andes and that there is an area of variable winds over South America centred about 10°S. At 200 and 150 millibars the flow pattern seems to be similar to that at 300 millibars with the Pacific westerlies somewhat stronger, while at 100 millibars the streamlines suggest that the area of light winds over South America may extend farther south.

The flow pattern round the North Pole is shown in Figures 56 to 61. An area of light winds covers the pole and the two main troughs in the contour patterns over northern Canada and eastern Siberia (Figures 8 to 13) ; within this area there are a number of closed cyclonic circulations. In the outer regions of the circumpolar charts winds are generally westerly and on the whole speeds increase with decreasing latitude. The flow patterns of these charts between 75°N and 55°N are repeated on the Mercator charts and have already been discussed in that context.

July.—It is convenient to discuss the July charts next since the greatest seasonal differences in the wind flow occur between January and July. Figures 74 to 79 show the wind distribution between 75°N and 60°S, and it is evident on comparing them with Figures 50 to 55 that the seasonal contrast is much greater in the northern than in the southern hemisphere. In the northern hemisphere the westerlies are much weaker than in January and the strong wind belts less pronounced. At each of the four lower levels a strong wind belt can be distinguished extending from north-east of Japan across the Pacific and southern Canada to western Europe (Figures 74 to 77). Winds increase generally up to 200 millibars with the strongest winds occurring near southern Canada on all four charts. In the neighbourhood of Japan it will be noticed that the July flow at 200 millibars is very weak (about 30 knots) in contrast with the strong flow (about 140 knots) in January (Figure 53). Above 200 millibars wind speeds fall off again and the belt becomes less extensive but the cell near southern Canada persists as an important feature. The strong wind belt associated with the subtropical jet stream is much weaker and less extensive and is located at higher latitudes than in January. It is restricted to an area of relatively strong wind from the Mediterranean to east of the Caspian : this belt appears at 300 millibars and higher levels, with maximum winds of about 50 knots at 200 millibars which is only about half the maximum speed in January.

In extratropical regions of the southern hemisphere there is one strong wind belt lying mainly between 45°S and 55°S. A marked maximum is shown in the southern Indian Ocean in association with the main trough in the contour pattern at 80°E (Figures 26 to 31). It seems probable that this belt extends right round the globe, though it becomes weaker in the southern Pacific. Data are completely lacking for the area from Tierra del Fuego westwards to Macquarie Island and in this region the drawing of the charts can only be regarded at tentative. The axis of the belt reaches its most southerly latitude south of New Zealand and at 100 millibars (Figure 79) appears to lie south of 60°S. South of 45°S wind speeds continue to increase with height up to 100 millibars. It seems probable that this strong wind belt is associated with the polar front jet stream in the upper troposphere, but that at higher levels it merges with the strong wind belt associated with the winter stratospheric jet stream.

A second strong wind belt is shown at about 25°S to 30°S at all the levels except 700 millibars. The highest wind speeds in this belt occur near the 200-millibar level and appear to be associated with the subtropical jet stream. Available data appear to justify the drawing from South Africa to north-east of New Zealand, but data are completely lacking across the Pacific, South America and South Atlantic. On the present charts the belt is shown extending across the Pacific but becoming rather indeterminate across South America and the South Atlantic. Radio-sonde stations have recently been established both in Chile and Argentina as part of the International Geophysical Year programme and data from them should throw more light on the detailed wind distribution in this region. Winds in this belt decrease above 200 millibars, until, with winds farther south still increasing with height, at 100 millibars (Figure 79) only two relatively small separate areas of strong wind over Australia and the South Pacific are apparent. As in January an area of relatively light wind appears near New Zealand at all levels.

In the tropics winds are mostly easterly as in January, but the axis of the flow is considerably farther north and winds are much stronger particularly at the higher levels. The high-level area of strong easterlies across the Indian Ocean in about 10°N overlying the low-level westerlies is particularly prominent. It extends, with much reduced speed over the western Pacific and Africa and appears to be an important feature of the general circulation. Above 700 millibars the westerlies of the southern hemisphere extend somewhat farther northwards than in January, reaching about 10°S.

The easterly flow at 700 millibars (Figure 74) is interrupted by a belt of westerlies at about 15°N extending from the Arabian Sea across India to Thailand. This belt is a reflection of the Indian monsoonal surface circulation ; it appears on the 500-millibar chart (Figure 75) as a small area of light westerly winds over southern India. In the remaining sectors the easterly flow at 700 and 500 millibars extends between 15°S and 25°N, with the strongest winds occurring at about 10°N to 15°N. Speeds do not exceed 10 to 15 knots except locally at 700 millibars near Trinidad and in the southern Sahara. Some irregularity in the flow is indicated at 500 millibars by light southerly winds over the Hawaiian Islands ; at 300 millibars (Figure 76) a definite encroachment of the westerlies is indicated over this area persisting up to 150 millibars (Figure 78) with maximum winds at 200 millibars but easterlies appear again at 100 millibars (Figure 79). These westerlies extend as far south as 10°N at 300 and 200 millibars, and possibly almost to the equator at 150 millibars. A somewhat similar break in the easterly flow occurs over the West Indies. At 300 millibars the wind at San Juan is light southerly and at 200 and 150 millibars there is westerly flow in this area with maximum wind at 200 millibars ; again, however, easterly flow reappears at 100 millibars.

Between 10°W and 150°E in the northern hemisphere, that is to the south of the Eurasian landmass, the easterlies become well established at 300 millibars and increase with height above this level, whereas outside these longitudes speeds reach 20 knots only locally and the easterly flow is broken up by the incursions of westerly winds as noted above. The centre of this strong easterly flow lies at about 10°N at all levels from 300 to 100 millibars. At 300 millibars there are three separate areas of stronger wind, one over the Arabian Sea, one over Nigeria and the Cameroons and the third near Singapore. At 200 millibars two such areas are indicated, one centred near Aden and the other over Malaya ; it is possible that they should be drawn as one. At 150 and 100 millibars a single area of strong winds is indicated, extending eastwards and westwards from about Aden, where the maximum easterly winds of over 60 knots occur. For Aden the charted wind speeds at 150 and 100 millibars are substantially the same. Bannon and Jones[15] indicate a maximum wind at 60 millibars of about 50 to 60 knots in this region and it appears probable that the axis of this strong wind belt lies near to 100 millibars.

Figures 80 to 85 show the wind distribution round the North Pole. North of 75°N winds are everywhere less than 20 knots and, in a large part of the area, less than 10 knots. At 700 millibars the centre of the circulation lies near the Pole, but the axis is not vertical and the centre shifts with height towards the Canadian sector, until at 100 millibars it lies about 68°N 73°W.

April.—The mean flow in April between 75°N and 60°S is depicted in Figures 68 to 73. It is not intended to deal in detail with the April circulation since it is to a great extent transitional between the flow of January and July. However, some points of interest may be noted by reference to the 200-millibar level (Figure 71) in particular.

In the northern hemisphere at 200 millibars the pattern of flow appears to be more like that of January than of July. The strong wind belt associated with the subtropical jet stream over North Africa and Arabia is in much the same position as in January. However, it appears to merge upstream with the polar front strong wind belt over southern U.S.A. and downstream with the polar front strong wind belt near south Japan. Although significantly weaker than it is in January, the strong wind belt near south Japan is in about the same location and is still an important feature, unlike the very weak remnants a little farther north in July. On the other hand, the strong wind belt over southern U.S.A. is, surprisingly, at least 10° of latitude farther south than its central position in both January and July. It will be seen that there is no evidence of the stratospheric jet stream at or above 200 millibars in April over Canada and eastern Siberia ; this feature is evident in January but not in July.

In the southern hemisphere the westerlies at 200 millibars show a double structure in many longitudes rather like the pattern in July. Over middle latitudes of the South Atlantic and southern Indian Ocean an extensive strong wind belt is shown at all levels, but the double structure with a subsidiary belt over South Africa exists only at 200 millibars.

In the tropics the winds are light easterly for the most part. At high levels in the Pacific they are probably light westerly and there is evidence of an area of maximum winds at 300, 200 and 150 millibars in the Central Pacific about 15° to 20°N similar to the maximum referred to in July. There is as yet no sign of strong winds in the easterly flow in the upper troposphere from Africa to south-east Asia. Indeed in this region the high-level winds are slightly lighter in April than in January. It cannot be said that the high-level easterlies in April are intermediate in position and strength between those of January and July. This suggests that the strong easterly stream of July develops quite rapidly after April.

The flow round the North Pole, shown in Figures 62 to 67, is weak and has no outstanding feature.

October.—The mean flow in October is transitional but the seasonal changes between July and January are not uniform. In some areas the wind distribution in October is more like that of July, in other areas it has greater resemblance to that of January. Naturally there is a good deal of similarity between the October and April flow patterns but significant differences are also in evidence. Figures 86 to 91 show the wind distributions between 75°N and 60°S.

In the northern hemisphere strongest winds occur at about 200 millibars. A belt of strong westerlies extends from middle latitudes of eastern Asia across the Pacific and North America and then as a weakening system over the North Atlantic to northern Scandinavia, with centres of maximum wind near south Japan and south of Newfoundland. The main features are intermediate between the July and January patterns. They are similar to those of April, except that the Newfoundland wind maximum is 10° to 15° of latitude farther north than in April. The subtropical strong wind belt over North Africa and the Middle East is a little farther north and not quite so strong as in April. It merges into the strong wind belt associated with the polar front over eastern Asia, but there is little trace of it across the North Atlantic. As in April, there is no evidence of stratospheric strong wind belts over Canada and Siberia such as exist in January.

The circulation in the southern hemisphere is not unlike that obtaining in April. There is a double structure to the strong upper westerlies in both months from the longitude of Australia eastwards across the South Pacific with a relative minimum over New Zealand. Above 300 millibars a single strong wind belt dominates the South Atlantic and southern Indian Ocean with an area of maximum speeds about 45° to 50°S, 40°E, where wind speeds increase up to the 100-millibar level; in April strongest winds occur at 200 and 150 millibars rather than at 100 millibars.

In the tropics the winds up to 300 millibars are mainly light easterly, but, as in April, there are many areas where the light winds are variable or uncertain in direction ; in such areas more data are needed before the average flow can be determined with certainty. At 200 and 150 millibars (Figures 89 and 90) the pattern is complex. The strong and extensive easterlies centred over the Arabian Sea in July no longer exist, though there is still a rather restricted area of easterly winds over and near south-east Asia. Over central and eastern Pacific the flow is westerly, with an area of maximum winds in the central Pacific about 15° to 20°N, as also occurs in April. A light westerly flow probably also occurs close to or just south of the equator from South America to Africa. However in the equatorial zone north of the equator from South America to Africa winds are mainly light and variable. At 100 millibars (Figure 91) easterly winds occur between approximately 5°S and 20°N from the western Pacific to Africa, with a well defined maximum of about 40 knots from near Ceylon to Sumatra ; the easterlies in this region are stronger and the area covered by the easterlies is more extensive than in April. Over the rest of the tropics the winds are generally light ; as in April, they are probably westerly over the central and eastern Pacific and easterly in a narrow belt near the equator with zones of variable winds about 10°S and 10°N over Africa.

Round the North Pole the flow north of 75°N is mostly light (Figures 92 to 97). The centre of the weak cyclonic circulation is near north Baffin Land at 500 millibars and shifts northwards at higher levels.

ACKNOWLEDGEMENTS

Grateful acknowledgement is made to the following Heads of Meteorological Services who have kindly supplied manuscript and microfilm following special requests made to them. Such data have proved most valuable in filling the gaps for which published or other forms of data as listed in the Appendix were not obtainable.

The Chief of the United States Weather Bureau.
The Director, Meteorological Branch, Department of Transport, Canada.
The Director, Det Norske Meteorologiske Institutt.
The Director General of Observatories, Meteorological Department, India.
The Director, Bureau of Meteorology, Australia.
The Director, Weather Bureau, Union of South Africa.
The Director, New Zealand Meteorological Service.
The Director, Central Meteorological Observatory, Japan.
The Inspector General, Météorologie Nationale, France.
The Director, British West African Meteorological Services.
The Director, Meteorological Department, Royal Thai Navy, Thailand.
The Director, Servico Meteorologico de Moçambique.
The Director, Meteorological and Geophysical Institute, Indonesia.
The Director, Weather Bureau, Republic of the Philippines.
The Commanding General, Air Weather Service, United States Air Force.
The Director General, Servicio Meteorológico Nacional, Argentine Republic.
The Director, Oficina Meteorológica de Chile.
The Director, Servicio Meteorológico de Bolivia.

BIBLIOGRAPHY

1. BROOKS, C. E. P., DURST, C. S., CARRUTHERS, N., DEWAR, D. and SAWYER, J. S.; Upper winds over the world. *Geophys. Mem., London,* **10,** No. 85, 1950.

2. London, Meteorological Office; Handbook of weather messages, Part II, Codes and specifications. London, 1959, p. 81.

3. Deutsche Wetterdienst; *Grosswett. Mitteleur., Bad Kissingen.*

4. CROSSLEY, A. F.; Significance of mean contour charts. *Met. Mag., London,* **81,** 1952, p. 229.

5. Washington, United States Weather Bureau; Monthly climatic data for the world by continents. Washington, D.C., 1949–53.

6. SCRASE, F. J.; Application of radiation and lag corrections to temperatures measured with the Meteorological Office radio-sonde. *Met. Mag., London,* **85,** 1956, p. 65.

7. Washington, United States Weather Bureau; Manual of radiosonde observations. Circular P, Addendum. Washington, D.C., 1950.

8. HENRY, T. J. G.; A comparison of mean temperatures obtained with Canadian and American types of radiosondes. *Circ. met. Div. Dep. Transp., Toronto,* No. 2041, 1951.

9. GOLDIE, N., MOORE, J. G. and AUSTIN, E. E.; Upper air temperature over the world. *Geophys. Mem., London,* **13,** No. 101, 1958.

10. GUTERMAN, I. G.; Radiation error of the comb radio-sonde. *Met. i Gidrol., Leningrad,* No. 5, 1955, p. 49.

11. VOWINCKEL, E.; Southern Hemisphere weather map analysis: five-year mean pressures. *Notos, Pretoria,* **4,** No. 1, 1955, p. 17.

12. Washington, United States Weather Bureau; Daily Series Synoptic Weather Maps. Washington, D.C., 1949–53.

13. Poona, India Meteorological Department; Climatological atlas for airmen. Poona, 1943.

14. SCHMIDT, F. H.; Upper winds over Indonesia and Western New Guinea. Djawatan Meteorologi dan Geofisik, Verhandelingen No. 45, Djakarta, 1952.

15. BANNON, J. K. and JONES, R. A.; Average wind at 60 mb. *Met. Mag., London,* **85,** 1956, p. 194.

APPENDIX I—AVERAGE CONTOUR HEIGHTS

JANUARY 1949–53

Pressure level	Pole	85° N 180°W	85° N 90°W	85° N 0°	85° N 90°E
mb.		*geopotential decametres*			
700	270·4	271·4	270·4	270·2	269·8
500	507·2	508·0	507·0	507·4	506·2
300	840·2	841·6	839·2	840·8	839·0
200	1093·1	1094·8	1092·7	1093·2	1091·8
150	1271·9	1273·9	1271·7	1271·8	1270·7
100	1521·5	1524·4	1521·5	1520·9	1520·5

Latitude	Pressure level	180°W	160°W	140°W	120°W	100°W	80°W	60°W	40°W	20°W	0°	20°E	40°E	60°E	80°E	100°E	120°E	140°E	160°E	Pressure level
°N	mb.	*geopotential decametres*																		mb.
	700	274·2	273·6	272·4	270·8	269·4	268·6	269·2	270·8	271·0	271·2	270·8	269·8	268·8	268·2	268·8	269·8	271·6	273·0	700
	500	511·0	511·2	509·2	507·2	505·4	505·0	506·4	508·6	509·4	509·2	508·6	507·2	506·2	505·6	505·4	506·2	508·0	509·4	500
80	300	845·6	845·2	843·8	840·4	837·8	837·6	838·4	840·6	843·2	843·6	843·0	842·0	840·8	839·6	839·4	840·2	842·0	844·2	300
	200	1099·3	1099·3	1098·7	1095·3	1092·3	1091·7	1091·8	1093·4	1095·6	1096·2	1095·8	1094·9	1093·9	1092·9	1092·7	1093·5	1095·3	1097·6	200
	150	1279·3	1279·5	1279·0	1275·4	1272·0	1271·2	1271·0	1272·4	1274·4	1275·0	1274·6	1273·9	1273·4	1272·7	1272·6	1273·2	1274·9	1277·3	150
	100	1531·2	1532·3	1531·6	1527·4	1523·1	1521·4	1520·8	1522·2	1524·1	1524·6	1524·1	1523·7	1524·3	1524·2	1524·4	1524·5	1525·8	1528·4	100
	700	277·0	277·4	275·0	271·2	267·0	265·6	267·0	271·4	272·0	272·4	272·6	271·6	269·8	268·8	270·2	271·2	272·4	275·2	700
	500	515·6	516·0	512·6	507·0	501·8	500·4	503·0	508·6	512·2	513·4	512·6	511·4	508·8	506·8	507·0	507·2	508·6	512·6	500
75	300	851·2	851·8	848·0	840·4	833·2	832·4	836·0	841·2	847·8	849·4	848·2	846·4	844·2	842·8	841·8	840·6	842·2	847·4	300
	200	1105·6	1107·0	1104·4	1096·7	1088·2	1087·0	1090·0	1094·5	1100·8	1102·8	1101·6	1099·8	1098·0	1097·0	1096·1	1094·3	1095·6	1101·2	200
	150	1286·4	1288·6	1286·3	1278·3	1269·1	1267·6	1270·7	1274·9	1280·7	1282·3	1280·7	1279·3	1278·2	1277·6	1276·7	1274·5	1275·7	1281·6	150
	100	1540·4	1544·8	1542·2	1533·0	1523·0	1520·2	1523·0	1527·0	1532·3	1533·0	1530·6	1530·4	1530·9	1530·9	1530·4	1527·6	1528·0	1534·4	100
	700	279·8	281·2	278·6	272·8	265·8	262·4	264·4	269·6	273·2	274·6	276·0	274·6	272·4	272·4	273·2	272·6	273·2	276·2	700
	500	521·0	521·8	517·8	509·4	500·0	496·6	500·6	508·8	516·0	518·8	517·8	517·0	513·2	511·2	510·2	508·2	508·8	514·4	500
70	300	858·2	861·0	856·6	844·4	831·8	828·8	835·4	844·4	856·4	859·2	856·0	855·0	852·2	850·0	847·0	842·4	842·0	849·2	300
	200	1113·4	1117·5	1114·5	1102·0	1088·1	1084·4	1090·7	1099·5	1111·8	1114·2	1110·0	1108·8	1106·6	1104·8	1101·8	1096·4	1095·5	1103·3	200
	150	1295·2	1300·7	1298·4	1285·6	1270·6	1266·3	1272·9	1281·7	1293·3	1294·7	1289·6	1288·7	1287·3	1286·0	1283·1	1277·3	1276·0	1284·2	150
	100	1552·0	1559·9	1557·5	1543·6	1527·6	1521·8	1527·5	1536·5	1547·6	1547·6	1541·5	1541·6	1541·5	1541·2	1538·5	1532·0	1529·8	1538·8	100
	700	280·0	283·2	281·2	276·6	267·2	263·0	264·2	269·6	275·6	279·8	280·0	277·4	275·8	277·2	277·8	273·6	272·4	275·4	700
	500	523·4	527·4	522·8	514·8	502·0	496·4	501·4	510·8	520·8	526·6	524·8	521·4	518·4	518·4	516·0	509·4	508·0	514·2	500
65	300	863·6	870·8	863·6	851·8	835·0	831·0	837·2	850·8	866·8	871·4	865·8	863·0	860·0	860·4	855·0	843·8	840·8	849·8	300
	200	1120·0	1128·7	1123·2	1110·2	1092·6	1088·4	1094·6	1108·7	1125·0	1127·8	1120·4	1117·2	1114·8	1115·8	1110·4	1098·1	1094·6	1104·6	200
	150	1303·3	1313·3	1308·3	1295·3	1276·7	1272·2	1278·6	1292·6	1307·8	1309·0	1300·6	1297·7	1296·2	1297·9	1292·6	1279·5	1275·4	1286·2	150
	100	1562·6	1575·1	1569·5	1555·6	1536·2	1530·2	1536·1	1550·2	1564·3	1563·7	1554·0	1552·2	1552·3	1555·0	1549·8	1535·4	1530·8	1542·9	100
	700	280·4	284·6	283·4	280·6	271·6	266·8	267·8	272·4	282·0	286·6	285·2	281·8	280·8	283·2	282·6	275·2	271·6	274·2	700
	500	524·8	531·6	527·8	520·8	508·6	502·2	506·8	517·0	531·2	536·4	532·0	526·8	525·0	526·8	522·2	512·2	507·4	513·8	500
60	300	868·4	878·2	871·8	860·2	844·0	837·4	845·6	861·4	880·6	884·6	876·6	871·2	869·4	871·2	863·0	848·6	841·6	849·6	300
	200	1126·2	1138·2	1132·6	1119·2	1102·7	1096·5	1105·6	1121·7	1140·0	1141·7	1131·9	1125·9	1124·8	1127·3	1118·9	1103·6	1095·8	1105·3	200
	150	1310·8	1324·1	1318·7	1305·0	1288·0	1281·9	1291·3	1306·8	1322·7	1323·0	1312·7	1307·1	1307·0	1310·4	1302·0	1285·5	1277·5	1288·0	150
	100	1572·8	1587·7	1581·4	1567·1	1549·5	1541·9	1551·3	1566·3	1579·4	1578·4	1568·1	1563·7	1564·8	1569·5	1561·1	1543·1	1535·0	1546·8	100

APPENDIX I—*continued*

JANUARY 1949–53

Lati-tude	Pressure level	180°W	160°W	140°W	120°W	100°W	80°W	60°W	40°W	20°W	0°	20°E	40°E	60°E	80°E	100°E	120°E	140°E	160°E	Pressure level
°N	*mb.*	*geopotential decametres*																		*mb.*
	700	281·2	286·2	286·6	284·8	277·6	273·0	274·0	280·0	291·0	294·8	289·4	286·6	286·4	289·2	285·0	278·0	272·0	274·1	700
	500	527·4	536·8	534·4	528·4	518·6	512·2	516·0	528·8	544·2	546·2	538·8	533·2	531·6	534·4	528·6	516·0	508·2	514·5	500
55	300	873·8	887·6	881·8	871·6	859·2	851·4	860·4	877·4	898·2	896·4	886·8	880·0	878·8	881·2	871·0	854·6	844·0	852·5	300
	200	1133·6	1149·0	1143·8	1130·9	1119·0	1112·1	1122·4	1138·9	1157·8	1154·1	1142·6	1135·5	1134·9	1137·9	1127·5	1110·6	1100·0	1109·7	200
	150	1319·4	1336·0	1330·3	1316·6	1304·9	1297·9	1309·1	1323·4	1339·4	1335·5	1324·5	1317·6	1317·9	1321·4	1311·0	1293·5	1282·7	1293·9	150
	100	1583·7	1600·9	1593·7	1578·8	1567·2	1559·2	1570·4	1582·4	1594·8	1591·3	1581·7	1576·0	1577·9	1581·9	1571·5	1552·9	1542·1	1555·5	100
	700	284·0	291·0	292·0	291·5	285·0	281·0	283·5	291·5	298·5	298·0	293·0	290·5	291·5	295·5	290·5	282·0	275·0	275·0	700
	500	532·5	544·0	543·5	539·0	531·5	525·5	530·5	545·0	554·5	551·5	544·0	539·0	539·5	544·0	537·0	523·0	514·0	517·5	500
50	300	882·5	897·5	895·5	886·5	877·0	871·0	881·0	899·5	910·5	904·0	892·5	887·0	888·0	892·0	882·0	863·0	852·0	858·5	300
	200	1144·5	1160·5	1158·0	1146·0	1136·5	1131·5	1142·5	1160·0	1169·0	1161·5	1149·8	1143·5	1144·5	1148·3	1137·5	1120·5	1112·0	1119·5	200
	150	1332·7	1348·1	1343·6	1330·6	1321·7	1317·1	1328·2	1343·0	1349·4	1341·7	1332·6	1327·2	1328·5	1332·2	1321·2	1305·4	1297·3	1307·1	150
	100	1598·5	1613·1	1605·5	1590·1	1581·6	1577·8	1589·1	1600·3	1604·3	1596·2	1591·1	1588·2	1590·0	1593·6	1582·5	1568·4	1559·7	1572·3	100
	700	290·0	295·5	297·5	297·5	293·5	291·5	293·0	302·0	306·0	301·0	296·5	293·5	295·5	299·5	294·5	286·0	278·5	281·0	700
	500	542·5	551·5	552·0	549·0	545·0	542·5	546·5	559·0	563·5	556·5	549·0	545·0	546·0	551·5	544·5	530·0	519·5	525·5	500
45	300	896·5	908·5	907·5	901·5	895·5	895·5	902·5	917·0	921·0	910·5	898·0	896·0	896·5	901·5	893·0	874·0	860·5	871·5	300
	200	1160·5	1172·8	1170·5	1161·2	1155·0	1155·2	1164·5	1176·5	1179·5	1168·5	1156·0	1153·5	1153·7	1158·2	1149·7	1135·0	1123·5	1135·0	200
	150	1348·3	1359·1	1355·1	1344·8	1339·0	1338·9	1347·8	1357·5	1359·2	1349·2	1338·7	1336·9	1337·1	1341·4	1333·3	1321·1	1311·0	1323·4	150
	100	1611·3	1620·2	1614·5	1602·7	1597·1	1596·8	1605·3	1612·3	1611·7	1604·5	1597·0	1596·6	1596·8	1600·9	1592·9	1584·9	1575·6	1587·8	100
	700	296·0	302·0	304·5	303·0	300·0	301·5	303·0	308·0	309·0	303·5	298·5	297·5	301·0	303·0	299·0	292·0	286·0	288·5	700
	500	552·0	560·5	562·5	558·0	556·0	559·0	561·5	567·0	568·0	559·5	552·0	550·5	554·0	558·0	552·5	540·5	531·0	539·0	500
40	300	911·0	920·5	922·0	914·5	913·5	918·5	922·5	928·0	927·5	915·5	904·0	904·0	907·0	911·5	906·0	890·5	879·0	892·0	300
	200	1177·5	1187·0	1185·5	1175·0	1174·5	1180·0	1185·0	1187·5	1186·8	1175·0	1163·0	1163·0	1165·3	1169·5	1164·0	1154·0	1143·7	1157·0	200
	150	1363·8	1371·6	1368·5	1357·3	1356·1	1361·5	1366·3	1367·3	1366·6	1356·7	1346·0	1346·0	1347·7	1351·4	1347·0	1339·6	1331·1	1344·2	150
	100	1622·7	1628·2	1624·1	1612·2	1611·1	1615·0	1619·6	1619·6	1619·7	1612·6	1603·3	1603·1	1603·9	1606·7	1603·1	1599·1	1592·1	1604·1	100
	700	307·0	310·5	311·5	311·0	312·0	315·5	315·5	315·5	313·0	307·0	306·0	308·0	309·0	310·0	307·5	306·0	305·5	308·0	700
	500	570·5	575·0	575·0	574·0	577·0	580·5	580·0	579·5	575·5	567·0	566·0	568·0	570·0	570·0	568·5	566·0	566·0	570·5	500
30	300	941·5	943·5	942·0	939·5	946·0	950·5	949·0	947·0	942·0	930·0	928·5	933·5	933·0	932·0	935·0	934·5	933·5	942·0	300
	200	1213·0	1214·2	1208·5	1203·5	1211·3	1216·8	1214·7	1209·5	1205·3	1194·0	1194·5	1200·5	1199·0	1197·5	1201·5	1207·0	1206·5	1214·5	200
	150	1396·2	1396·6	1389·7	1383·7	1390·3	1396·0	1394·3	1388·5	1385·5	1376·2	1377·1	1382·5	1380·4	1378·2	1382·9	1390·2	1389·9	1397·3	150
	100	1643·6	1645·0	1637·5	1631·5	1635·5	1640·2	1639·5	1636·1	1635·1	1628·0	1628·3	1632·1	1628·2	1625·8	1629·9	1638·0	1637·1	1643·3	100
	700	312·0	312·5	313·5	313·5	316·0	317·0	317·0	316·5	314·5	311·0	313·0	314·5	315·0	314·0	314·0	315·0	315·0	315·0	700
	500	582·3	581·5	582·0	581·5	585·0	586·0	585·5	584·5	581·0	577·5	580·0	583·0	584·5	582·0	584·0	585·5	585·5	585·5	500
20	300	961·8	958·5	956·0	954·5	960·0	962·0	961·0	959·5	954·5	950·5	955·0	961·0	961·0	957·5	961·5	966·0	965·5	965·5	300
	200	1236·3	1231·0	1225·5	1222·5	1228·5	1232·0	1231·0	1227·0	1222·0	1220·2	1226·0	1232·5	1231·0	1229·0	1235·0	1241·0	1239·7	1239·5	200
	150	1417·7	1412·0	1405·4	1401·1	1406·4	1410·6	1410·4	1405·9	1401·8	1400·6	1407·1	1412·7	1411·2	1408·5	1414·8	1422·0	1420·5	1420·3	150
	100	1658·3	1654·0	1646·0	1641·4	1645·9	1650·3	1651·0	1648·2	1645·6	1643·3	1649·6	1652·3	1651·1	1648·5	1653·5	1661·2	1659·4	1658·9	100
	700	313·0	313·0	314·5	314·5	315·0	315·0	315·5	316·0	315·0	315·0	315·5	316·0	316·0	315·5	315·0	315·0	314·5	313·5	700
	500	585·5	585·0	585·8	585·5	586·0	586·0	586·3	586·7	585·0	585·0	585·8	587·1	587·3	587·0	587·1	587·2	586·7	585·8	500
10	300	968·0	966·8	966·0	964·0	965·5	966·0	966·5	966·2	963·5	965·0	967·0	968·8	969·0	968·5	969·5	969·7	969·2	968·3	300
	200	1244·0	1240·8	1238·0	1235·5	1237·0	1238·0	1239·5	1237·7	1234·8	1237·7	1240·0	1243·0	1243·0	1242·8	1244·7	1244·7	1244·2	1242·6	200
	150	1424·2	1420·7	1417·5	1414·5	1415·6	1417·2	1419·0	1416·9	1413·6	1417·1	1420·2	1423·2	1422·8	1422·7	1424·2	1424·5	1424·0	1422·4	150
	100	1661·0	1657·7	1654·5	1652·0	1652·7	1655·3	1657·8	1655·7	1652·6	1656·0	1659·0	1660·9	1660·0	1660·4	1661·2	1661·0	1660·5	1658·6	100

APPENDIX I—*continued*

JANUARY 1949–53

Latitude °S	Pressure level mb.	180°W	160°W	140°W	120°W	100°W	80°W	60°W	40°W	20°W	0°	20°E	40°E	60°E	80°E	100°E	120°E	140°E	160°E	Pressure level mb.
											geopotential decametres									
0	700	313·5	313·5	315·1	315·1	314·5	314·5	315·0	315·5	316·0	316·0	315·5	316·0	316·0	315·5	314·5	313·5	313·0	313·0	700
	500	586·5	586·2	587·3	587·1	586·2	586·0	586·3	586·8	587·1	586·7	586·3	587·5	587·7	587·5	586·9	586·1	585·7	585·7	500
	300	970·5	969·7	969·0	968·3	967·4	967·5	968·4	968·0	968·0	968·1	968·4	970·0	970·0	970·0	970·4	969·1	968·7	968·7	300
	200	1246·5	1244·2	1242·5	1241·6	1240·7	1241·5	1242·7	1241·5	1241·0	1241·1	1242·4	1244·7	1245·0	1245·2	1245·8	1244·5	1244·1	1244·0	200
	500	1425·8	1423·2	1421·4	1420·8	1420·0	1421·0	1422·4	1421·1	1420·6	1420·9	1422·9	1425·1	1424·8	1425·0	1425·4	1424·3	1424·2	1423·6	150
	100	1661·2	1657·9	1656·6	1657·3	1657·2	1659·1	1661·1	1659·9	1659·4	1659·7	1661·7	1662·6	1661·9	1662·2	1661·9	1660·8	1660·7	1659·1	100
10	700	313·5	314·0	316·0	316·0	315·5	314·5	314·5	315·5	316·0	316·0	315·5	316·0	316·0	315·5	314·0	312·5	312·0	312·5	700
	500	586·2	586·6	588·3	588·2	587·4	586·1	586·0	587·0	587·4	587·3	587·1	587·9	587·7	587·4	586·3	585·1	584·4	585·1	500
	300	969·2	969·3	970·3	969·7	968·9	967·7	968·2	968·5	968·9	969·0	969·7	971·4	970·1	969·8	969·3	968·1	967·2	968·1	300
	200	1243·7	1243·3	1244·3	1243·4	1242·9	1242·1	1243·0	1242·8	1242·5	1243·0	1245·2	1247·4	1245·8	1245·3	1244·7	1243·5	1242·9	1243·5	200
	150	1422·4	1422·0	1423·3	1422·6	1422·5	1422·0	1423·2	1422·9	1422·5	1423·2	1426·3	1428·3	1426·3	1425·5	1424·7	1423·7	1423·3	1423·1	150
	100	1657·8	1657·3	1659·6	1659·7	1659·9	1660·5	1662·7	1662·8	1662·4	1662·7	1665·8	1666·8	1664·8	1663·1	1661·8	1660·8	1660·1	1659·0	100
20	700	312·5	313·8	315·8	315·8	315·8	314·8	313·9	315·5	316·0	316·0	315·0	315·5	315·5	316·0	315·0	314·0	312·5	311·5	700
	500	583·8	585·0	587·0	587·1	587·1	586·1	585·7	586·7	587·2	587·5	587·4	588·0	587·0	587·2	586·3	586·1	583·7	582·6	500
	300	964·8	965·5	967·3	967·3	967·3	966·3	966·8	967·2	968·2	969·0	970·4	971·0	968·5	968·7	968·4	967·6	965·2	963·6	300
	200	1238·3	1238·7	1240·7	1240·7	1241·2	1240·6	1241·6	1241·6	1241·8	1243·0	1246·6	1247·5	1244·1	1244·0	1243·4	1242·1	1240·5	1238·8	200
	150	1417·4	1418·1	1420·7	1421·0	1421·6	1421·6	1422·7	1422·9	1422·9	1424·1	1428·7	1429·4	1425·3	1424·8	1424·1	1422·9	1421·3	1419·0	150
	100	1656·1	1657·2	1661·0	1661·9	1662·8	1663·1	1664·4	1665·4	1665·4	1665·8	1670·6	1670·7	1666·2	1665·0	1663·6	1661·8	1659·8	1658·3	100
30	700	309·5	311·0	315·0	316·0	315·5	314·7	314·2	315·5	316·0	316·0	315·0	315·0	315·0	315·5	315·0	314·5	313·5	310·5	700
	500	577·0	578·5	582·5	583·5	583·0	582·4	584·3	585·6	586·0	586·5	586·8	585·5	584·5	584·0	583·5	583·5	581·5	578·0	500
	300	950·5	953·0	957·5	958·5	958·5	957·5	961·8	962·1	963·5	965·0	967·0	965·8	963·0	962·0	961·0	959·5	957·5	952·0	300
	200	1221·5	1224·0	1229·0	1230·5	1231·3	1230·6	1235·1	1235·1	1236·2	1238·0	1241·5	1241·3	1238·0	1235·5	1233·5	1231·0	1228·5	1222·7	200
	150	1402·5	1405·0	1410·8	1412·8	1413·8	1413·3	1418·3	1418·1	1419·0	1420·5	1425·2	1425·2	1421·1	1417·8	1415·5	1412·8	1410·2	1404·4	150
	100	1648·1	1652·0	1658·8	1661·4	1663·0	1662·3	1667·6	1667·7	1668·2	1667·6	1673·3	1673·4	1668·9	1664·4	1661·8	1657·8	1655·0	1649·9	100
40	700	305·0	305·5	308·2	310·4	310·7	310·6	307·5	307·0	308·0	307·0	304·0	303·0	306·0	310·0	311·0	310·5	307·5	305·5	700
	500	567·5	568·0	570·7	572·9	573·2	573·6	572·5	571·0	572·5	573·0	572·0	566·5	568·5	573·0	575·0	575·5	572·0	568·0	500
	300	934·0	935·5	938·7	941·1	941·9	942·1	942·5	939·5	941·5	943·0	942·5	937·0	939·0	943·5	944·5	944·0	940·5	935·5	300
	200	1200·0	1202·0	1206·2	1209·6	1211·4	1211·6	1212·5	1209·0	1210·5	1212·5	1213·5	1209·0	1210·5	1213·0	1213·0	1212·0	1207·5	1200·5	200
	150	1383·0	1385·0	1390·2	1394·2	1396·3	1397·2	1398·3	1394·6	1395·7	1397·8	1399·6	1395·5	1396·8	1398·5	1398·0	1396·3	1390·9	1383·8	150
	100	1637·6	1640·1	1646·7	1651·5	1653·8	1655·8	1657·2	1652·9	1653·4	1655·7	1658·3	1655·0	1655·8	1656·4	1655·5	1653·0	1646·9	1638·8	100
45	700	301·5	301·5	302·8	304·0	304·3	304·8	300·2	297·5	298·5	297·0	293·0	292·0	294·5	298·5	302·5	302·5	301·5	301·0	700
	500	562·0	561·5	562·8	564·0	564·3	564·8	561·2	558·0	559·5	559·5	555·5	550·5	552·5	558·0	563·0	564·0	563·0	562·0	500
	300	925·0	925·5	926·8	928·0	928·8	929·3	926·2	922·0	924·0	923·5	919·5	914·0	916·5	923·0	928·5	929·0	928·5	926·5	300
	200	1189·0	1190·0	1192·3	1194·7	1196·3	1197·3	1194·4	1189·5	1191·5	1191·5	1188·5	1183·5	1186·0	1191·5	1196·0	1195·5	1194·2	1190·5	200
	150	1372·9	1374·2	1377·5	1380·7	1382·7	1384·3	1381·8	1376·8	1378·5	1378·7	1376·5	1371·8	1374·1	1379·4	1383·0	1381·6	1379·2	1375·3	150
	100	1630·9	1633·7	1638·0	1642·2	1644·7	1647·3	1645·0	1639·8	1641·0	1641·7	1640·0	1636·2	1638·5	1643·1	1645·7	1643·3	1639·7	1634·8	100
50	700	295·5	294·3	294·7	294·5	294·4	294·7	289·8	288·0	288·0	286·5	283·5	282·5	284·0	287·0	290·0	292·5	293·0	295·0	700
	500	553·0	551·3	551·4	551·5	551·4	551·8	547·0	544·0	544·5	544·5	541·0	536·5	538·0	543·0	547·5	550·5	551·0	553·0	500
	300	913·0	912·3	912·4	912·4	912·4	912·5	907·0	902·5	902·5	902·5	899·0	894·5	896·0	902·5	908·0	912·0	912·5	913·5	300
	200	1176·5	1176·0	1176·4	1177·4	1178·7	1179·3	1174·1	1168·5	1168·5	1169·0	1166·5	1163·0	1164·5	1170·2	1174·5	1177·8	1177·8	1177·5	200
	150	1361·7	1361·3	1362·8	1364·7	1366·5	1367·7	1363·1	1357·3	1357·3	1358·0	1356·2	1353·0	1354·6	1360·0	1363·7	1365·9	1365·0	1364·5	150
	100	1623·2	1623·6	1626·5	1629·6	1631·9	1633·9	1630·5	1624·1	1623·8	1625·3	1624·2	1621·2	1623·1	1628·0	1630·2	1631·5	1629·6	1628·3	100

APPENDIX I—*continued*

JANUARY 1949–53

Latitude	Pressure level	180°W	160°W	140°W	120°W	100°W	80°W	60°W	40°W	20°W	0°	20°E	40°E	60°E	80°E	100°E	120°E	140°E	160°E	Pressure level
°S	mb.										*geopotential decametres*									mb
	700	285·5	284·0	284·9	284·8	284·1	284·8	278·3	277·5	277·5	276·5	274·5	273·5	274·0	276·0	279·0	281·5	283·5	285·0	700
	500	540·0	537·5	538·0	538·0	537·0	538·3	531·5	529·0	529·5	529·5	527·0	523·5	524·5	528·5	532·5	536·0	538·5	540·0	500
55	300	897·0	894·5	895·0	895·0	894·0	895·0	887·0	882·5	882·5	882·5	879·5	875·5	876·5	882·0	888·5	893·0	895·5	897·0	300
	200	1161·5	1159·0	1159·5	1159·8	1159·6	1161·5	1153·7	1148·5	1148·5	1148·5	1146·3	1143·0	1144·5	1149·5	1155·0	1158·7	1161·0	1162·3	200
	150	1348·3	1345·6	1347·1	1348·4	1348·7	1351·3	1344·3	1338·8	1339·0	1339·2	1337·2	1334·1	1336·1	1341·0	1345·8	1348·7	1350·2	1351·1	150
	100	1613·4	1610·9	1613·6	1616·0	1617·2	1620·7	1614·6	1609·1	1609·5	1610·0	1608·0	1605·0	1607·6	1612·5	1616·2	1617·9	1618·8	1617·6	100
	700	276·5	276·8	276·6	276·5	277·4	276·9	271·7	270·0	269·5	268·5	267·0	266·5	267·0	268·5	270·5	273·0	274·0	275·0	700
	500	527·5	526·8	526·4	526·2	526·5	525·9	520·2	517·5	516·5	516·5	514·5	512·5	513·5	516·5	520·0	523·5	525·0	526·0	500
60	300	881·5	880·0	879·5	879·0	879·0	878·0	871·5	867·0	866·0	866·0	863·5	861·0	862·0	865·5	871·0	876·0	878·0	879·5	300
	200	1147·5	1145·9	1145·2	1144·8	1145·2	1145·0	1138·8	1134·3	1133·5	1133·5	1130·8	1128·7	1129·8	1133·2	1138·0	1142·7	1144·6	1146·0	200
	150	1335·9	1334·1	1334·2	1334·9	1335·7	1336·3	1330·4	1325·9	1325·3	1325·4	1322·7	1320·9	1322·4	1325·8	1330·2	1334·0	1335·3	1336·2	150
	100	1602·9	1601·3	1603·2	1605·5	1606·9	1608·4	1602·6	1598·6	1598·2	1598·3	1595·6	1594·3	1596·2	1599·7	1603·5	1605·8	1605·9	1606·2	100

APPENDIX I—*continued*

APRIL 1949–53

Pressure level	Pole	85° N 180°W	85° N 90°W	85° N 0°	85° N 90°E
mb.		*geopotential decametres*			
700	276·9	278·1	278·2	275·8	275·5
500	516·1	517·8	516·8	515·3	516·1
300	853·8	855·9	853·6	853·1	855·6
200	1117·4	1119·2	1117·5	1116·3	1118·9
150	1305·7	1308·0	1306·2	1304·0	1306·9
100	1571·2	1574·4	1572·4	1568·6	1572·1

Latitude	Pressure level	180°W	160°W	140°W	120°W	100°W	80°W	60°W	40°W	20°W	0°	20°E	40°E	60°E	80°E	100°E	120°E	140°E	160°E	Pressure level
°*N*	*mb.*								*geopotential decametres*											*mb.*
	700	278·8	279·7	280·4	280·7	280·2	279·0	278·5	278·1	277·2	276·5	275·6	275·6	275·8	275·4	275·6	276·3	277·2	278·0	700
	500	519·6	520·6	520·9	520·5	518·8	516·7	516·4	516·6	516·4	516·5	516·8	517·7	518·2	517·8	517·6	517·7	518·0	518·6	500
80	300	858·6	859·4	859·7	859·4	857·2	854·3	853·6	853·6	853·3	854·4	856·1	858·4	859·9	859·8	859·2	858·7	858·3	858·1	300
	200	1121·5	1122·3	1122·8	1122·7	1120·8	1118·5	1117·6	1116·8	1115·8	1116·7	1118·5	1120·8	1122·8	1123·0	1122·5	1122·1	1121·6	1121·2	200
	150	1310·7	1311·6	1312·1	1312·0	1310·1	1307·7	1306·4	1305·0	1303·4	1303·8	1305·4	1308·1	1310·8	1311·3	1311·0	1310·8	1310·5	1310·3	150
	100	1577·9	1578·9	1579·5	1579·3	1577·2	1574·8	1572·7	1570·3	1567·9	1567·6	1569·1	1572·0	1575·7	1577·0	1577·1	1577·2	1577·3	1577·4	100
	700	280·0	281·2	281·9	282·0	280·8	280·0	279·0	279·6	278·7	277·1	277·5	279·3	279·8	278·5	277·7	278·0	278·0	278·7	700
	500	521·9	523·4	524·6	524·0	521·1	518·9	517·5	518·5	518·6	518·6	520·8	523·9	524·9	522·7	520·9	520·4	520·0	520·4	500
75	300	862·0	863·1	865·2	865·1	860·6	857·5	856·5	856·9	857·1	857·6	861·1	866·9	869·5	867·7	864·5	862·9	862·0	861·5	300
	200	1125·2	1125·5	1128·1	1128·4	1124·3	1122·2	1120·9	1120·1	1118·9	1119·0	1122·9	1128·7	1132·0	1131·2	1128·2	1126·6	1125·4	1125·0	200
	150	1314·6	1315·0	1317·8	1318·1	1313·8	1311·8	1310·2	1308·5	1306·4	1306·0	1309·6	1315·8	1319·8	1319·7	1317·1	1315·7	1314·6	1314·5	150
	100	1582·0	1582·9	1586·3	1586·3	1581·6	1579·9	1577·4	1574·0	1570·4	1569·5	1572·7	1579·7	1584·4	1585·7	1583·9	1583·0	1582·1	1582·1	100
	700	280·5	282·6	284·6	283·8	282·9	282·2	280·1	280·8	279·7	278·6	281·0	284·4	286·0	283·7	281·2	280·0	279·0	279·0	700
	500	523·5	525·8	529·8	528·5	525·9	523·6	520·8	522·1	522·2	522·5	526·8	531·9	533·8	529·6	525·5	523·3	521·8	521·6	500
70	300	865·2	867·0	872·6	872·0	867·6	864·4	862·4	862·9	863·5	863·6	869·3	877·9	882·1	877·3	870·4	867·0	864·8	863·9	300
	200	1127·5	1129·1	1135·2	1135·3	1131·1	1128·8	1126·5	1125·5	1125·2	1125·1	1130·4	1139·1	1144·2	1141·1	1134·6	1130·8	1128·4	1127·5	200
	150	1316·8	1318·3	1324·7	1324·9	1320·4	1318·2	1315·7	1314·0	1312·9	1312·3	1316·9	1325·7	1331·6	1329·5	1323·3	1319·6	1317·5	1316·9	150
	100	1584·3	1586·0	1593·2	1593·3	1588·0	1585·9	1582·8	1579·4	1576·6	1575·8	1579·5	1588·9	1595·7	1595·3	1590·1	1586·8	1585·1	1584·8	100
	700	280·9	282·7	287·1	288·5	286·3	285·3	283·1	284·1	281·4	282·0	286·3	290·5	292·2	289·3	285·4	283·0	280·5	279·8	700
	500	525·3	527·7	533·8	535·3	531·8	529·5	526·6	529·3	527·7	529·1	534·9	540·7	542·7	537·4	530·7	527·4	524·0	523·4	500
65	300	867·9	871·1	878·1	881·0	876·0	873·1	870·7	873·5	873·0	873·9	881·1	890·3	894·0	887·3	877·1	872·4	868·4	867·1	300
	200	1129·7	1133·4	1140·5	1143·5	1138·6	1135·8	1133·7	1135·7	1135·4	1135·9	1141·0	1150·9	1155·6	1150·3	1140·9	1136·0	1132·0	1130·8	200
	150	1318·9	1322·3	1329·6	1332·6	1327·4	1324·5	1322·2	1323·7	1323·1	1323·3	1327·1	1337·0	1342·7	1338·1	1329·1	1324·2	1320·5	1320·0	150
	100	1586·4	1589·4	1597·1	1599·7	1593·9	1590·8	1588·6	1588·5	1586·8	1586·6	1589·1	1599·4	1606·4	1602·7	1594·9	1590·5	1587·5	1587·6	100
	700	281·4	281·9	287·6	292·6	290·1	287·7	286·9	288·8	285·5	287·0	291·8	296·4	297·1	294·0	289·8	286·0	283·0	281·3	700
	500	526·9	528·6	535·4	541·5	538·1	533·8	534·0	537·7	535·6	536·6	543·5	549·4	549·9	544·4	537·1	531·0	527·8	526·3	500
60	300	871·1	873·8	882·4	889·3	884·6	879·4	881·2	886·0	885·5	884·8	893·6	902·7	903·8	895·7	885·1	877·7	873·5	871·0	300
	200	1134·4	1137·2	1145·1	1151·2	1146·5	1141·1	1143·2	1148·3	1148·9	1147·2	1152·8	1162·5	1164·9	1157·6	1147·9	1140·9	1136·5	1134·3	200
	150	1322·5	1326·3	1333·6	1339·4	1334·4	1329·2	1330·8	1335·2	1335·9	1334·1	1337·9	1347·8	1351·4	1344·7	1335·2	1328·2	1324·2	1322·9	150
	100	1589·8	1593·4	1599·8	1604·5	1599·4	1594·1	1596·0	1598·9	1599·0	1596·4	1599·1	1609·2	1614·2	1608·4	1599·8	1593·2	1589·8	1589·6	100

APPENDIX I—*continued*

APRIL 1949–53

Latitude	Pressure level	180°W	160°W	140°W	120°W	100°W	80°W	60°W	40°W	20°W	0°	20°E	40°E	60°E	80°E	100°E	120°E	140°E	160°E	Pressure level
°N	mb.									geopotential decametres										mb.
	700	282·4	282·7	288·6	295·5	293·2	288·2	289·1	292·9	293·2	292·6	296·1	300·0	300·4	297·7	293·6	289·8	285·5	282·5	700
	500	529·2	531·5	538·3	546·7	544·2	536·1	538·8	545·4	546·7	545·5	550·9	555·1	555·2	549·8	542·6	537·0	532·0	529·0	500
55	300	876·2	879·3	887·4	897·1	894·3	884·0	888·8	897·9	900·3	896·4	904·5	911·6	911·3	902·9	892·5	885·0	879·0	876·0	300
	200	1138·9	1143·7	1150·9	1158·2	1156·2	1145·4	1150·6	1159·6	1162·8	1157·5	1162·7	1170·4	1172·3	1164·5	1154·2	1147·4	1141·2	1138·5	200
	150	1327·9	1333·0	1338·6	1344·5	1342·8	1333·0	1337·6	1345·2	1347·7	1342·8	1346·5	1355·1	1358·0	1350·9	1340·8	1333·9	1328·0	1325·7	150
	100	1594·7	1600·1	1603·3	1607·3	1606·0	1596·7	1601·3	1607·2	1608·8	1603·6	1606·1	1615·6	1619·6	1613·6	1604·4	1597·7	1592·4	1590·7	100
	700	285·5	286·5	292·3	300·0	297·0	291·7	291·2	296·5	299·2	298·0	299·5	302·0	303·5	302·0	297·0	293·8	289·0	285·5	700
	500	534·3	536·7	544·4	554·0	550·2	542·6	543·3	551·8	554·8	552·0	554·2	558·1	560·0	557·6	548·8	543·0	537·3	534·2	500
50	300	885·7	889·9	899·2	908·9	903·4	894·4	896·6	908·8	911·7	906·0	909·5	915·2	918·8	913·9	902·0	892·8	886·5	883·7	300
	200	1148·1	1152·9	1161·3	1168·7	1163·2	1156·5	1160·0	1169·8	1172·2	1165·8	1168·5	1174·9	1181·3	1176·2	1163·7	1154·1	1147·2	1144·9	200
	150	1335·2	1340·0	1347·0	1352·4	1347·6	1343·4	1346·3	1353·5	1354·7	1349·3	1351·9	1358·7	1366·3	1361·8	1349·4	1339·8	1333·0	1330·9	150
	100	1598·9	1604·2	1609·2	1612·1	1608·3	1606·1	1608·4	1613·0	1612·6	1608·3	1610·7	1617·8	1626·7	1622·9	1611·3	1602·3	1595·8	1593·5	100
	700	293·0	293·7	298·2	303·7	300·2	295·1	295·5	301·2	303·8	302·0	302·0	302·5	305·5	304·8	300·2	297·0	292·6	290·5	700
	500	546·4	548·0	553·5	561·0	556·2	549·0	551·0	559·3	561·5	557·9	558·3	559·2	564·0	561·7	555·0	548·8	543·2	542·2	500
45	300	903·5	906·7	912·3	919·0	912·8	904·3	908·4	919·3	920·3	914·1	914·5	916·0	925·3	921·8	911·8	902·1	895·1	896·0	300
	200	1166·0	1169·4	1174·1	1178·8	1172·8	1166·5	1170·7	1179·3	1179·9	1173·0	1173·7	1176·0	1188·3	1185·4	1174·1	1163·4	1155·7	1157·2	200
	150	1350·8	1353·9	1357·2	1360·8	1356·2	1351·8	1355·2	1361·2	1361·0	1354·9	1356·4	1359·1	1372·3	1370·5	1359·1	1348·2	1340·6	1341·7	150
	100	1611·1	1614·1	1615·7	1617·9	1614·9	1612·1	1614·1	1618·1	1616·9	1611·9	1614·2	1616·9	1631·0	1630·2	1619·3	1609·5	1602·0	1601·2	100
	700	300·5	301·0	304·4	306·5	304·0	300·1	302·5	307·0	307·0	304·8	304·6	303·8	307·5	307·5	303·8	300·6	297·0	298·0	700
	500	558·4	558·6	562·3	566·5	563·0	557·0	561·1	567·0	566·3	562·5	562·3	561·5	567·7	567·9	562·0	555·7	551·2	554·3	500
40	300	920·8	921·0	924·3	927·4	922·8	916·0	922·4	929·4	926·6	920·6	920·2	919·3	930·5	931·2	922·9	914·1	908·7	915·1	300
	200	1185·0	1184·5	1186·5	1187·8	1183·6	1178·3	1184·7	1190·5	1186·5	1180·4	1180·0	1179·8	1194·0	1195·7	1186·7	1177·1	1171·7	1178·8	200
	150	1368·2	1367·0	1367·7	1368·7	1365·9	1361·6	1366·7	1370·7	1366·6	1361·7	1361·9	1362·5	1377·3	1379·8	1370·7	1360·7	1355·3	1361·7	150
	100	1624·2	1623·1	1622·5	1623·7	1622·5	1619·0	1622·0	1624·6	1620·1	1617·0	1618·3	1619·1	1634·0	1637·3	1628·0	1618·1	1613·0	1616·8	100
	700	315·0	313·3	312·2	310·8	311·0	312·0	314·2	315·2	312·0	310·8	311·5	310·0	312·3	313·0	310·0	308·8	309·0	311·0	700
	500	580·2	577·3	575·8	575·4	576·3	576·6	578·6	580·0	576·0	574·2	575·2	573·4	577·6	579·0	575·5	573·7	573·8	576·0	500
30	300	951·5	946·4	944·1	943·4	944·3	945·7	948·3	949·1	943·3	941·7	942·2	939·0	945·8	949·1	945·1	945·9	946·7	948·7	300
	200	1220·1	1213·2	1208·8	1207·9	1209·3	1211·5	1214·3	1213·6	1207·6	1207·7	1207·0	1203·5	1212·8	1218·6	1215·0	1215·7	1216·9	1218·7	200
	150	1400·3	1393·3	1388·4	1387·2	1388·8	1390·9	1393·2	1392·0	1387·0	1388·3	1387·7	1385·0	1394·3	1401·0	1397·0	1397·0	1398·1	1399·5	150
	100	1647·5	1641·5	1636·7	1635·5	1637·6	1638·7	1640·9	1638·7	1634·8	1637·7	1637·7	1635·0	1642·5	1650·0	1644·8	1643·6	1644·3	1645·4	100
	700	315·3	314·0	313·5	313·3	314·7	316·4	317·0	316·6	315·0	314·8	315·2	315·0	315·7	316·0	313·2	315·1	315·3	315·4	700
	500	583·8	581·4	579·8	581·5	585·2	586·6	585·8	584·5	583·0	583·5	584·8	584·0	585·7	587·1	583·2	585·3	585·5	585·7	500
20	300	960·1	954·7	952·9	955·9	961·5	964·3	962·3	959·3	957·8	960·5	962·7	960·5	963·2	965·9	962·7	965·7	965·7	964·6	300
	200	1231·4	1223·7	1221·4	1224·7	1231·9	1235·3	1232·8	1228·4	1227·8	1233·0	1235·9	1231·5	1235·7	1240·4	1237·7	1240·4	1240·0	1237·3	200
	150	1410·8	1402·7	1400·0	1403·0	1410·4	1414·2	1411·3	1406·5	1407·0	1413·3	1416·5	1411·2	1415·6	1421·3	1418·4	1420·9	1420·2	1417·1	150
	100	1651·7	1644·8	1642·1	1644·7	1651·1	1654·9	1651·4	1646·8	1648·2	1655·0	1658·0	1652·1	1655·0	1662·0	1658·3	1659·3	1658·4	1655·6	100
	700	313·3	312·8	313·4	314·0	314·6	314·8	315·6	317·2	316·2	315·8	315·8	315·8	315·7	315·6	315·5	316·1	315·0	313·7	700
	500	583·9	582·2	582·7	584·2	585·9	586·3	586·3	587·4	586·4	586·9	587·2	587·3	587·4	587·9	587·6	588·1	587·0	585·5	500
10	300	964·3	960·4	960·8	963·1	966·3	967·1	966·6	966·3	966·6	968·0	969·1	968·4	969·1	971·1	970·9	971·3	970·2	967·8	300
	200	1237·3	1232·6	1232·5	1235·0	1239·5	1240·2	1239·8	1238·8	1240·4	1242·7	1244·1	1242·2	1243·8	1247·5	1247·3	1247·5	1245·9	1242·8	200
	150	1416·3	1411·1	1411·0	1413·1	1417·6	1418·7	1418·8	1417·6	1419·8	1422·9	1424·7	1421·9	1423·4	1427·8	1427·4	1427·5	1425·7	1422·4	150
	100	1653·2	1648·1	1648·3	1649·8	1654·2	1655·8	1656·5	1655·5	1657·7	1661·2	1662·7	1657·9	1658·9	1664·4	1663·5	1663·2	1661·6	1658·5	100

APPENDIX I—*continued*

APRIL 1949–53

Latitude	Pressure level	180°W	160°W	140°W	120°W	100°W	80°W	60°W	40°W	20°W	0°	20°E	40°E	60°E	80°E	100°E	120°E	140°E	160°E	Pressure level
°S	mb.										geopotential decametres									mb.
	700	312·8	312·9	313·8	314·8	315·1	314·7	314·8	317·1	316·7	316·2	316·2	315·8	315·5	315·1	314·6	314·4	313·8	312·9	700
	500	584·9	584·4	584·6	586·0	586·7	586·3	586·4	587·9	587·4	587·5	587·9	587·6	587·1	587·0	587·0	587·1	586·5	585·5	500
0	300	966·8	965·7	965·4	967·1	968·1	968·2	968·6	968·9	968·7	969·8	970·6	969·5	969·5	970·3	970·9	971·4	970·7	968·9	300
	200	1241·2	1239·6	1238·9	1240·5	1241·8	1242·3	1243·3	1242·8	1243·6	1245·3	1246·5	1244·0	1244·7	1246·4	1247·2	1247·8	1247·0	1244·2	200
	150	1420·1	1418·2	1417·4	1419·0	1420·3	1421·0	1422·5	1422·1	1423·2	1425·5	1427·1	1424·0	1424·5	1426·3	1427·1	1427·7	1426·8	1423·6	150
	100	1655·6	1653·5	1652·7	1654·2	1655·8	1657·2	1660·2	1660·0	1660·9	1663·2	1664·6	1660·4	1660·5	1662·1	1662·9	1663·4	1662·6	1659·3	100
	700	314·3	314·7	315·2	315·3	315·3	314·9	314·8	316·6	316·5	315·9	316·3	316·4	315·3	315·2	314·9	313·7	312·9	312·9	700
	500	586·6	586·8	586·9	586·7	586·7	586·2	586·2	587·2	587·0	586·9	587·5	587·3	586·3	586·3	586·7	585·7	584·9	585·1	500
10	300	968·9	968·9	968·8	968·2	968·0	967·6	968·1	968·0	967·8	968·7	969·4	969·1	968·4	968·6	969·9	968·9	967·9	967·9	300
	200	1243·6	1243·3	1243·1	1242·1	1241·8	1241·8	1243·0	1242·1	1242·2	1244·0	1245·0	1244·2	1243·5	1243·8	1245·5	1244·5	1243·5	1243·2	200
	150	1423·0	1422·3	1421·9	1420·9	1420·6	1421·1	1422·5	1421·7	1422·1	1424·6	1425·9	1424·6	1423·7	1423·8	1425·4	1424·4	1423·4	1422·9	150
	100	1659·6	1658·4	1658·2	1657·0	1656·9	1657·8	1660·7	1660·3	1660·5	1663·5	1664·9	1662·9	1661·2	1660·9	1662·0	1660·9	1659·8	1659·2	100
	700	315·1	315·1	315·2	315·2	315·3	315·0	314·5	315·8	315·6	315·2	315·7	316·0	315·0	315·0	315·3	315·1	313·5	312·8	700
	500	585·9	585·5	585·4	585·2	585·2	584·7	584·0	584·8	584·8	585·0	586·1	586·3	585·1	585·0	585·3	585·3	583·2	583·1	500
20	300	965·4	964·8	964·7	964·1	963·6	963·0	962·4	962·3	962·8	964·4	966·9	967·1	965·5	965·0	964·8	964·8	962·5	962·5	300
	200	1238·7	1238·2	1237·9	1237·3	1236·3	1235·6	1235·3	1235·0	1235·8	1238·6	1242·0	1242·0	1240·0	1239·1	1238·3	1238·3	1236·4	1236·4	200
	150	1418·4	1417·7	1417·4	1416·8	1415·8	1415·1	1415·1	1414·8	1415·9	1419·5	1423·4	1423·3	1420·9	1419·7	1418·4	1418·4	1416·8	1416·6	150
	100	1657·8	1656·8	1656·7	1656·1	1655·1	1654·5	1655·1	1655·1	1656·6	1661·0	1665·1	1665·2	1661·9	1660·4	1657·9	1657·5	1655·5	1656·1	100
	700	309·8	310·0	311·0	312·6	314·5	314·0	313·0	314·0	313·0	312·0	314·0	314·0	311·0	311·8	313·0	314·0	312·0	310·4	700
	500	574·8	575·0	576·2	578·0	580·3	579·9	579·0	580·0	579·5	579·3	582·0	582·0	578·6	578·3	578·6	579·0	576·0	575·4	500
30	300	945·1	945·3	946·5	949·2	952·2	952·0	950·9	952·1	952·4	953·9	958·3	958·8	954·7	952·5	950·5	949·3	945·0	945·3	300
	200	1213·6	1214·1	1215·5	1218·7	1222·2	1221·9	1220·9	1222·1	1222·7	1225·3	1230·8	1231·5	1227·2	1223·7	1220·0	1216·8	1212·5	1213·7	200
	150	1394·0	1394·4	1395·8	1399·0	1402·7	1402·1	1401·1	1402·3	1403·1	1406·3	1412·5	1413·8	1409·3	1405·2	1401·1	1397·7	1393·8	1394·9	150
	100	1640·0	1640·0	1640·8	1644·0	1647·7	1646·7	1645·7	1646·9	1647·9	1651·6	1658·7	1661·2	1656·9	1652·0	1647·6	1645·1	1642·2	1642·1	100
	700	303·0	303·3	303·8	305·4	307·0	308·0	307·2	305·2	304·0	304·0	305·0	303·7	303·0	304·0	305·3	306·2	305·8	304·0	700
	500	562·0	562·3	563·0	565·0	567·2	568·8	568·0	566·0	565·0	566·0	568·0	566·9	565·5	565·2	565·5	566·2	565·2	563·4	500
40	300	923·1	923·4	924·5	927·3	931·0	933·3	932·3	930·4	929·8	932·7	937·2	937·2	934·6	931·1	929·2	928·6	926·7	924·7	300
	200	1185·6	1185·9	1187·5	1191·1	1195·8	1198·4	1197·4	1195·5	1195·1	1199·0	1205·5	1206·6	1202·8	1197·4	1193·4	1191·3	1189·0	1187·0	200
	150	1367·9	1367·8	1369·5	1373·0	1378·0	1380·4	1379·3	1377·4	1377·0	1381·3	1389·3	1391·2	1387·3	1381·1	1376·0	1373·3	1371·3	1369·5	150
	100	1622·8	1621·5	1623·0	1625·9	1630·7	1632·7	1631·2	1629·3	1629·0	1633·7	1643·0	1646·7	1643·3	1636·4	1630·3	1627·6	1626·8	1625·5	100
	700	299·0	299·0	299·8	301·0	301·5	302·1	300·0	297·5	296·2	296·2	297·0	295·8	295·0	295·5	297·0	298·7	299·0	298·5	700
	500	556·0	556·1	557·0	558·3	559·2	560·0	557·7	555·2	554·0	554·7	556·0	555·0	553·7	553·2	554·2	556·0	556·3	555·8	500
45	300	914·3	914·5	915·7	917·5	919·3	920·7	917·2	914·7	914·0	916·5	920·0	919·5	917·4	914·4	913·6	914·7	914·4	914·1	300
	200	1176·1	1176·3	1177·6	1179·8	1182·3	1184·1	1180·5	1177·9	1177·3	1180·6	1185·9	1186·2	1183·6	1178·6	1176·2	1176·3	1175·4	1175·4	200
	150	1359·3	1359·3	1360·7	1362·9	1365·5	1367·2	1363·4	1360·7	1360·2	1363·8	1370·3	1371·5	1369·1	1363·4	1360·1	1359·2	1358·5	1358·6	150
	100	1617·2	1616·6	1617·8	1619·4	1621·7	1623·2	1618·9	1616·0	1615·8	1619·9	1627·8	1631·2	1629·6	1623·2	1618·6	1616·9	1616·6	1616·9	100
	700	292·0	293·0	293·7	294·7	295·0	295·0	291·5	289·0	287·8	287·7	287·2	286·1	286·0	286·0	286·5	288·0	290·0	291·0	700
	500	546·9	547·9	548·6	549·7	550·0	549·8	546·0	543·2	541·9	542·0	542·0	541·0	540·7	540·0	540·3	541·9	544·3	545·7	500
50	300	902·7	903·7	904·4	905·9	906·8	906·6	900·7	898·0	897·4	898·9	900·3	899·8	898·2	895·8	895·1	896·6	899·1	901·2	300
	200	1163·9	1164·8	1165·5	1167·4	1168·8	1168·8	1162·8	1159·7	1159·2	1161·1	1163·5	1163·7	1162·2	1158·8	1156·9	1156·8	1159·3	1161·9	200
	150	1348·2	1349·1	1349·7	1351·5	1353·0	1352·9	1346·7	1343·5	1343·1	1345·3	1348·3	1349·4	1348·4	1344·8	1341·7	1340·8	1343·1	1346·1	150
	100	1608·5	1609·4	1609·4	1610·7	1612·1	1611·9	1605·2	1601·9	1601·7	1604·5	1608·6	1610·9	1611·0	1607·3	1602·7	1600·9	1602·9	1606·4	100

APPENDIX I—*continued*

APRIL 1949–53

Latitude	Pressure level	180°W	160°W	140°W	120°W	100°W	80°W	60°W	40°W	20°W	0°	20°E	40°E	60°E	80°E	100°E	120°E	140°E	160°E	Pressure level
°S	mb.									geopotential decametres										mb.
	700	283·0	285·5	286·3	287·0	286·3	286·0	282·4	279·7	279·0	278·7	278·0	277·0	276·0	275·0	276·0	277·3	280·0	281·8	700
	500	535·0	537·6	538·5	539·2	538·5	538·0	534·0	530·5	529·4	529·0	528·3	527·2	526·0	524·7	525·7	527·3	530·8	533·8	500
55	300	888·0	890·6	891·7	892·5	891·9	890·6	884·8	880·7	880·0	880·7	880·8	879·7	877·8	874·7	875·3	877·0	881·4	886·0	300
	200	1148·6	1151·2	1152·3	1153·2	1152·9	1151·9	1145·8	1141·1	1140·3	1141·4	1142·2	1141·8	1140·0	1136·6	1136·1	1136·6	1141·0	1146·4	200
	150	1333·8	1336·4	1337·4	1338·2	1337·9	1336·7	1330·5	1325·7	1324·9	1326·1	1327·4	1327·5	1326·2	1322·9	1321·7	1321·4	1325·8	1331·7	150
	100	1595·2	1597·8	1598·5	1599·0	1598·7	1597·4	1590·9	1586·2	1585·4	1586·8	1588·7	1589·4	1588·9	1586·1	1583·9	1582·7	1587·1	1593·1	100
	700	275·5	276·7	278·0	278·7	278·9	278·0	275·0	273·0	271·5	271·3	270·0	268·0	266·0	265·0	265·0	267·0	270·0	273·1	700
	500	524·8	526·1	527·6	528·5	528·7	527·6	523·8	521·0	519·0	518·5	517·1	514·8	512·5	511·0	510·7	512·7	516·3	521·0	500
60	300	875·0	876·3	877·8	878·9	879·1	877·1	871·6	868·0	866·2	865·7	864·4	862·3	859·9	857·8	856·1	857·6	862·3	869·4	300
	200	1135·2	1136·4	1137·9	1139·0	1139·4	1137·5	1131·6	1127·7	1125·9	1125·5	1124·6	1123·1	1120·9	1118·8	1116·3	1116·7	1121·7	1129·2	200
	150	1320·8	1321·9	1323·4	1324·7	1325·2	1323·2	1316·9	1312·8	1311·0	1310·7	1309·9	1308·8	1307·0	1305·0	1302·2	1302·3	1307·3	1314·9	150
	100	1581·8	1582·8	1584·3	1585·8	1586·6	1584·5	1577·6	1573·2	1571·4	1571·2	1570·6	1570·2	1569·2	1567·3	1564·0	1563·6	1568·6	1576·3	100

APPENDIX I—*continued*

JULY 1949–53

Pressure level	Pole	85° N 180°W	90°W	0°	90°E
mb.		*geopotential decametres*			
700	291·9	292·7	292·1	292·5	292·5
500	546·8	547·8	545·9	547·8	548·8
300	902·6	904·0	900·5	903·9	907·0
200	1173·4	1174·2	1171·2	1174·2	1177·1
150	1368·7	1368·8	1366·3	1369·0	1371·9
100	1644·5	1643·7	1641·6	1644·2	1647·6

Latitude	Pressure level	180°W	160°W	140°W	120°W	100°W	80°W	60°W	40°W	20°W	0°	20°E	40°E	60°E	80°E	100°E	120°E	140°E	160°E	Pressure level
°*N*	*mb.*									*geopotential decametres*										*mb.*
	700	294·4	294·5	293·8	293·1	292·6	292·8	293·4	294·0	293·9	293·8	293·2	292·8	292·8	293·4	293·5	293·8	293·8	294·1	700
	500	550·3	549·7	548·6	547·2	546·3	546·6	547·8	549·3	549·6	549·5	549·1	549·2	549·7	550·7	551·5	551·9	551·3	550·8	500
80	300	907·4	905·9	904·4	902·2	900·5	900·9	902·8	905·3	906·0	905·9	905·9	906·9	908·9	911·2	912·7	912·9	911·4	909·5	300
	200	1176·1	1175·0	1173·9	1172·4	1171·0	1170·9	1172·2	1174·3	1174·8	1174·8	1174·9	1175·8	1177·9	1180·5	1182·1	1182·3	1180·5	1178·3	200
	150	1369·6	1368·3	1367·4	1366·3	1365·3	1365·3	1366·4	1368·5	1368·9	1369·0	1369·1	1369·8	1371·4	1374·0	1375·6	1376·0	1374·3	1372·0	150
	100	1643·3	1641·9	1641·3	1640·6	1640·0	1639·9	1640·7	1642·7	1643·0	1643·2	1643·8	1644·6	1646·1	1648·6	1650·2	1650·7	1649·0	1646·3	100
	700	295·8	297·3	296·8	294·9	292·9	292·9	294·2	294·7	295·1	295·2	294·8	294·3	294·0	294·3	294·9	295·2	295·0	294·7	700
	500	553·0	554·1	552·8	549·8	546·9	546·8	549·2	550·8	550·9	551·0	551·0	551·6	552·3	553·0	554·3	555·0	553·9	552·7	500
75	300	911·7	912·1	910·4	906·2	901·7	901·2	905·1	907·8	907·7	907·7	908·2	911·0	913·8	916·1	918·6	919·3	916·7	913·4	300
	200	1179·1	1179·0	1178·2	1174·6	1171·0	1170·3	1173·2	1175·3	1175·3	1175·4	1176·0	1178·8	1182·0	1185·0	1188·0	1188·7	1185·6	1181·5	200
	150	1371·3	1370·6	1370·0	1367·2	1364·7	1364·4	1366·5	1368·5	1368·5	1368·7	1369·1	1371·3	1374·1	1377·2	1380·5	1381·6	1378·6	1374·2	150
	100	1643·7	1642·2	1642·1	1640·4	1638·6	1638·3	1639·8	1641·6	1641·7	1642·0	1642·7	1644·7	1647·1	1650·5	1654·1	1655·7	1652·7	1647·7	100
	700	296·8	300·1	300·7	298·6	294·8	292·9	294·0	295·3	295·3	296·3	296·7	297·1	296·5	296·2	296·6	296·5	295·6	295·5	700
	500	554·9	558·6	559·3	556·1	550·0	547·0	549·7	551·8	551·2	552·4	553·5	555·8	556·4	556·1	557·0	557·4	556·4	554·7	500
70	300	915·7	919·1	919·2	914·9	906·4	902·5	906·9	910·3	908·4	909·6	911·1	917·6	920·6	921·8	923·8	924·2	921·9	917·6	300
	200	1182·5	1184·3	1184·9	1181·4	1174·3	1171·1	1173·8	1176·9	1175·9	1176·8	1178·1	1185·0	1188·8	1191·1	1193·5	1194·0	1191·2	1185·8	200
	150	1373·7	1374·2	1375·0	1372·6	1367·1	1364·8	1366·3	1369·2	1368·4	1369·3	1370·4	1376·3	1379·6	1382·1	1385·0	1386·0	1383·4	1377·9	150
	100	1644·7	1643·6	1645·0	1644·5	1640·2	1637·9	1638·2	1640·8	1640·4	1641·7	1642·8	1648·0	1650·9	1653·6	1657·2	1658·8	1656·4	1650·4	100
	700	297·0	302·7	304·9	302·5	297·5	292·7	293·9	296·4	295·7	297·4	299·1	299·3	299·7	298·9	299·0	298·4	297·0	296·0	700
	500	556·1	562·1	564·8	562·0	554·8	548·7	550·9	553·7	552·6	554·7	557·3	559·4	561·4	560·5	560·6	560·9	559·3	556·6	500
65	300	918·6	923·8	926·1	922·3	913·3	905·8	909·4	913·2	911·2	913·4	917·4	923·9	928·3	929·1	930·0	930·3	927·3	922·0	300
	200	1185·6	1188·5	1190·2	1187·4	1180·2	1173·6	1175·8	1179·4	1178·6	1180·3	1184·1	1191·7	1197·7	1199·3	1200·6	1201·1	1197·3	1190·5	200
	150	1376·4	1377·7	1379·1	1377·2	1371·8	1366·3	1367·3	1370·8	1370·4	1372·1	1375·5	1381·9	1387·5	1389·1	1391·2	1392·2	1388·8	1381·9	150
	100	1646·0	1645·3	1647·0	1647·6	1643·2	1637·9	1637·9	1640·6	1641·0	1643·2	1646·4	1652·2	1657·2	1658·9	1661·8	1663·6	1660·5	1652·7	100
	700	297·8	302·2	307·0	305·5	299·9	294·7	295·3	298·9	298·6	300·4	301·5	300·9	302·1	301·9	301·3	300·4	299·3	297·4	700
	500	558·1	562·0	567·1	566·4	559·1	552·3	553·6	557·2	557·3	559·6	561·6	562·8	565·2	565·0	564·6	564·6	563·0	559·3	500
60	300	922·1	924·5	928·8	928·2	920·0	911·2	914·2	918·3	919·3	920·8	924·3	930·3	934·4	935·6	936·2	937·0	933·5	926·9	300
	200	1188·9	1189·8	1193·3	1192·9	1186·0	1178·0	1180·9	1184·5	1186·8	1187·9	1191·3	1199·1	1205·2	1207·2	1208·2	1209·2	1204·2	1195·5	200
	150	1378·7	1378·5	1381·5	1381·6	1375·8	1368·9	1371·1	1374·3	1377·2	1377·9	1381·5	1388·5	1394·6	1396·6	1398·0	1399·5	1394·7	1385·9	150
	100	1646·3	1645·1	1647·6	1649·6	1644·6	1638·1	1639·1	1641·5	1645·8	1646·4	1650·1	1656·7	1662·8	1664·8	1666·8	1669·1	1664·5	1655·5	100

APPENDIX I—*continued*

JULY 1949–53

Latitude	Pressure level	180°W	160°W	140°W	120°W	100°W	80°W	60°W	40°W	20°W	0°	20°E	40°E	60°E	80°E	100°E	120°E	140°E	160°E	Pressure level
°N	mb.										*geopotential decametres*									mb.
55	700	300·0	303·2	308·1	307·5	304·1	299·1	299·2	302·6	303·1	305·3	305·6	303·6	304·6	304·3	303·0	303·1	301·5	299·8	700
	500	561·8	564·2	568·3	568·9	565·5	558·9	559·4	563·4	564·2	566·4	567·6	567·2	569·4	569·0	568·6	569·0	566·7	563·3	500
	300	927·5	929·1	931·4	932·4	929·8	920·6	923·0	928·2	929·2	930·8	933·9	937·6	941·1	941·7	942·6	944·1	939·9	933·3	300
	200	1194·2	1195·6	1196·4	1197·7	1195·0	1186·7	1189·8	1194·9	1196·4	1197·7	1201·3	1207·6	1213·4	1215·0	1216·3	1217·8	1210·6	1201·9	200
	150	1382·2	1383·2	1383·6	1385·5	1382·8	1375·5	1378·0	1382·6	1384·4	1385·4	1389·5	1396·9	1402·9	1404·3	1405·8	1407·6	1400·0	1390·9	150
	100	1647·4	1648·0	1648·0	1650·5	1648·0	1641·2	1643·1	1646·9	1649·8	1650·0	1655·0	1663·8	1670·2	1671·2	1672·8	1674·6	1667·0	1657·9	100
50	700	305·0	307·2	310·7	311·0	310·0	306·0	305·0	308·5	308·5	310·0	309·7	306·5	307·0	306·7	305·7	305·3	304·5	303·5	700
	500	568·7	570·4	573·5	575·3	574·9	569·5	568·7	572·3	571·9	573·5	573·4	571·7	573·8	573·3	573·7	573·8	571·3	568·2	500
	300	937·5	938·6	940·8	943·1	943·7	937·0	937·5	941·4	939·7	941·5	943·1	944·0	948·9	948·1	950·5	951·6	946·6	940·0	300
	200	1205·7	1205·8	1207·8	1209·8	1211·2	1204·5	1205·5	1208·6	1206·7	1207·7	1211·6	1216·9	1223·8	1222·7	1225·6	1227·1	1219·1	1210·2	200
	150	1391·1	1391·0	1393·2	1395·0	1395·8	1389·7	1390·5	1393·0	1391·7	1392·8	1397·4	1404·7	1412·3	1410·8	1413·8	1415·3	1406·2	1396·4	150
	100	1651·0	1651·4	1653·7	1655·3	1654·3	1648·8	1650·0	1651·5	1652·6	1653·5	1658·1	1667·0	1675·5	1673·4	1676·8	1678·3	1668·8	1657·8	100
45	700	310·8	312·0	314·7	314·8	315·0	313·0	313·0	315·0	314·0	313·7	312·3	308·3	310·2	308·8	307·5	307·5	307·2	308·2	700
	500	575·9	576·8	579·7	582·6	583·8	580·0	579·2	581·0	579·5	579·5	577·3	575·6	579·3	577·6	577·3	577·8	575·7	574·6	500
	300	947·2	947·2	950·2	954·9	957·6	952·5	951·7	953·1	949·9	949·8	949·1	952·2	959·0	955·9	956·9	958·1	953·1	948·9	300
	200	1216·4	1214·7	1217·7	1223·3	1227·8	1222·5	1221·7	1220·6	1217·4	1218·2	1220·0	1228·3	1237·0	1232·9	1233·7	1234·8	1227·2	1220·3	200
	150	1399·4	1398·1	1400·9	1406·3	1410·1	1405·3	1403·8	1402·5	1400·6	1401·9	1404·7	1415·5	1424·8	1420·3	1421·0	1421·7	1412·4	1404·0	150
	100	1653·8	1653·2	1656·1	1660·7	1661·5	1658·2	1657·1	1656·7	1656·4	1657·7	1660·4	1672·9	1682·7	1677·9	1679·1	1680·1	1669·9	1659·4	100
40	700	315·2	316·0	317·0	317·0	317·5	317·6	317·7	319·5	317·5	317·5	314·0	310·0	311·0	309·8	308·0	308·5	310·5	312·7	700
	500	581·7	582·3	583·8	587·8	589·0	586·6	585·5	586·3	584·4	585·5	582·0	579·6	582·8	580·7	579·3	580·1	580·7	581·0	500
	300	954·5	954·4	956·1	963·3	966·6	962·9	960·3	959·5	956·5	958·3	956·3	960·8	967·1	963·0	961·7	962·7	961·1	958·2	300
	200	1223·7	1222·4	1224·1	1234·3	1238·6	1234·2	1230·0	1226·9	1224·7	1228·3	1229·2	1238·8	1247·7	1242·2	1240·2	1240·8	1237·4	1230·3	200
	150	1405·0	1404·5	1406·0	1415·6	1419·4	1414·8	1410·0	1407·7	1407·0	1411·3	1413·2	1425·3	1434·7	1428·8	1426·7	1426·7	1421·4	1412·2	150
	100	1654·8	1656·3	1657·6	1663·7	1665·0	1661·8	1659·0	1659·2	1660·0	1662·4	1664·1	1677·2	1687·2	1681·6	1680·3	1680·1	1672·7	1661·4	100
30	700	318·7	318·2	318·5	317·5	319·0	321·2	322·7	322·7	320·5	321·0	316·6	312·6	311·0	308·0	308·0	311·7	315·2	318·0	700
	500	587·7	587·2	587·8	588·9	591·4	591·5	591·6	591·6	590·7	592·0	588·6	586·8	587·0	583·2	581·7	584·4	587·0	588·6	500
	300	963·2	962·3	963·1	967·2	972·2	969·8	968·1	966·4	965·7	968·8	970·6	973·2	974·7	970·4	968·6	969·3	970·0	968·4	300
	200	1232·2	1231·1	1232·8	1239·3	1245·3	1241·3	1238·4	1236·3	1236·2	1242·3	1248·5	1253·3	1256·3	1251·5	1249·5	1247·9	1246·7	1240·9	200
	150	1410·8	1410·9	1412·7	1418·9	1424·1	1419·4	1416·9	1416·5	1417·0	1424·7	1432·1	1437·1	1441·2	1436·5	1434·3	1431·3	1428·2	1420·3	150
	100	1652·4	1655·4	1656·6	1659·9	1664·6	1661·6	1661·4	1662·5	1663·0	1669·6	1675·2	1677·9	1684·9	1682·4	1680·4	1675·1	1669·7	1660·8	100
20	700	317·0	317·0	317·3	316·8	317·0	320·0	321·0	320·2	319·0	318·0	316·2	313·7	311·8	309·7	310·2	313·7	315·2	316·2	700
	500	587·8	587·9	588·0	587·6	588·7	590·4	591·0	590·4	589·9	590·1	589·2	587·5	585·7	584·1	583·9	586·2	586·8	586·7	500
	300	966·3	965·7	865·4	966·3	969·0	969·0	968·8	967·8	967·7	969·6	971·8	970·5	970·6	970·4	968·7	969·4	968·6	966·4	300
	200	1236·8	1236·2	1236·0	1238·1	1241·6	1240·4	1239·8	1239·6	1240·4	1244·2	1247·9	1247·3	1249·9	1250·3	1246·4	1245·3	1242·6	1237·6	200
	150	1414·4	1415·0	1414·5	1416·5	1419·8	1418·1	1417·8	1418·9	1420·5	1425·5	1429·4	1428·6	1433·1	1434·0	1428·5	1425·6	1421·7	1415·6	150
	100	1652·1	1655·8	1652·9	1653·5	1657·5	1657·8	1658·3	1660·2	1661·0	1666·5	1668·1	1665·5	1672·8	1676·0	1668·8	1663·8	1659·0	1652·6	100
10	700	314·8	315·0	315·5	315·0	315·0	316·2	317·5	317·3	317·2	317·0	316·0	314·5	313·3	313·3	314·0	315·2	314·7	314·6	700
	500	586·5	586·6	586·8	585·8	586·1	587·0	588·0	587·7	587·7	588·0	587·7	586·6	585·4	585·6	586·4	587·1	586·1	586·1	500
	300	967·4	966·6	966·1	965·1	965·6	966·3	967·1	966·6	966·6	967·7	967·5	966·5	966·7	968·4	968·3	968·8	967·3	966·7	300
	200	1239·6	1238·6	1237·9	1237·1	1237·8	1238·0	1238·9	1239·1	1239·7	1241·6	1241·2	1239·7	1242·3	1244·9	1242·9	1242·6	1240·1	1239·1	200
	150	1416·9	1416·5	1415·8	1415·0	1415·7	1415·7	1417·0	1418·1	1419·3	1421·7	1420·8	1418·9	1423·3	1426·4	1422·0	1420·4	1417·8	1416·6	150
	100	1651·4	1652·8	1651·2	1650·3	1652·0	1653·1	1654·9	1656·7	1658·0	1659·7	1657·1	1654·0	1661·3	1665·8	1658·7	1655·8	1651·4	1650·4	100

APPENDIX I—*continued*

JULY 1949–53

Lati-tude	Pressure level	180°W	160°W	140°W	120°W	100°W	80°W	60°W	40°W	20°W	0°	20°E	40°E	60°E	80°E	100°E	120°E	140°E	160°E	Pressure level
°S	*mb.*								*geopotential decametres*											*mb.*
	700	314·0	314·0	314·5	314·5	314·5	315·0	316·2	316·7	316·8	316·5	316·0	316·0	315·5	315·5	315·5	315·2	314·9	315·2	700
	500	586·3	585·9	585·8	585·1	584·8	585·0	585·6	586·2	586·8	586·7	586·2	586·2	585·9	586·3	586·9	586·7	586·5	587·3	500
0	300	967·6	967·0	966·0	964·7	964·1	963·8	964·5	965·5	966·2	966·1	965·3	965·1	965·7	967·4	968·0	968·0	967·8	968·4	300
	200	1240·3	1239·7	1238·5	1236·8	1236·1	1235·6	1236·5	1238·0	1238·9	1238·8	1237·8	1236·8	1239·1	1242·0	1241·9	1241·7	1241·0	1241·4	200
	150	1417·9	1417·5	1416·5	1414·8	1414·1	1413·4	1414·7	1416·8	1418·1	1418·2	1417·1	1415·3	1418·9	1422·5	1421·0	1419·5	1418·7	1419·0	150
	100	1650·6	1651·7	1651·3	1649·9	1650·0	1649·8	1651·7	1654·6	1656·2	1656·1	1654·5	1652·4	1656·8	1661·9	1658·0	1653·8	1649·9	1650·6	100
	700	314·5	315·0	316·0	316·0	315·5	314·5	315·2	316·0	316·0	316·0	316·3	316·5	316·5	316·4	315·5	315·0	314·5	315·3	700
	500	585·6	586·1	586·7	586·1	584·3	582·8	583·4	584·5	584·7	584·8	585·0	585·1	585·3	585·4	585·8	586·1	585·7	586·5	500
10	300	966·4	966·5	966·5	965·2	962·6	960·6	961·2	963·2	963·4	963·5	963·5	963·6	964·0	965·0	966·6	967·3	966·9	967·3	300
	200	1239·1	1239·3	1239·2	1237·4	1234·4	1232·1	1232·7	1235·4	1235·6	1235·8	1235·7	1235·6	1236·9	1238·9	1241·1	1241·4	1240·8	1240·6	200
	150	1417·1	1417·5	1417·8	1415·9	1412·7	1410·6	1411·3	1414·5	1414·8	1415·4	1415·4	1415·4	1417·3	1420·0	1421·5	1420·6	1419·3	1418·8	150
	100	1651·0	1652·5	1654·3	1652·6	1649·5	1648·1	1649·3	1653·0	1653·6	1654·7	1654·9	1655·5	1657·4	1660·8	1660·9	1657·1	1653·6	1652·3	100
	700	314·0	315·0	315·2	315·3	315·3	314·5	314·5	315·2	315·4	315·5	315·3	316·2	316·5	315·7	315·0	313·3	312·3	313·0	700
	500	582·7	583·6	583·3	582·4	581·9	580·6	580·4	582·1	582·6	582·8	582·7	583·3	583·6	583·2	582·9	581·9	580·1	581·1	500
20	300	959·9	961·0	960·5	958·8	957·6	955·0	954·6	957·4	959·4	960·1	960·2	960·8	960·9	960·6	960·9	960·8	958·0	958·3	300
	200	1231·4	1233·0	1233·0	1230·9	1228·9	1225·9	1225·5	1228·9	1231·4	1232·6	1233·2	1233·8	1233·6	1233·8	1234·9	1234·8	1230·8	1230·5	200
	150	1410·4	1412·3	1412·8	1410·6	1408·3	1405·3	1405·3	1409·1	1411·9	1413·6	1414·7	1415·7	1415·9	1416·3	1417·1	1415·5	1410·5	1409·7	150
	100	1649·2	1651·7	1653·6	1651·1	1648·3	1645·7	1646·6	1650·9	1654·6	1657·8	1659·3	1660·3	1661·0	1661·5	1660·9	1656·1	1649·0	1648·2	100
	700	308·3	308·7	308·7	309·8	310·5	311·0	310·0	310·3	312·0	314·0	313·2	315·0	315·2	312·0	310·2	308·3	308·6	308·5	700
	500.	569·1	569·8	569·5	570·8	571·4	571·9	571·4	572·6	574·6	576·8	576·2	577·6	577·5	574·0	571·9	568·3	567·5	567·8	500
30	300	936·4	937·1	936·9	938·2	938·3	938·6	938·3	940·8	943·7	946·1	945·7	946·5	945·9	942·2	939·9	932·8	932·1	932·6	300
	200	1204·9	1206·3	1206·1	1207·2	1206·9	1207·1	1206·9	1210·0	1213·3	1215·8	1215·5	1216·2	1215·8	1212·2	1210·4	1202·5	1200·5	1200·8	200
	150	1386·6	1387·8	1387·6	1388·6	1388·0	1388·5	1388·3	1391·6	1395·2	1398·2	1398·7	1399·4	1399·4	1396·0	1394·4	1385·3	1383·9	1383·8	150
	100	1635·7	1635·9	1635·9	1636·5	1635·1	1635·9	1635·4	1639·0	1643·5	1647·8	1649·8	1650·7	1651·2	1647·7	1645·8	1634·0	1633·8	1634·5	100
	700	301·5	300·0	300·0	300·0	301·3	302·4	302·2	301·9	302·5	304·0	305·5	305·5	305·0	303·5	302·0	300·7	301·7	302·2	700
	500	555·2	554·1	554·6	554·9	556·6	558·2	558·3	558·4	559·5	561·2	562·2	562·2	561·6	559·2	556·5	554·6	555·4	555·8	500
40	300	908·0	908·0	910·1	911·7	914·5	916·7	917·1	917·6	919·6	921·3	922·3	922·3	921·4	918·0	913·4	909·5	908·9	909·0	300
	200	1167·8	1168·5	1172·1	1174·6	1178·5	1181·1	1181·7	1182·4	1184·4	1185·9	1186·4	1186·4	1185·1	1181·9	1176·9	1171·7	1169·9	1169·3	200
	150	1351·6	1351·7	1355·3	1358·0	1361·9	1364·8	1365·4	1366·0	1368·1	1369·7	1370·2	1370·2	1369·1	1366·4	1361·7	1356·3	1354·5	1353·7	150
	100	1610·1	1608·6	1611·3	1614·3	1617·6	1620·8	1621·4	1621·9	1624·3	1626·6	1627·7	1628·1	1627·2	1625·7	1621·4	1615·8	1614·2	1613·0	100
	700	297·5	295·5	295·0	295·0	295·3	296·2	294·2	292·5	293·5	295·8	297·3	297·0	297·0	295·5	295·0	295·0	297·0	298·0	700
	500	549·7	547·9	547·4	547·5	547·8	548·9	547·1	545·4	546·6	549·3	551·0	550·5	549·9	547·5	546·2	546·2	548·7	550·0	500
45	300	899·9	898·7	899·4	900·2	901·3	902·5	901·1	899·7	901·3	904·1	905·9	905·4	904·2	900·5	898·0	897·0	899·3	900·4	300
	200	1157·1	1156·6	1158·5	1160·7	1162·7	1164·5	1163·3	1161·7	1162·8	1165·8	1167·1	1166·2	1164·2	1160·2	1157·3	1155·7	1157·1	1157·7	200
	150	1340·3	1339·7	1341·7	1344·1	1346·6	1348·6	1247·4	1345·5	1346·3	1349·2	1350·3	1349·4	1347·4	1343·6	1341·1	1339·6	1340·7	1341·2	150
	100	1599·4	1598·3	1599·7	1602·1	1605·3	1607·3	1605·8	1603·4	1604·1	1607·5	1608·8	1607·9	1605·9	1602·3	1600·3	1599·4	1600·4	1601·0	100
	700	291·8	290·0	288·5	288·5	288·8	288·5	285·5	282·8	283·5	285·0	287·2	286·8	285·0	283·0	283·5	285·7	290·0	292·0	700
	500	542·8	541·0	539·3	539·0	539·0	538·5	535·5	532·6	533·3	535·1	537·5	536·8	534·2	531·1	531·3	533·7	539·4	542·7	500
50	300	891·1	889·3	888·9	888·8	889·0	888·3	885·3	882·4	883·1	884·9	887·3	886·3	882·2	878·1	878·1	880·6	887·3	891·3	300
	200	1147·1	1145·5	1145·9	1146·5	1147·5	1147·8	1145·0	1141·8	1141·8	1143·1	1145·0	1143·9	1138·9	1133·6	1134·1	1136·4	1143·1	1147·2	200
	150	1329·6	1327·8	1328·3	1329·2	1330·6	1331·0	1328·1	1324·6	1324·2	1325·3	1327·1	1325·8	1320·8	1315·5	1316·2	1318·5	1325·4	1329·7	150
	100	1588·3	1586·1	1586·2	1586·9	1588·6	1589·1	1586·1	1582·3	1581·4	1582·2	1584·0	1582·5	1577·5	1572·1	1573·5	1576·2	1583·5	1588·4	100

APPENDIX I—*continued*

JULY 1949–53

Latitude	Pressure level	180°W	160°W	140°W	120°W	100°W	80°W	60°W	40°W	20°W	0°	20°E	40°E	60°E	80°E	100°E	120°E	140°E	160°E	Pressure level
°S	mb.										*geopotential decametres*									mb.
	700	282·0	281·3	281·1	280·7	280·0	280·2	277·5	275·0	274·7	275·3	275·0	272·8	269·0	266·0	268·0	272·2	277·7	281·2	700
	500	531·2	530·5	529·9	529·1	527·8	527·6	524·5	522·0	521·5	522·1	521·7	519·0	514·3	510·0	512·0	517·1	524·2	530·0	500
55	300	878·1	877·4	876·8	875·8	874·0	873·4	869·9	867·3	866·7	867·0	866·7	863·4	856·9	851·4	854·0	860·1	868·7	876·0	300
	200	1132·8	1132·2	1131·6	1130·7	1129·3	1128·9	1125·4	1122·5	1121·4	1121·7	1121·3	1117·5	1109·9	1103·9	1106·6	1113·2	1122·5	1130·6	200
	150	1314·1	1313·6	1313·1	1312·0	1310·3	1309·7	1306·0	1302·5	1301·4	1301·7	1301·1	1297·1	1289·3	1283·5	1286·4	1293·4	1303·3	1311·9	150
	100	1570·8	1570·2	1569·4	1567·7	1565·3	1564·5	1560·5	1556·2	1555·0	1555·3	1554·6	1550·2	1542·2	1536·8	1540·5	1548·1	1559·0	1568·6	100
	700	273·0	273·0	273·0	273·5	273·0	272·8	270·3	267·5	266·8	266·5	266·1	264·2	259·5	257·6	259·5	262·2	266·8	270·5	700
	500	519·6	519·8	519·2	519·5	518·6	517·7	514·9	512·0	511·1	510·6	509·8	507·3	501·0	497·7	499·2	502·9	509·5	515·6	500
60	300	864·0	864·2	863·1	863·2	861·6	860·0	856·6	853·3	852·2	851·3	850·0	846·9	839·4	835·1	836·2	841·3	850·2	858·6	300
	200	1117·5	1117·7	1116·5	1116·3	1114·3	1112·0	1108·4	1104·3	1103·1	1102·1	1100·8	1097·7	1089·7	1085·0	1086·3	1092·1	1102·4	1111·9	200
	150	1297·5	1297·7	1296·3	1295·5	1292·9	1289·6	1285·4	1281·1	1280·1	1279·3	1277·9	1275·0	1266·9	1262·1	1263·8	1270·3	1281·5	1291·7	150
	100	1551·8	1552·0	1549·9	1548·1	1544·7	1539·8	1534·6	1530·1	1529·2	1528·4	1526·9	1524·2	1516·3	1511·6	1513·9	1521·7	1534·5	1545·8	100

APPENDIX I—*continued*

OCTOBER 1949–53

Pressure level	Pole	85° N 180°W	85° N 90°W	85° N 0°	85° N 90°E
mb.		*geopotential decametres*			
700	276·7	277·4	276·8	277·3	276·4
500	518·4	519·4	518·0	520·2	518·5
300	859·5	859·8	857·5	862·5	860·6
200	1119·1	1119·2	1117·4	1121·7	1120·7
150	1305·3	1305·2	1304·2	1307·7	1306·7
100	1566·1	1565·9	1565·7	1568·7	1567·7

Latitude	Pressure level	180°W	160°W	140°W	120°W	100°W	80°W	60°W	40°W	20°W	0°	20°E	40°E	60°E	80°E	100°E	120°E	140°E	160°E	Pressure level
°N	*mb.*									*geopotential decametres*										*mb.*
	700	279·6	280·0	279·6	278·6	276·9	275·9	276·6	278·1	278·8	279·3	279·7	279·2	277·9	276·3	275·8	276·3	277·4	278·5	700
	500	522·4	522·8	521·9	520·2	517·7	516·3	518·3	521·4	523·6	524·5	524·9	524·1	522·1	519·9	518·6	518·6	519·6	521·1	500
80	300	863·6	863·4	861·9	859·8	856·6	854·7	857·9	863·1	866·9	868·8	869·4	868·4	866·5	863·6	861·5	860·8	861·3	862·8	300
	200	1123·1	1121·9	1120·7	1119·3	1117·1	1115·4	1118·5	1123·0	1126·1	1127·7	1128·0	1127·6	1126·5	1124·1	1122·5	1121·9	1122·3	1123·2	200
	150	1308·7	1307·7	1306·9	1306·3	1304·4	1302·8	1305·6	1309·5	1312·2	1313·3	1313·1	1312·8	1312·0	1309·9	1308·6	1308·0	1308·3	1309·0	150
	100	1569·3	1568·6	1568·2	1568·1	1566·6	1565·1	1567·7	1571·4	1573·8	1574·3	1573·5	1573·4	1573·2	1571·4	1570·5	1569·9	1570·1	1570·1	100
	700	281·7	282·5	282·2	280·3	277·5	275·7	276·6	279·4	281·6	283·1	284·6	283·7	281·2	278·5	277·3	277·2	278·6	280·3	700
	500	526·5	527·4	526·7	523·6	519·2	515·4	518·4	524·2	529·0	531·7	532·6	531·1	527·6	523·2	520·9	520·1	521·6	524·1	500
75	300	868·9	869·5	868·8	865·2	859·8	854·3	859·0	867·5	874·9	879·1	879·2	878·1	874·3	868·6	864·6	863·2	864·5	867·1	300
	200	1128·5	1127·6	1127·4	1125·1	1121·4	1116·4	1120·2	1127·8	1134·9	1138·1	1137·7	1137·0	1134·4	1129·6	1125·9	1124·8	1126·3	1128·3	200
	150	1314·1	1312·7	1313·1	1311·9	1309·1	1304·6	1307·5	1314·2	1320·6	1322·8	1322·0	1321·8	1320·0	1315·6	1312·1	1311·1	1312·5	1314·2	150
	100	1575·1	1573·7	1574·4	1574·1	1572·3	1568·2	1570·4	1576·5	1582·0	1583·2	1581·5	1582·1	1581·5	1577·8	1574·7	1573·9	1574·8	1575·7	100
	700	282·8	283·8	284·7	283·8	279·7	276·5	276·8	280·7	283·4	286·8	290·5	289·4	285·5	281·9	280·3	280·4	280·6	282·0	700
	500	529·2	530·7	532·0	530·1	523·4	518·1	520·1	527·3	532·8	538·0	541·3	539·7	533·6	527·6	524·7	524·3	525·0	527·6	500
70	300	873·1	875·0	877·2	875·5	866·6	858·7	862·9	872·6	881·6	888·1	890·3	890·4	883·0	874·0	869·2	868·3	869·3	872·2	300
	200	1132·9	1133·8	1136·4	1135·9	1128·7	1122·0	1124·5	1133·3	1142·4	1147·8	1149·2	1149·2	1143·0	1135·1	1130·7	1130·2	1131·9	1134·2	200
	150	1319·0	1319·2	1321·6	1322·2	1316·4	1310·7	1312·0	1319·8	1328·1	1332·2	1332·7	1334·0	1328·8	1321·2	1317·0	1316·7	1318·4	1320·6	150
	100	1581·1	1581·6	1583·5	1584·4	1580·2	1575·1	1575·4	1582·3	1589·4	1591·9	1590·7	1594·2	1590·7	1583·7	1580·0	1579·9	1581·1	1582·8	100
	700	282·8	283·2	287·0	288·1	284·0	278·7	278·2	280·3	282·7	290·8	295·7	294·4	289·9	285·9	284·6	284·5	283·5	283·2	700
	500	530·3	531·0	536·3	537·1	530·1	523·0	523·5	528·5	534·0	544·3	549·1	547·1	539·9	533·2	530·8	530·3	529·7	530·5	500
65	300	875·6	876·5	883·7	886·1	876·6	866·7	869·3	876·2	886·2	897·6	902·0	901·2	891·6	881·4	877·0	876·1	876·0	876·9	300
	200	1135·8	1137·1	1143·8	1146·9	1138·7	1129·6	1131·5	1138·0	1148·5	1158·2	1161·6	1160·4	1151·7	1142·4	1138·5	1138·2	1139·2	1139·0	200
	150	1322·7	1323·9	1329·7	1332·6	1325·9	1317·6	1318·7	1325·0	1334·6	1342·2	1344·4	1344·9	1337·3	1328·5	1324·7	1324·7	1326·0	1325·9	150
	100	1586·0	1587·8	1592·6	1594·4	1589·4	1581·7	1582·3	1588·5	1596·5	1601·7	1601·9	1604·7	1599·1	1591·1	1587·7	1588·0	1589·3	1589·0	100
	700	283·2	282·7	288·8	292·6	288·8	283·2	282·1	280·7	284·9	296·3	299·6	298·4	293·8	291·2	290·5	289·4	286·4	284·7	700
	500	532·1	531·2	539·5	544·5	538·2	530·2	530·3	530·6	538·8	552·2	555·3	553·0	545·3	540·4	539·0	537·1	534·4	533·5	500
60	300	880·0	878·2	889·0	897·0	889·1	877·1	879·8	881·7	894·4	909·2	911·9	909·7	899·1	890·5	887·8	885·1	883·3	882·6	300
	200	1140·9	1140·8	1150·7	1158·5	1151·1	1139·6	1142·8	1144·9	1158·2	1171·2	1172·2	1169·7	1159·4	1151·3	1149·2	1147·0	1145·5	1144·3	200
	150	1328·6	1328·4	1337·1	1343·6	1337·8	1326·5	1329·6	1332·1	1344·5	1354·6	1354·7	1353·7	1344·6	1337·1	1335·1	1333·2	1332·3	1331·6	150
	100	1593·0	1593·2	1600·3	1604·6	1600·4	1589·7	1592·7	1595·2	1606·0	1613·1	1611·7	1612·9	1605·9	1599·2	1597·4	1596·1	1595·7	1595·5	100

APPENDIX I—*continued*

OCTOBER 1949–53

Latitude	Pressure level	180°W	160°W	140°W	120°W	100°W	80°W	60°W	40°W	20°W	0°	20°E	40°E	60°E	80°E	100°E	120°E	140°E	160°E	Pressure level
°N	mb.									*geopotential decametres*										mb.
	700	285·0	284·0	291·8	297·9	294·3	288·9	287·9	287·2	292·0	300·7	303·0	301·2	297·8	296·8	296·8	294·3	289·8	287·4	700
	500	535·7	534·4	544·5	552·5	548·4	539·5	539·6	540·9	548·8	558·9	560·7	557·3	551·3	548·6	547·6	544·2	539·8	537·8	500
55	300	886·6	885·0	898·4	908·7	904·4	890·6	893·9	896·8	907·4	918·5	920·5	916·3	908·0	902·3	898·8	895·1	891·2	889·2	300
	200	1148·8	1149·7	1161·8	1170·5	1166·8	1152·8	1157·2	1161·2	1171·6	1181·3	1181·8	1176·9	1168·7	1162·9	1159·9	1156·6	1152·9	1151·0	200
	150	1337·3	1338·4	1347·8	1353·9	1352·2	1338·8	1343·1	1347·3	1356·4	1363·9	1363·7	1360·2	1353·5	1348·2	1345·5	1342·5	1339·4	1338·4	150
	100	1602·5	1603·8	1610·0	1612·6	1613·2	1600·5	1605·2	1608·2	1615·4	1620·7	1619·8	1618·3	1614·3	1609·5	1607·1	1604·6	1602·6	1602·3	100
	700	292·0	291·2	296·2	304·0	301·0	297·5	296·3	296·8	299·0	304·0	305·3	304·0	302·5	302·2	302·2	298·8	294·7	292·5	700
	500	545·1	545·9	552·5	561·9	558·7	552·2	551·8	554·7	558·0	562·8	564·0	561·5	558·5	557·2	555·7	550·9	546·6	544·9	500
50	300	901·4	903·8	912·3	922·8	918·8	910·0	911·4	916·9	920·4	924·3	924·9	921·9	917·7	914·6	910·8	905·0	901·0	899·9	300
	200	1165·6	1169·3	1176·8	1185·1	1181·2	1173·0	1175·7	1182·1	1184·7	1186·9	1186·4	1183·4	1180·0	1176·9	1172·8	1167·0	1163·4	1163·6	200
	150	1351·7	1355·1	1361·2	1367·3	1364·4	1357·2	1360·0	1365·6	1367·4	1368·5	1367·9	1365·5	1363·6	1361·5	1357·5	1351·8	1348·8	1349·3	150
	100	1613·2	1615·5	1620·0	1622·9	1621·4	1615·7	1618·5	1621·9	1623·1	1623·4	1623·4	1621·2	1621·4	1620·6	1617·3	1612·1	1609·9	1610·6	100
	700	300·0	299·0	302·6	308·0	307·0	305·0	304·6	305·5	305·7	307·5	307·5	306·5	306·7	307·3	306·2	303·0	300·0	300·3	700
	500	558·3	557·8	562·5	569·8	568·2	564·5	565·0	567·5	567·0	567·7	567·7	566·4	565·8	565·9	563·3	558·2	554·5	556·7	500
45	300	921·7	922·0	926·7	934·7	932·3	928·2	930·7	933·9	932·2	930·8	930·3	928·8	928·9	927·6	923·0	916·4	912·7	917·8	300
	200	1187·7	1188·3	1191·9	1198·4	1195·8	1192·8	1196·2	1199·5	1196·0	1193·2	1191·9	1191·0	1192·9	1192·1	1187·5	1180·9	1177·2	1183·6	200
	150	1370·9	1371·5	1374·4	1379·9	1377·4	1375·3	1378·4	1380·6	1376·2	1373·4	1372·8	1372·1	1375·6	1375·8	1371·7	1365·1	1361·7	1367·4	150
	100	1624·6	1625·9	1628·7	1632·4	1630·5	1629·8	1631·4	1631·9	1627·6	1625·9	1627·0	1625·8	1630·1	1631·5	1628·3	1622·6	1619·7	1623·6	100
	700	307·2	306·3	309·0	311·7	311·5	311·1	311·2	313·0	310·8	310·4	309·2	309·8	310·5	311·0	309·5	306·8	305·2	308·0	700
	500	570·0	568·7	571·7	575·9	575·8	574·2	575·5	577·4	573·8	572·2	571·3	572·0	572·5	572·8	570·1	566·4	564·6	569·4	500
40	300	938·9	937·1	939·4	943·5	943·0	941·6	945·5	947·2	941·0	936·9	936·2	937·1	939·0	938·5	935·1	931·3	930·3	938·0	300
	200	1206·3	1204·0	1205·4	1208·6	1207·7	1207·3	1212·3	1213·4	1204·9	1199·5	1198·6	1200·5	1204·7	1205·5	1202·5	1199·0	1198·8	1206·6	200
	150	1387·4	1385·2	1386·2	1389·4	1388·4	1388·6	1392·3	1391·7	1383·7	1378·9	1378·5	1381·0	1386·4	1388·5	1385·9	1382·6	1382·3	1388·7	150
	100	1634·2	1633·9	1635·3	1638·6	1637·6	1638·8	1639·8	1637·8	1631·0	1629·3	1631·0	1633·1	1637·0	1640·5	1638·3	1635·3	1635·4	1638·2	100
	700	316·7	315·6	315·5	316·0	316·2	315·8	317·0	317·4	315·3	314·5	315·4	316·0	315·8	314·7	315·2	312·5	315·5	317·1	700
	500	585·9	583·1	583·0	584·0	584·9	583·7	585·5	585·6	582·0	579·9	581·7	583·7	583·5	582·4	583·7	580·1	584·6	586·2	500
30	300	962·1	956·6	955·6	956·9	959·3	959·1	961·6	960·8	954·1	950·4	952·7	956·1	957·8	957·8	960·2	957·5	962·3	963·9	300
	200	1232·3	1225·1	1223·6	1225·3	1229·2	1229·4	1231·3	1229·4	1221·6	1217·9	1219·7	1224·6	1228·5	1230·4	1233·4	1231·7	1235·1	1235·7	200
	150	1410·8	1403·8	1402·4	1404·5	1408·7	1408·4	1408·9	1406·7	1399·7	1397·2	1399·4	1404·5	1408·7	1411·9	1415·5	1414·6	1416·0	1415·1	150
	100	1650·7	1645·7	1644·9	1647·0	1651·2	1650·3	1648·7	1647·0	1642·4	1643·0	1646·2	1649·1	1650·6	1654·1	1658·5	1657·6	1657·6	1655·3	100
	700	316·7	315·4	314·9	315·4	315·7	316·4	317·2	317·3	315·8	316·3	317·0	316·7	316·3	314·3	314·6	315·6	316·4	316·3	700
	500	587·5	585·7	584·7	585·6	586·6	587·4	587·7	587·0	584·5	585·1	587·1	587·2	587·4	585·8	585·8	586·8	587·3	587·0	500
20	300	966·0	962·7	961·1	963·0	966·8	967·7	966·5	965·1	961·4	962·0	965·2	966·6	968·5	968·7	967·6	967·9	967·5	966·6	300
	200	1237·3	1232·9	1231·1	1234·1	1238·8	1240·3	1237·9	1236·1	1232·7	1233·8	1237·7	1239·1	1242·3	1244·7	1242·9	1242·0	1240·7	1239·1	200
	150	1414·6	1410·9	1409·3	1412·7	1416·8	1418·5	1415·7	1413·9	1411·7	1413·3	1417·2	1418·3	1421·9	1425·5	1423·4	1422·2	1419·5	1417·1	150
	100	1650·5	1649·6	1648·3	1651·0	1653·4	1655·1	1653·0	1651·9	1651·6	1654·1	1657·9	1657·2	1659·2	1663·3	1661·4	1659·2	1655·4	1652·7	100
	700	314·0	313·8	313·7	313·9	314·3	314·7	315·7	317·1	316·4	316·6	317·0	316·2	315·6	314·6	314·5	315·8	314·6	314·0	700
	500	585·4	584·7	584·4	584·6	584·8	585·5	586·3	587·4	586·5	587·0	587·9	586·8	586·3	586·1	586·1	587·5	586·3	585·0	500
10	300	965·7	964·7	963·9	964·3	964·7	965·4	966·0	966·9	965·4	967·1	968·3	967·7	967·6	968·5	967·5	969·3	968·4	965·9	300
	200	1237·9	1236·9	1236·2	1237·1	1237·6	1238·3	1238·5	1239·3	1238·1	1240·5	1242·4	1241·2	1241·9	1244·0	1241·9	1243·1	1242·2	1239·1	200
	150	1415·1	1414·6	1414·5	1415·6	1415·9	1416·6	1416·7	1417·5	1417·1	1419·8	1421·9	1420·3	1421·3	1423·7	1421·1	1421·7	1420·4	1416·8	150
	100	1649·2	1650·6	1651·3	1652·3	1652·6	1653·3	1653·4	1654·5	1654·9	1657·6	1659·6	1656·6	1657·2	1659·9	1656·7	1656·5	1655·0	1651·2	100

APPENDIX I—*continued*

OCTOBER 1949–53

Latitude	Pressure level	180°W	160°W	140°W	120°W	100°W	80°W	60°W	40°W	20°W	0°	20°E	40°E	60°E	80°E	100°E	120°E	140°E	160°E	Pressure level
°S	*mb.*									*geopotential decametres*										*mb.*
	700	313·0	313·0	313·0	313·5	313·7	313·9	315·0	316·7	316·6	316·3	316·5	316·0	315·5	314·7	314·8	315·4	313·6	313·0	700
	500	584·9	584·6	584·4	584·4	584·2	584·4	585·7	587·6	587·0	586·8	587·3	585·9	585·3	585·0	586·1	587·3	585·5	583·7	500
0	300	967·1	966·4	965·6	965·4	965·0	964·8	966·5	968·3	966·9	967·2	968·7	966·4	965·3	965·5	967·0	969·8	968·0	965·1	300
	200	1240·6	1239·7	1239·1	1239·1	1238·7	1238·5	1239·8	1241·5	1240·2	1240·8	1242·9	1239·9	1239·0	1239·5	1240·9	1244·3	1242·2	1238·8	200
	150	1418·6	1417·6	1417·4	1417·6	1417·2	1417·0	1418·2	1420·0	1419·0	1420·0	1422·4	1419·1	1418·1	1418·5	1419·7	1422·9	1420·7	1416·9	150
	100	1652·8	1652·3	1653·8	1654·0	1653·6	1653·4	1655·0	1656·6	1656·2	1657·0	1658·4	1655·0	1653·9	1654·4	1654·6	1657·6	1655·4	1651·6	100
	700	314·0	314·0	314·0	314·0	314·0	313·9	314·6	316·2	316·3	316·1	316·5	316·6	315·5	314·9	314·8	315·2	313·7	313·6	700
	500	585·0	585·1	584·9	584·5	584·3	584·2	585·3	586·9	586·4	586·2	587·0	586·1	584·4	584·4	585·3	586·5	584·9	584·3	500
10	300	966·0	965·9	965·5	964·9	964·5	964·3	965·8	967·2	965·5	965·2	966·6	965·3	963·1	963·5	965·3	968·2	966·6	965·2	300
	200	1239·5	1239·3	1239·0	1238·4	1237·8	1237·5	1239·0	1240·1	1238·2	1238·0	1240·0	1238·6	1236·3	1236·9	1239·1	1242·5	1240·8	1238·9	200
	150	1418·3	1418·0	1417·8	1417·2	1416·6	1416·3	1417·7	1418·8	1417·0	1417·0	1419·4	1418·2	1415·7	1416·1	1418·3	1421·7	1419·9	1417·9	150
	100	1654·0	1654·2	1654·7	1654·1	1653·8	1653·7	1655·0	1655·8	1654·1	1654·0	1656·6	1655·9	1652·9	1652·7	1653·9	1657·0	1655·4	1653·5	100
	700	314·0	314·0	313·9	313·8	313·7	314·0	314·0	315·2	315·3	315·3	317·0	316·7	315·4	314·6	313·7	314·2	313·7	313·5	700
	500	582·8	582·6	582·4	582·0	581·9	582·2	583·0	584·0	583·7	583·8	587·1	585·7	583·4	582·5	582·4	583·8	582·7	582·3	500
20	300	959·3	959·1	958·9	958·2	958·2	958·6	960·8	960·9	960·1	961·2	965·2	963·5	961·4	959·6	959·7	963·0	960·3	959·6	300
	200	1230·3	1230·1	1229·9	1229·2	1229·6	1230·1	1232·8	1232·6	1231·6	1233·4	1238·0	1236·3	1235·1	1232·8	1232·6	1236·1	1233·0	1231·4	200
	150	1409·9	1409·7	1409·5	1408·8	1409·3	1409·8	1412·6	1412·4	1411·1	1413·2	1418·4	1417·0	1415·8	1413·0	1412·6	1416·1	1412·8	1411·0	150
	100	1649·7	1650·7	1650·5	1650·3	1650·6	1651·1	1654·0	1653·8	1652·0	1654·6	1660·8	1659·4	1657·7	1653·7	1651·7	1655·0	1651·7	1650·1	100
	700	309·2	309·5	310·2	311·0	312·3	312·3	311·5	310·5	310·0	312·0	314·7	315·0	311·3	310·0	309·0	309·2	309·0	309·2	700
	500	571·7	572·0	572·8	573·7	575·0	575·2	575·3	574·2	574·0	577·8	582·4	581·7	576·5	574·5	572·4	571·7	571·9	572·0	500
30	300	937·8	938·7	939·6	940·6	942·0	942·7	944·6	942·7	943·8	950·6	957·2	955·9	949·2	945·7	942·0	940·3	939·8	939·0	300
	200	1205·3	1206·4	1207·5	1208·6	1210·2	1211·2	1213·3	1211·1	1212·7	1220·9	1228·7	1227·9	1220·6	1216·8	1212·2	1209·5	1208·5	1206·5	200
	150	1388·2	1389·3	1390·4	1391·4	1392·9	1393·9	1396·0	1393·1	1394·6	1403·2	1411·6	1411·2	1403·9	1400·1	1395·7	1392·9	1392·0	1389·3	150
	100	1639·4	1640·5	1641·6	1642·0	1643·2	1644·2	1646·3	1642·5	1643·6	1653·3	1662·4	1662·1	1654·8	1650·7	1646·3	1643·5	1642·9	1640·2	100
	700	304·0	303·8	303·7	303·7	303·8	303·8	303·2	301·2	300·6	302·0	305·0	304·2	301·2	299·5	298·0	298·0	299·3	302·0	700
	500	561·8	561·6	561·3	561·0	561·0	561·1	560·7	558·7	558·6	561·6	566·7	564·6	560·0	557·0	554·8	555·0	556·8	559·7	500
40	300	920·7	920·5	920·2	919·7	919·9	920·0	920·0	918·0	919·2	925·5	933·2	931·0	923·8	917·7	913·7	913·5	915·8	918·4	300
	200	1184·3	1184·1	1183·5	1182·5	1182·6	1182·8	1183·0	1180·7	1182·7	1190·4	1199·9	1198·2	1190·5	1182·4	1177·5	1177·3	1180·1	1182·3	200
	150	1369·7	1369·4	1368·6	1367·3	1367·2	1367·4	1367·4	1364·7	1366·4	1374·3	1384·5	1383·4	1375·9	1367·8	1363·1	1363·4	1366·6	1368·0	150
	100	1629·6	1629·1	1628·7	1626·1	1625·2	1625·1	1624·9	1621·7	1622·9	1631·1	1642·5	1642·0	1634·9	1626·8	1622·1	1623·4	1627·5	1628·1	100
	700	300·5	299·2	298·0	298·0	298·0	298·6	297·3	293·2	293·0	294·0	295·0	295·2	292·5	291·3	290·8	291·5	294·1	297·5	700
	500	556·5	555·2	553·4	552·7	552·2	552·9	551·8	547·5	547·7	549·9	552·4	551·1	546·9	544·3	543·9	545·6	549·5	553·5	500
45	300	913·6	912·1	909·8	908·1	906·9	907·7	906·8	902·3	903·5	908·0	913·0	911·9	905·4	899·8	898·3	900·8	906·2	910·6	300
	200	1176·0	1174·5	1171·7	1169·4	1167·5	1168·0	1167·0	1162·5	1164·2	1169·9	1176·4	1176·3	1169·0	1162·1	1160·1	1163·1	1169·0	1173·4	200
	150	1362·1	1360·6	1357·4	1354·2	1351·9	1352·2	1350·9	1346·1	1347·6	1353·8	1360·8	1361·7	1354·6	1348·0	1346·3	1349·8	1356·4	1360·5	150
	100	1625·1	1623·4	1619·3	1614·9	1611·4	1611·3	1609·5	1604·4	1606·1	1613·0	1621·5	1623·7	1617·1	1610·7	1609·1	1613·4	1621·0	1625·1	100
	700	295·5	293·7	291·2	291·0	291·2	291·2	289·1	285·2	284·0	284·0	284·5	284·5	282·5	281·3	281·8	283·7	286·2	291·2	700
	500	549·6	547·7	544·7	543·4	543·0	542·8	540·7	536·4	535·2	536·0	536·9	536·1	532·7	530·1	531·4	534·8	539·1	545·4	500
50	300	904·5	902·6	898·7	896·3	894·5	894·0	891·2	887·0	886·3	888·5	891·3	890·6	885·6	880·0	880·9	885·9	892·3	900·2	300
	200	1166·2	1164·3	1159·4	1156·0	1153·2	1152·4	1149·2	1145·0	1144·4	1147·7	1151·9	1152·1	1146·9	1139·7	1140·4	1146·2	1154·0	1162·4	200
	150	1352·6	1350·5	1344·8	1340·4	1336·8	1335·6	1331·9	1327·3	1326·4	1330·0	1335·2	1336·5	1332·2	1325·6	1326·5	1333·2	1341·8	1350·5	150
	100	1617·0	1614·0	1606·9	1600·8	1595·8	1593·7	1589·4	1584·2	1583·4	1588·0	1594·9	1598·4	1595·3	1589·6	1591·3	1598·6	1608·4	1617·8	100

APPENDIX I—*continued*

OCTOBER 1949–53

Lati-tude	Pressure level	180°W	160°W	140°W	120°W	100°W	80°W	60°W	40°W	20°W	0°	20°E	40°E	60°E	80°E	100°E	120°E	140°E	160°E	Pressure level
°S	*mb.*									*geopotential decametres*										*mb.*
	700	287·0	285·8	283·2	283·0	283·0	283·2	281·3	276·2	274·2	274·2	274·5	272·5	269·5	268·0	270·0	272·8	277·0	283·2	700
	500	538·8	537·6	534·4	533·0	532·2	531·8	529·3	523·8	521·7	521·7	522·0	519·5	515·2	512·9	515·8	520·4	527·0	534·9	500
55	300	891·1	889·9	886·0	883·0	880·8	879·3	876·1	870·3	868·1	868·7	869·5	867·4	861·7	857·3	860·9	867·4	877·0	886·9	300
	200	1152·2	1150·6	1145·4	1141·0	1137·8	1135·6	1131·8	1125·3	1123·0	1124·3	1126·4	1125·0	1119·5	1114·6	1118·2	1125·3	1137·1	1148·2	200
	150	1338·6	1336·4	1329·9	1324·2	1320·0	1317·2	1312·6	1305·5	1302·8	1304·3	1307·4	1307·3	1303·0	1298·8	1303·0	1310·8	1324·1	1336·2	150
	100	1603·1	1599·9	1591·7	1583·4	1577·4	1573·5	1568·0	1560·0	1557·0	1559·3	1564·5	1566·3	1564·7	1561·5	1566·0	1574·9	1590·1	1603·6	100
	700	278·0	278·2	277·0	275·6	275·0	275·0	272·2	267·3	265·0	264·7	264·5	262·7	259·5	258·3	260·5	264·0	267·8	273·2	700
	500	527·3	527·4	525·8	523·4	521·8	521·0	517·3	511·8	509·2	508·5	508·2	505·6	501·3	499·8	503·1	508·5	514·6	521·8	500
60	300	877·1	877·0	874·8	870·9	867·8	866·0	860·0	854·1	850·7	850·0	849·7	847·1	842·1	839·8	844·6	852·0	860·6	871·6	300
	200	1137·1	1136·6	1132·8	1127·6	1123·4	1120·4	1113·0	1106·5	1102·7	1102·3	1102·7	1100·8	1096·3	1094·0	1099·6	1107·9	1118·3	1131·1	200
	150	1322·5	1321·4	1316·3	1309·8	1304·3	1300·2	1291·3	1284·3	1280·0	1279·7	1281·2	1280·6	1277·2	1275·6	1281·9	1290·8	1303·8	1316·5	150
	100	1585·5	1583·5	1576·5	1567·7	1559·7	1553·9	1543·2	1535·5	1530·9	1531·3	1534·7	1536·3	1534·9	1534·3	1540·9	1550·7	1565·2	1579·5	100

APPENDIX II—SOURCES OF DATA

CONTOUR CHARTS

1. CLIMAT TEMP reports where available. These are special reports appended monthly to the routine synoptic broadcasts and include monthly mean values of temperature and contour height for the standard upper levels for selected stations (see Item 2 of Bibliography).

2. *Daily Series Synoptic Weather Maps* published by the United States Weather Bureau. Daily values were used to calculate monthly mean heights for stations and levels for which CLIMAT TEMP reports were not available. This series provided data for the following territories or individual stations:

Aleutian Islands
Austria
Azores
Bermuda
Czechoslovakia
France
French North Africa
French Sahara
Greece
Greenland
Italy
Mexico
Nicaragua
Pacific Islands
Philippines
Poland
Romania
Turkey
U.S.S.R.
West Indies
Libya (Tripoli)

3. Data published at regular intervals by national or territorial meteorological services.

(*a*) *Daily weather reports:*

Czechoslovakia
Egypt
Germany
Greece
Holland
India
Portugal (including Atlantic Islands)

(*b*) *Monthly reports:*

Belgian Congo
Belgium
Cocos Islands (Malayan Meteorological Service)
French Equatorial Africa
Germany
India
Indo-China
Japan
Korea
Madagascar and Amsterdam Island
Mexico
Spain
U.S.A.
American Pacific Islands
West Indies

(*c*) *Annual reports:*

Angola
Holland
Hong Kong
Hungary
Switzerland
Union of South Africa
Venezuela

4. Synoptic data received and synoptic charts prepared at the Meteorological Office, Dunstable, for stations in Europe, Greenland and Asiatic Russia.

5. Routine data tabulations for Meteorological Office stations in the British Isles and overseas, and for British ocean weather ships.

6. Manuscript and microfilm data either already available in the Meteorological Office or supplied by other Meteorological Services on request (see Acknowledgements).

*Argentina
Australia
*Bolivia
British East Africa
Canada
Ceylon
*Chile
Eire
Falkland Islands
Germany (British Zone)
Hong Kong
India
Indonesia
Japan
New Zealand
Nigeria
Portuguese East Africa
Sudan
Thailand
Union of South Africa
United States Weather Bureau
United States Air Force.

* Surface reports from mountain stations.

7. Special publications.

(*a*) Baltimore, John Hopkins University, Department of Civil Engineering; Presentation of meteorological data for the North American sector for the year 1949. Final Report, **2**, Baltimore, Md., 1954.
Pacific weather ships N and P

(*b*) Melbourne, Department of External Affairs; Australian National Antarctic Research Expeditions. Reports series D, Meteorology. **2–6**, 1949–53, Melbourne, 1953–55.
Heard Island
Macquarie Island

(*c*) Paris, Météorologie Nationale; Les observations météorologiques de Port-Martin en Terre-Adélie. Fasc. III. Conditions atmosphériques en altitude du 17 janvier 1951 au 21 janvier 1952. Paris.
Adélie Land

(*d*) Toronto, Department of Transport, Meteorological Division; Aerological Data for southern Canada. Toronto.
Canada

WIND DATA FOR STREAMLINE–ISOTACH CHARTS

8. Manuscript data held in the Meteorological Office, including those from the following sources:
Argentina, Ministerio de Asuntos Tecnicos
Rhodesia Meteorological Service
Madagascar Meteorological Service
Indian Meteorological Department
Weather Bureau, Manila
Royal Australian Air Force
Imperial College of Science and Technology, Department of Meteorology

9. Washington, United States Weather Bureau; Daily Series Synoptic Weather Maps. Washington, D.C., 1949–53.

10. Washington, Hydrographic Office; Weather summaries for naval air pilots. Washington, D.C., 1943–45 and 1947.

11. SCOTT, J. R.; Wind statistics at Singapore. *Quart. J. R. met. Soc. London*, **83**, 1957, p. 381.

12. Wellington, New Zealand Meteorological Service; Daily Weather Bulletins, Wellington, 1949–53.

13. PORTER, E. M.; Upper winds over Nandi and Auckland. *Tech. Notes, N.Z. met. Serv., Wellington*, No. 92, 1952.

14. PORTER, E. M.; Upper winds over Invercargill. *Tech. Notes, N.Z. met. Serv., Wellington*, No. 94, 1952.

15. FARKAS, E.; Upper winds over Tarawa, April–July 1956. *Tech. Notes, N.Z. met. Serv., Wellington*, No. 123, 1957.

16. Tokyo, Central Meteorological Observatory; *Aerol. Data Japan, Tokyo*, 1949–53.

17. Dakar, Service Météorologique de l'Afrique Occidentale Française; Observations en altitude. Radiovent. Dakar. 1955.

18. BOYER, A. and DU CHAXAL, R.; Fréquences normales du vent en altitude. *Publ. Serv. mét. l'Afrique Occidentale Française, Brazzaville*, No. 1, Fasc. 1, 1954.

19. SCHMIDT, F. H.; Upper winds over Indonesia and Western New Guinea. Djawatan Meteorologi dan Geofisik. Verhandelingen No. 45, Djakarta, 1952.

20. Pretoria, South African Weather Bureau, Department of Transport; Report for the year. Pretoria. 1952, 1953 and 1954.

APPENDIX III—STATIONS FROM WHICH WIND DATA WERE AVAILABLE

Station	Position		Period	Approx. level reached	Seasonal or monthly	Source (see Appendix II)
CENTRAL AMERICA	°N	°W		mb		
Big Spring	32 14,	101 30	1950–52	100	monthly	8
San Antonio	29 32,	98 28	1950–52	100	monthly	8
Burrwood	28 58,	89 22	1950–52	100	monthly	8
Charleston	32 54,	80 02	1950–52	100	monthly	8
Brownsville	25 54,	97 26	1950–53, 56	100	monthly	9
Miami	25 49,	80 17	1950–53, 56	100	monthly	9
Havana	23 09,	82 21	1949–53	100	monthly	9
San Juan	18 27,	66 06	1950–53, 56	100	monthly	9
Albrook Field	08 58,	79 33	1951–53, 56	100	monthly	9
SOUTH AMERICA						
Chaguaramas	10 41,	61 37	1955–57	100	monthly	9
Port of Spain	10 36,	61 21	1935–44	500	seasonal	10
Cayenne	04 50,	52 22	1937–40	700	seasonal	10
Georgetown	06 49,	58 11	1937–40	700	seasonal	10
	°S	°W				
Pisco	13 45,	76 14	1939–41	700	seasonal	10
Arequipa	16 22,	71 34	1939–40	500	seasonal	10
Talara	04 34,	81 15	1939–41	700	seasonal	10
Fernando de Noronha	03 50,	32 25	1930–34, 36–41	700	seasonal	10
Quixeramobin	05 12,	39 18	1930–34, 38–41	700	seasonal	10
Recife	08 01,	34 51	1938–41	700	seasonal	10
Maceio	09 34,	35 47	1928–29	700	seasonal	10
Cuiaba	15 36,	56 06	1928–34, 36–41	700	seasonal	10
Caravelas	17 44,	39 15	1931–34, 36–41	700	seasonal	10
Campos	21 45,	41 20	1928–34, 36–41	700	seasonal	10
Santos	23 56,	46 20	1928–34, 36–41	700	seasonal	10
Florianopolis	27 36,	48 34	1928–34, 36–41	700	seasonal	10
Mercedes	33 41,	65 29	1937–47	500	seasonal	8
Comodoro Rivadavia	45 47,	67 30	1937–47	500	seasonal	8
Trelew	43 14,	65 10	1937–47	500	seasonal	8
Rio Gallegos	51 40,	69 16	1937–47	500	seasonal	8
Corrientes	27 28,	58 49	1937–47	500	seasonal	8
Cordoba	31 24,	64 17	1937–47	500	seasonal	8
Buenos Aires	34 35,	58 29	1937–47	500	seasonal	8
Bahia Blanca	38 44,	62 12	1937–47	500	seasonal	8
MIDDLE EAST	°N	°W				
Gibraltar	36 09,	5 21	1948–53	100	monthly	8
	°N	°E				
Habbaniya	33 22,	43 34	1948–53	100	monthly	8
Benina	32 06,	20 16	1948–53	100	monthly	8
Malta	35 50,	14 27	1948–53	100	monthly	8
Nicosia	35 09,	33 17	1948–53	100	monthly	8
Bahrain	26 16,	50 37	1949–53	100	monthly	8
Aden	12 50,	45 01	1948–53	100	monthly	8
CENTRAL AFRICA	°S	°E				
Nairobi	01 17,	36 50	1951–55	100	monthly	8
	°N	°E				
Lagos	06 35,	03 20	1953–55	100	monthly	8
Khartoum	15 36,	32 33	1953–55	100	monthly	8
Kano	12 03,	08 32	1955–57	100	monthly	8
	°N	°W				
Dakar	14 40,	17 26	1949–53	100	monthly	17
	°N	°E				
Bangui	04 22,	18 35	1935–53	500	monthly	18
Fort Lamy	12 07,	15 02	1936–53	500	monthly	18
	°S	°E				
Brazzaville	04 15,	15 15	1935–53	500	monthly	18
Loanda	08 50,	13 12	1932–36	700	seasonal	10

Appendix III—*continued*

Station	Position		Period	Approx. level reached	Seasonal or monthly	Source (see Appendix II)
SOUTH AFRICA	°*S*	°*E*		*mb*		
Pretoria	25 45,	28 14	1948–50, 52–54	100	monthly	20
Maun	19 59,	23 25	1950, 52–54	200	monthly	20
Salisbury	17 50,	31 01	1941–46	500	monthly	8
MADAGASCAR						
Diego Suarez	12 17,	49 18	unknown	300	monthly	8
Fort Dauphin	25 02,	46 59	unknown	300	monthly	8
Maintirano	18 03,	44 02	unknown	300	monthly	8
Majunga	15 14,	46 19	unknown	300	monthly	8
Moroni	11 41,	43 15	unknown	300	monthly	8
Tananarive	18 55,	47 32	unknown	300	monthly	8
Tulear	23 21,	43 41	unknown	300	monthly	8
INDIA	°*N*	°*E*				
Calcutta	22 39,	88 27	(i) 1919–51	200	monthly	8
			(ii) 1946 and 52	100	monthly	8
New Delhi	28 35,	77 12	(i) 1930–51	100	monthly	8
			(ii) 1946–48, 50–52	150	monthly	8
Poona	18 32,	73 51	(i) 1915–51	100	monthly	8
			(ii) 1946, 49–52	200	monthly	8
Madras	13 00,	80 11	1951–52	150	monthly	8
Ahmedabad	23 04,	72 38	1928–51	100	monthly	8
Allahabad	25 27,	81 44	1914–51	100	monthly	8
Bangalore	12 58,	77 35	1915–51	100	monthly	8
Gwalior	26 13,	78 00	1938–51	100	monthly	8
Hyderabad	17 26,	78 27	1929–51	100	monthly	8
Jodhpur	26 18,	73 01	1934–51	100	monthly	8
Nagercoil	08 10,	77 26	1943–51	100	monthly	8
Nagpur	21 09,	79 07	1915–51	100	monthly	8
Port Blair	11 40,	92 43	1926–51	100	monthly	8
Tezpur	26 37,	92 47	1928–51	100	monthly	8
FAR EAST						
Hong Kong	22 18,	114 10	1950–53	100	monthly	8
Singapore	01 18,	103 53	1950–55	100	seasonal	11
Clark Field	15 10,	120 34	1949–53	100	monthly	9
Laoag	18 11,	120 32	unknown	300	monthly	8
Zamboanga	06 54,	122 04	unknown	500	monthly	8
Cebu	10 20,	123 54	unknown	300	monthly	8
Baguio	16 25,	120 36	unknown	200	monthly	8
Surigao	09 48,	125 30	unknown	200	monthly	8
Saigon	10 49,	106 40	1953, 56	500	monthly	9
	°*S*	°*E*				
Djakarta	06 09,	106 51	1909–18	100	seasonal	19
AUSTRALIA AND NEW ZEALAND						
Sydney	33 57,	151 10	1944–45, 52	100	seasonal	8
Woomera	31 09,	136 48	1950–54	100	seasonal	8
Auckland	36 51,	174 46	(i) 1944–51	100	monthly	13
			(ii) 1955–56	100	monthly	12
Nandi	17 45,	177 27	(i) 1945–46, 49–52	100	monthly	13
			(ii) 1955–56	100	monthly	12
Invercargill	46 25,	168 19	(i) 1951–52	100	monthly	14
			(ii) 1955–56	100	monthly	12
	°*N*	°*E*				
Tarawa	01 21,	172 56	1956	100	monthly	15
SOUTH ATLANTIC OCEAN	°*S*	°*W*				
Ascension Island	07 55,	14 25	1955–57	700	monthly	8
Port Stanley	51 42,	57 52	1948–53	100	monthly	8

APPENDIX III—*continued*

Station	Position	Period	Approx. level reached	Seasonal or monthly	Source (see Appendix II)
PACIFIC OCEAN	°*N* °*E*		*mb*		
Marcus	24 17, 153 58	1952–54, 56	300	monthly	16
Ponape	06 58, 158 13	1953, 56	700	monthly	9
Kwajalein	08 43, 167 44	1949, 50, 53	100	monthly	9
Koror	07 21, 134 29	1952, 53, 56	100	monthly	9
Truk	07 27, 151 50	1953, 56	100	monthly	9
Yap	09 31, 138 08	1950, 53, 56	100	monthly	9
Guan	13 43, 144 55	1949–53, 56	100	monthly	9
Iwo Jima	24 47, 141 20	1949–53	300	monthly	9
Wake Island	19 17, 166 39	1951–53, 56	100	monthly	9
Eniwetok	11 20, 162 20	1950–53, 56	100	monthly	9
	°*N* °*W*				
Midway Island	28 13, 177 22	1949–53	100	monthly	9
Johnson Island	16 44, 169 31	1949–53	100	monthly	9
Lihue	21 59, 159 21	1951–53, 56	100	monthly	9
Honolulu	21 20, 157 55	1953, 56	150	monthly	9
Christmas Island	01 59, 157 21	1957	100	monthly	8
	°*S* °*W*				
Canton Island	02 46, 171 43	1950, 53, 56	100	monthly	9
Apia	13 48, 171 46	1923–36	200	seasonal	10
Papeete	17 32, 149 35	1934–39	300	seasonal	10
Jarvis Island	00 23, 160 02	1926–41	500	seasonal	10
	°*S* °*E*				
Noumea	22 16, 166 27	1939–41	500	seasonal	10

FIGURE 1.—STATIONS FOR WHICH DATA WERE AVAILABLE FOR CONSTRUCTING CONTOUR CHARTS

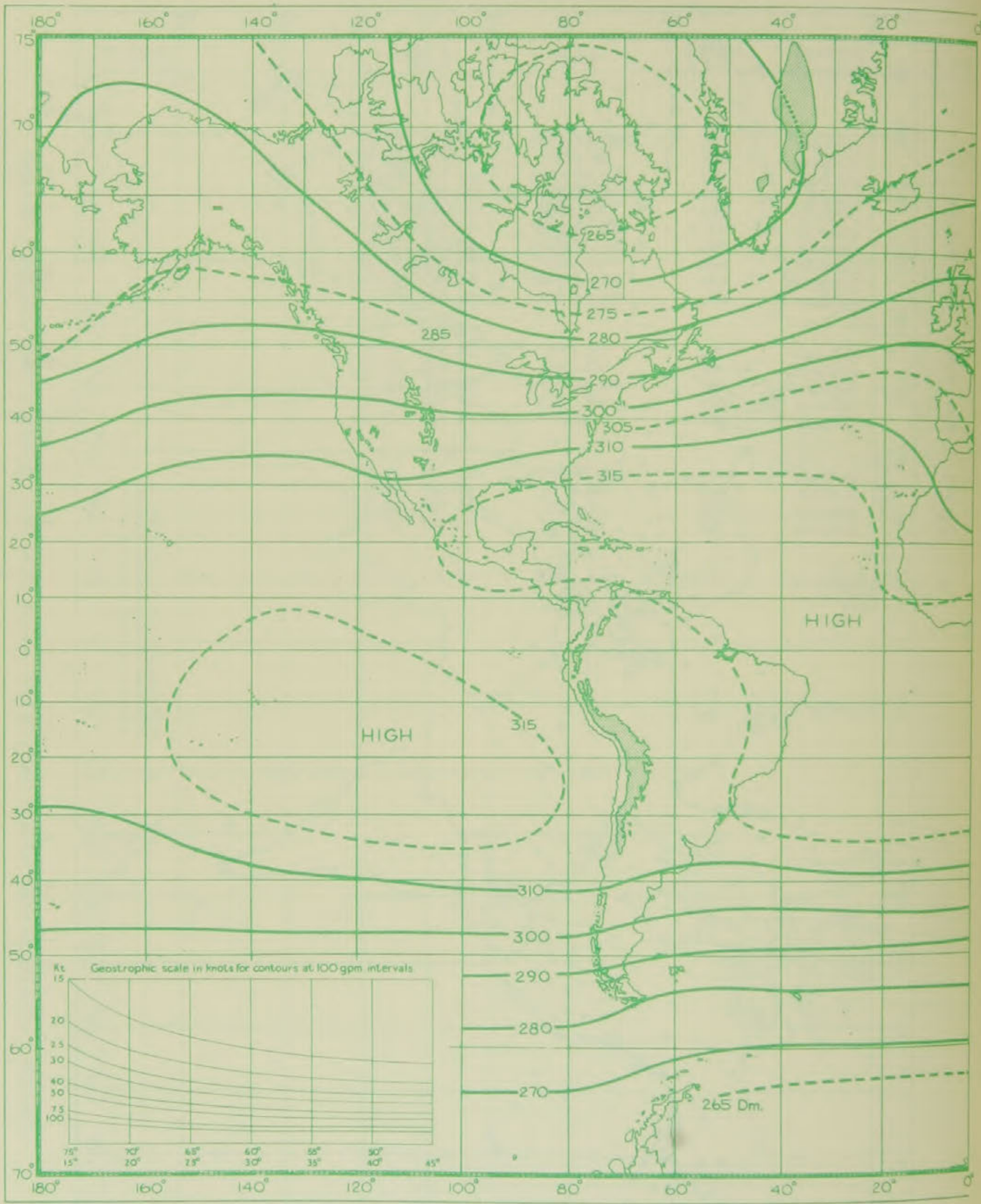


FIGURE 2—AVERAGE 700-MB. CONTOURS, JANUARY 1949–53
I.C.A.O. height = 9,882 ft. = 3,012 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

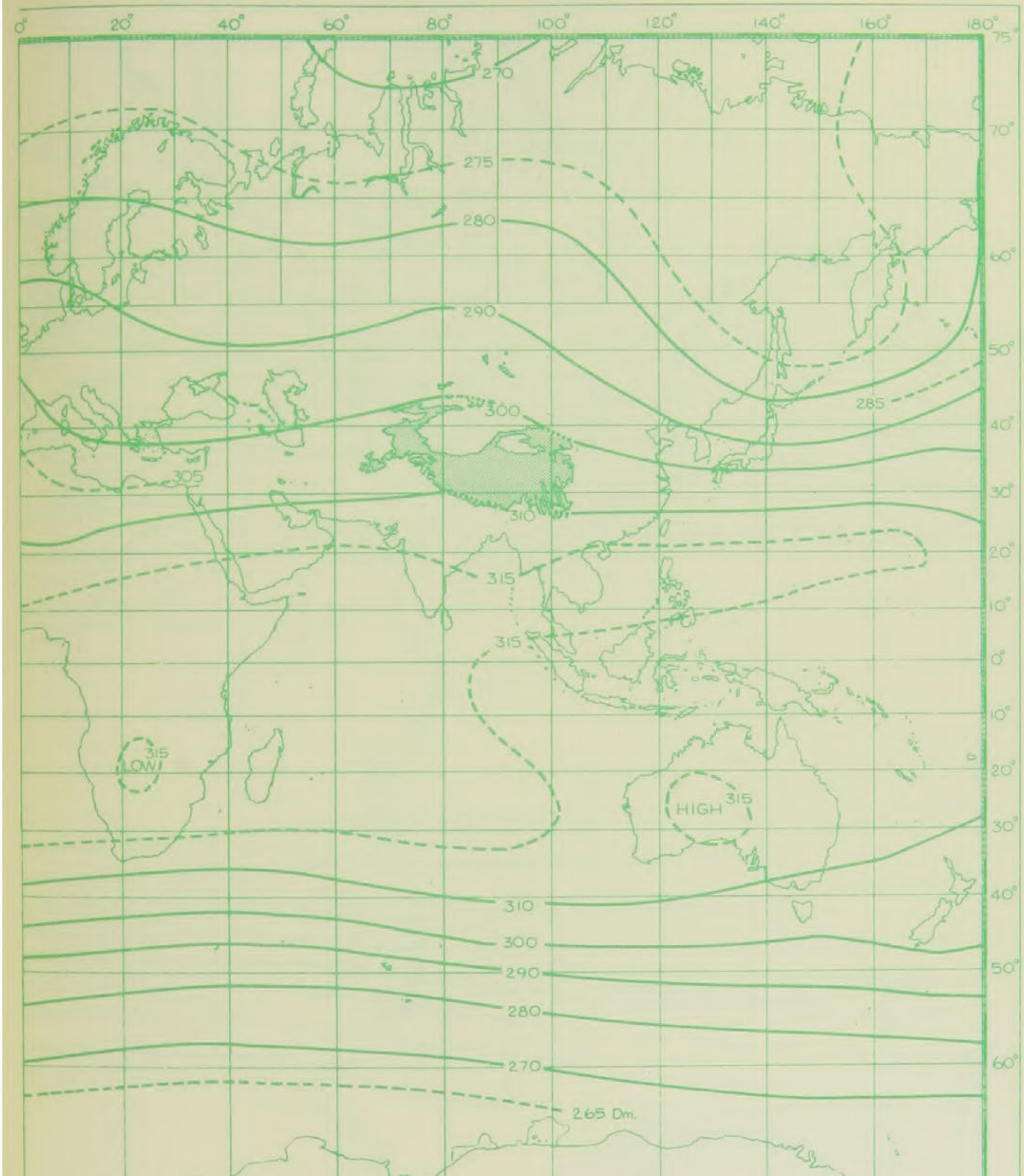


FIGURE 2—CONTINUED

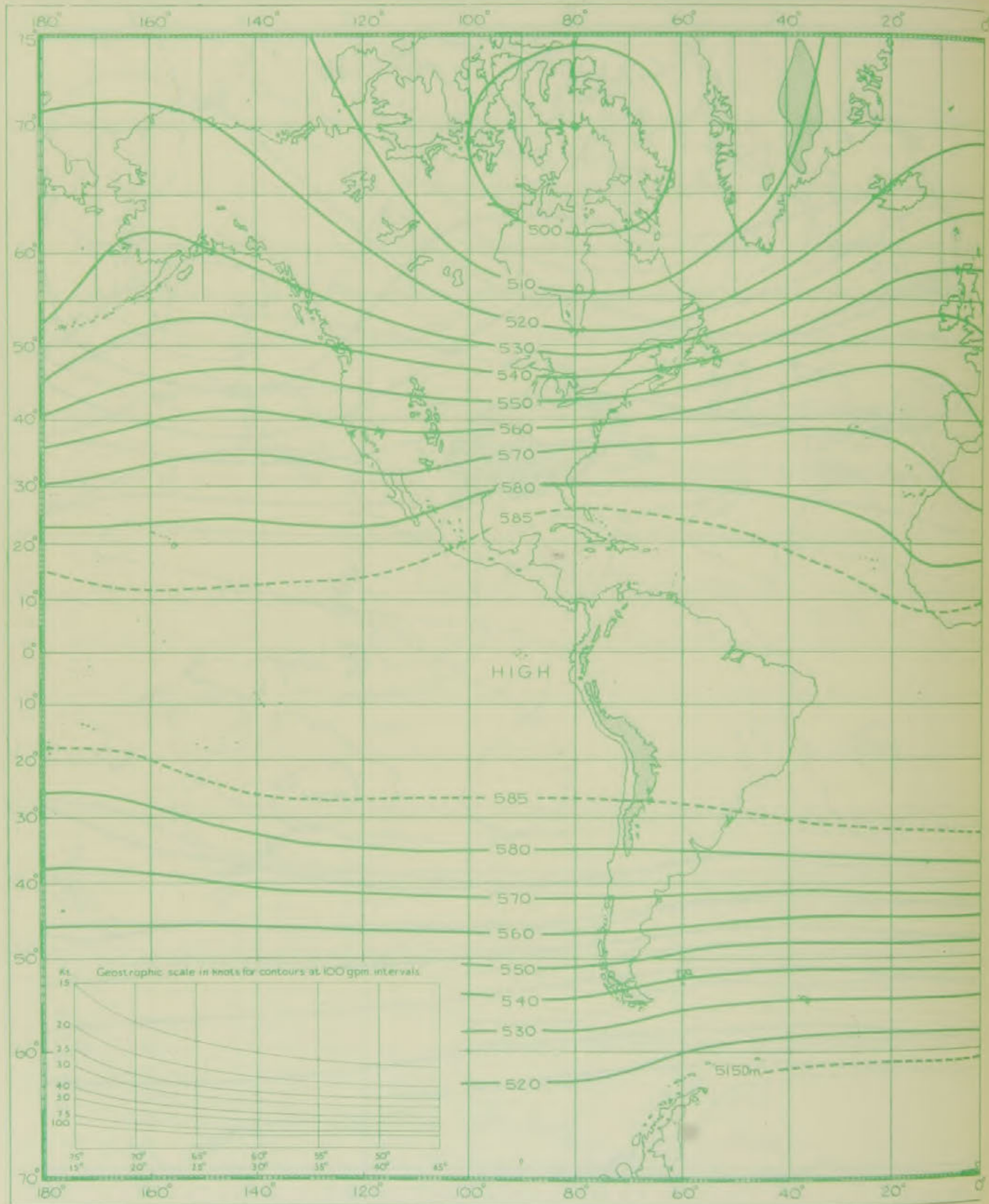


FIGURE 3—AVERAGE 500-MB. CONTOURS, JANUARY 1949–53
I.C.A.O. height = 18,289 ft. = 5,574 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

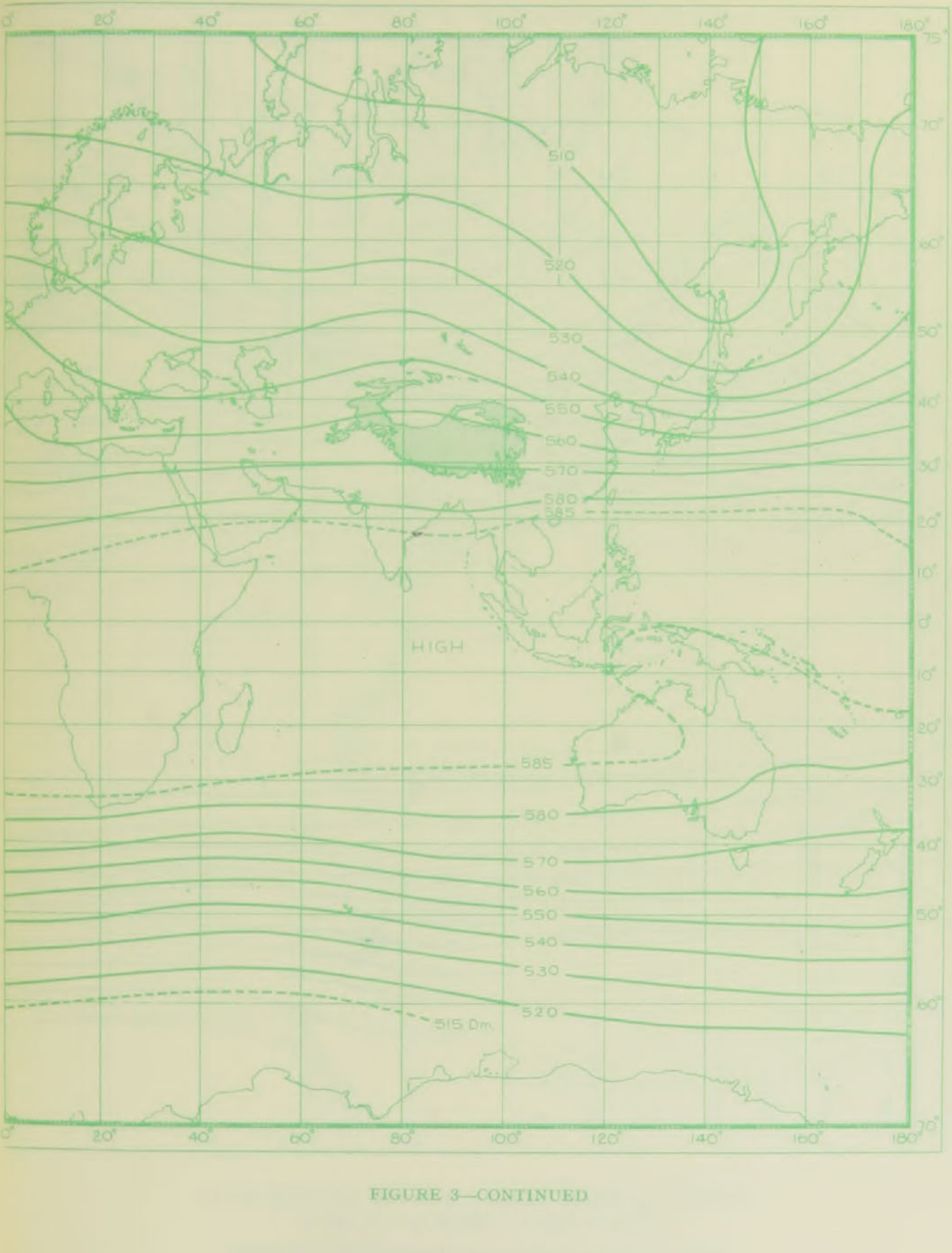


FIGURE 3—CONTINUED

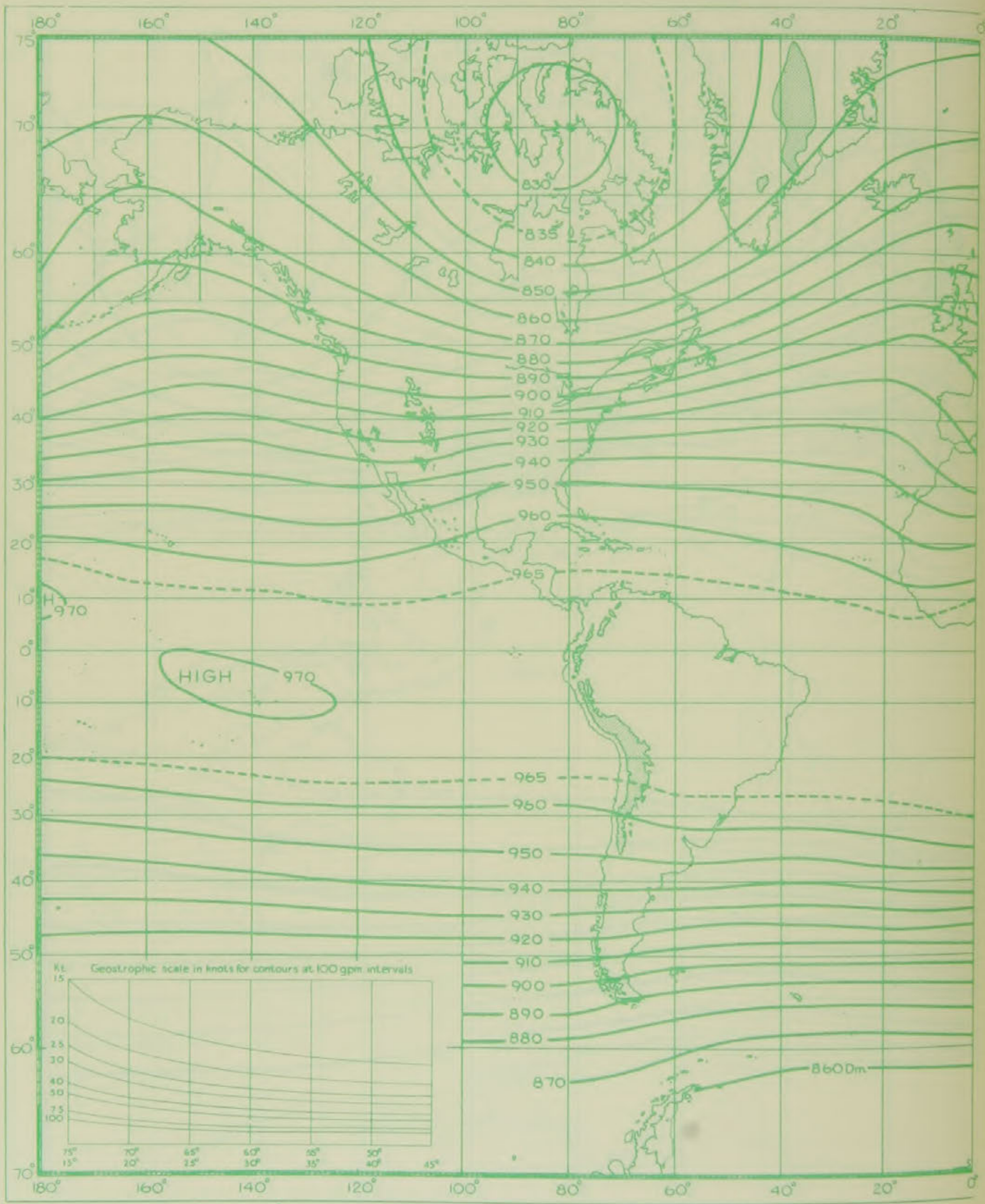


FIGURE 4—AVERAGE 300-MB. CONTOURS, JANUARY 1949–53
I.C.A.O. height = 30,065 ft. = 9,164 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

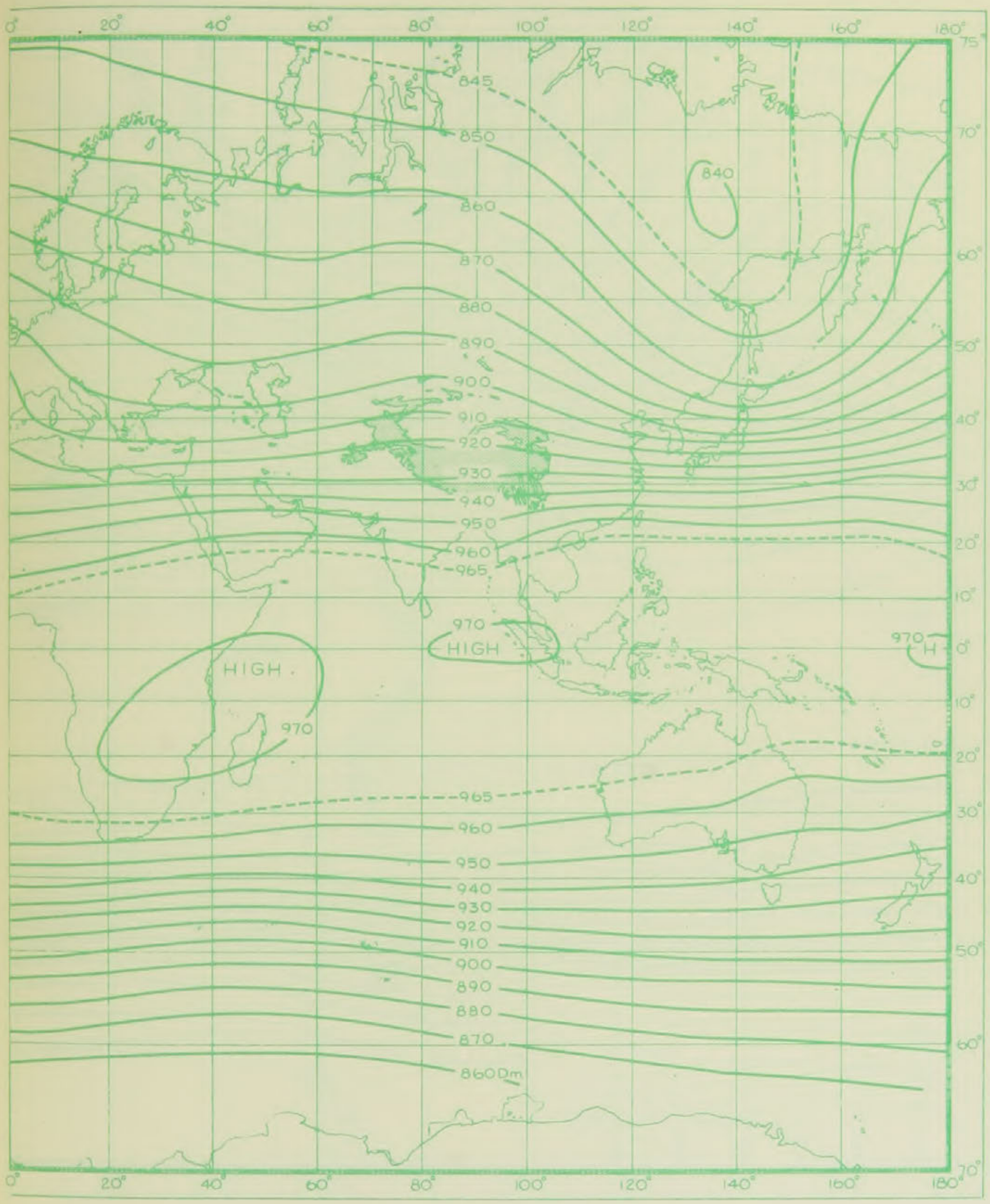


FIGURE 4—CONTINUED

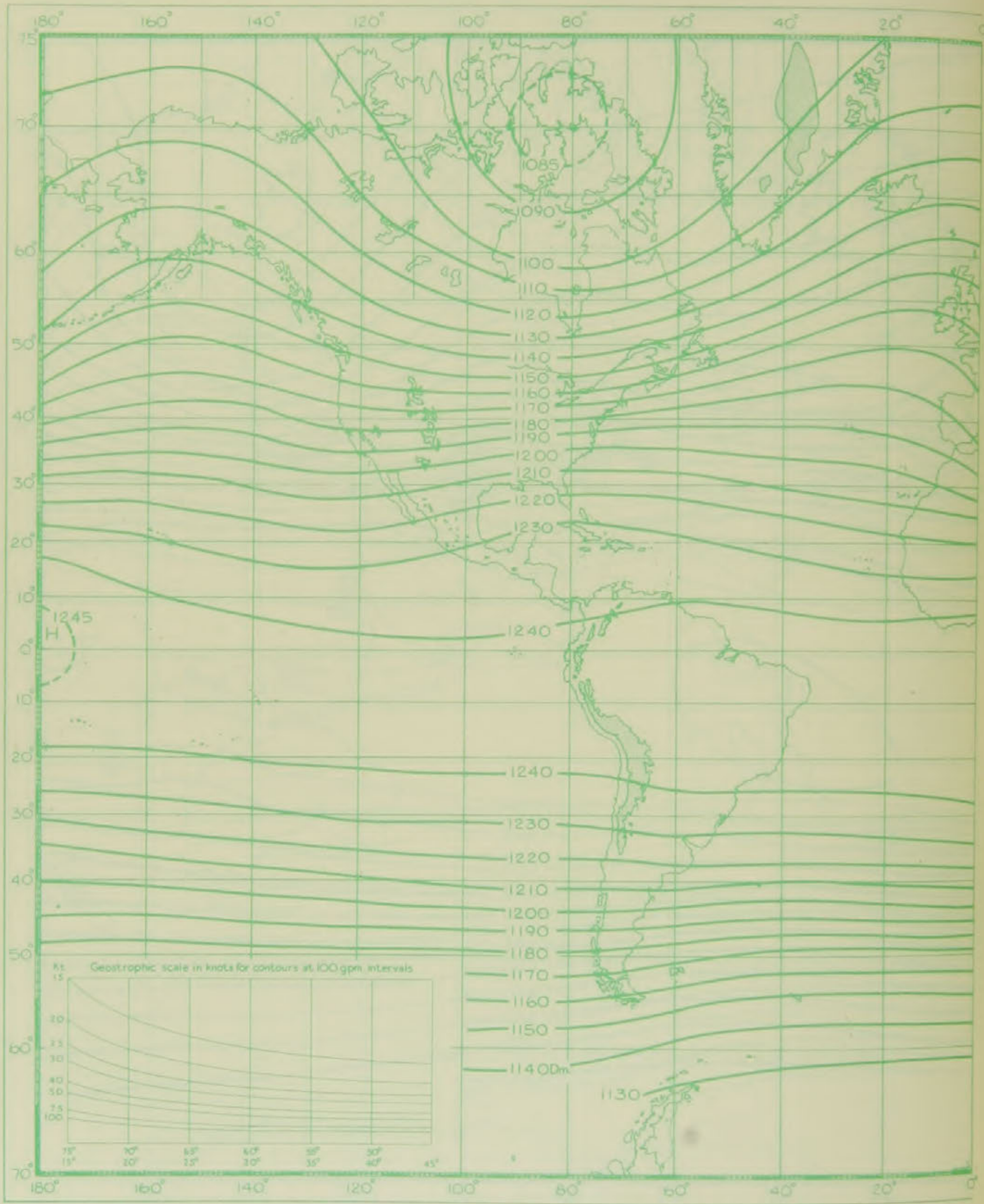


FIGURE 5—AVERAGE 200-MB. CONTOURS, JANUARY 1949–53
I.C.A.O. height = 38,662 ft. = 11,784 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

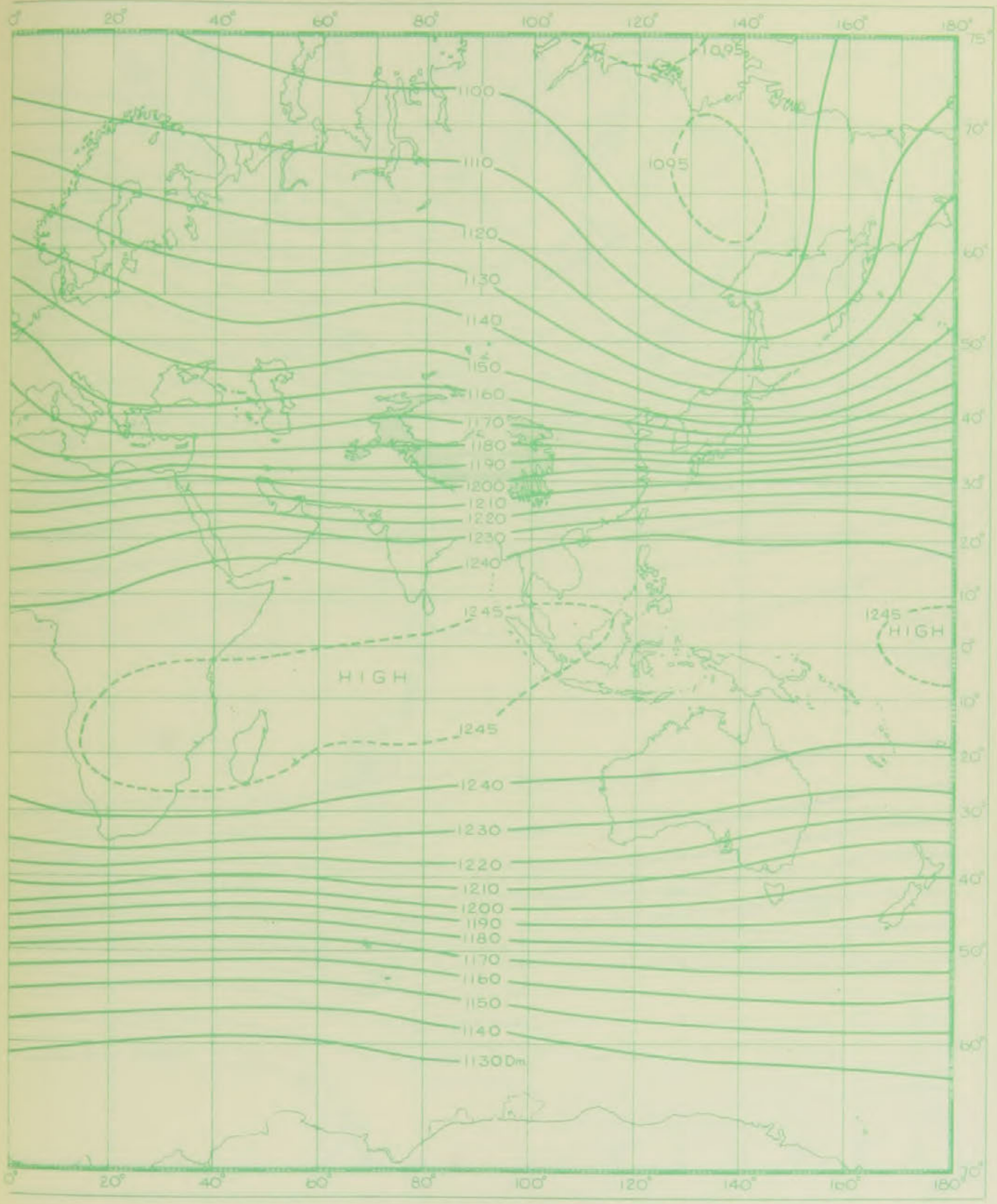


FIGURE 5—CONTINUED

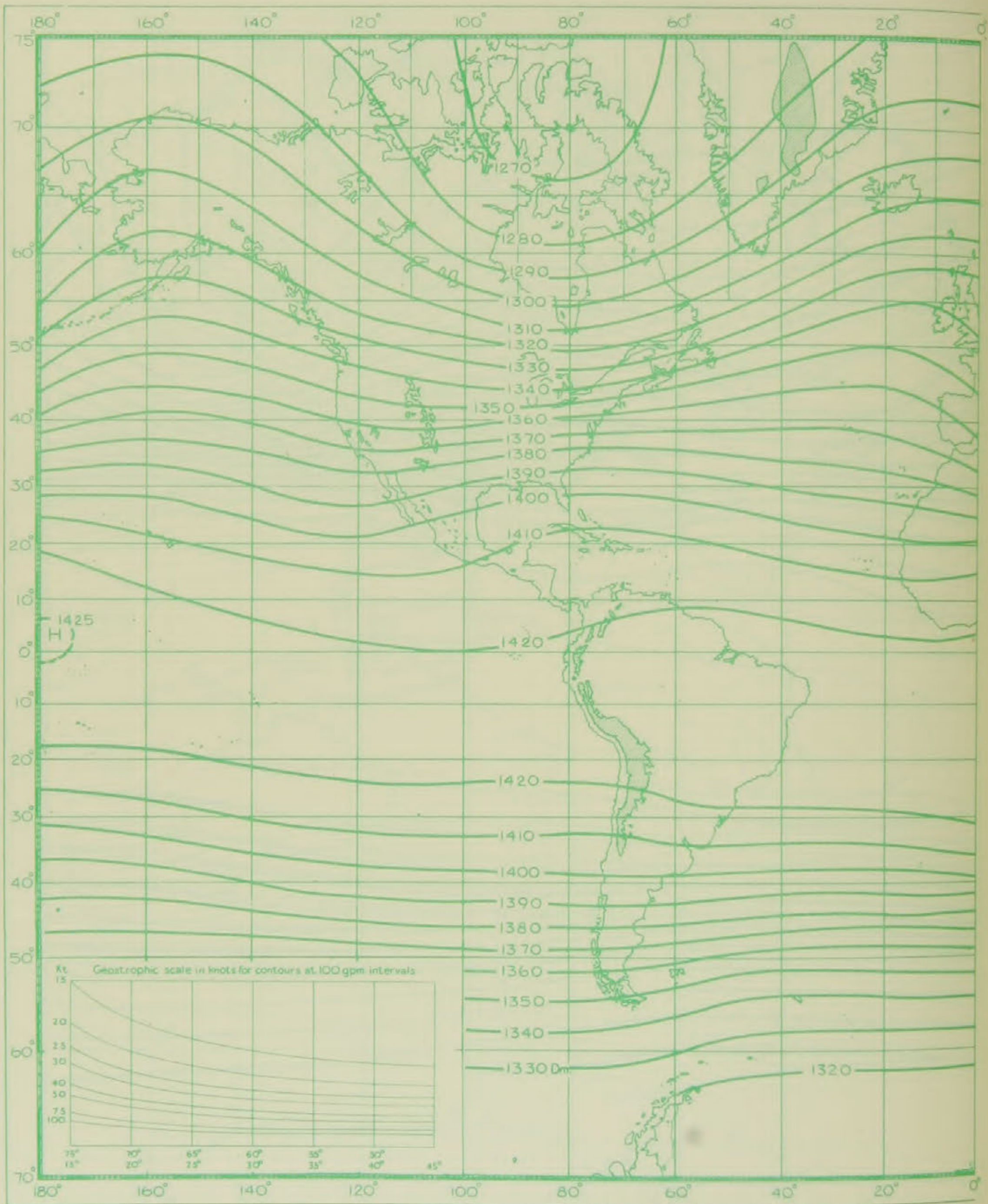


FIGURE 6—AVERAGE 150-MB. CONTOURS, JANUARY 1949–53
I.C.A.O. height = 44,647 ft. = 13,608 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

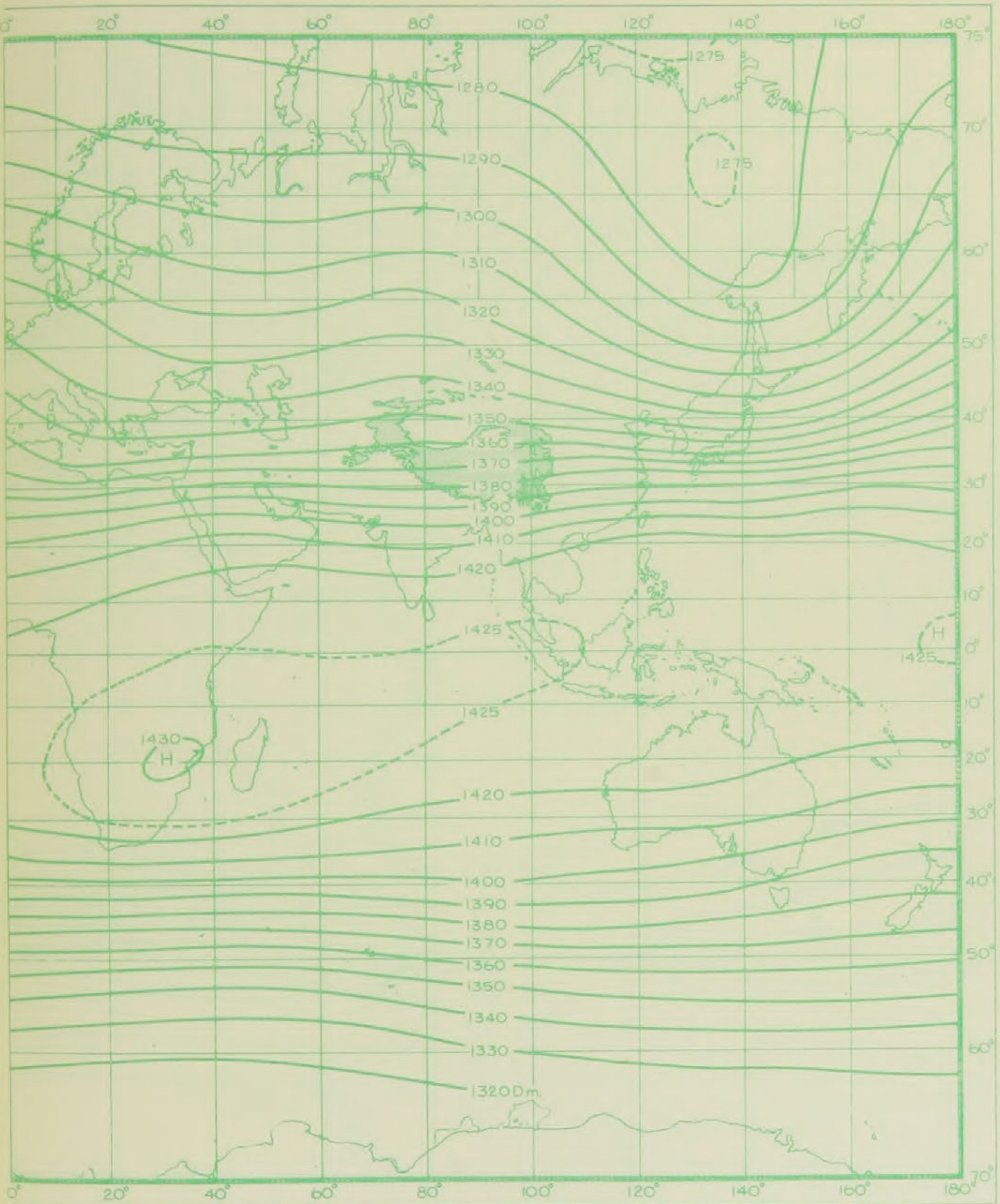


FIGURE 6—CONTINUED

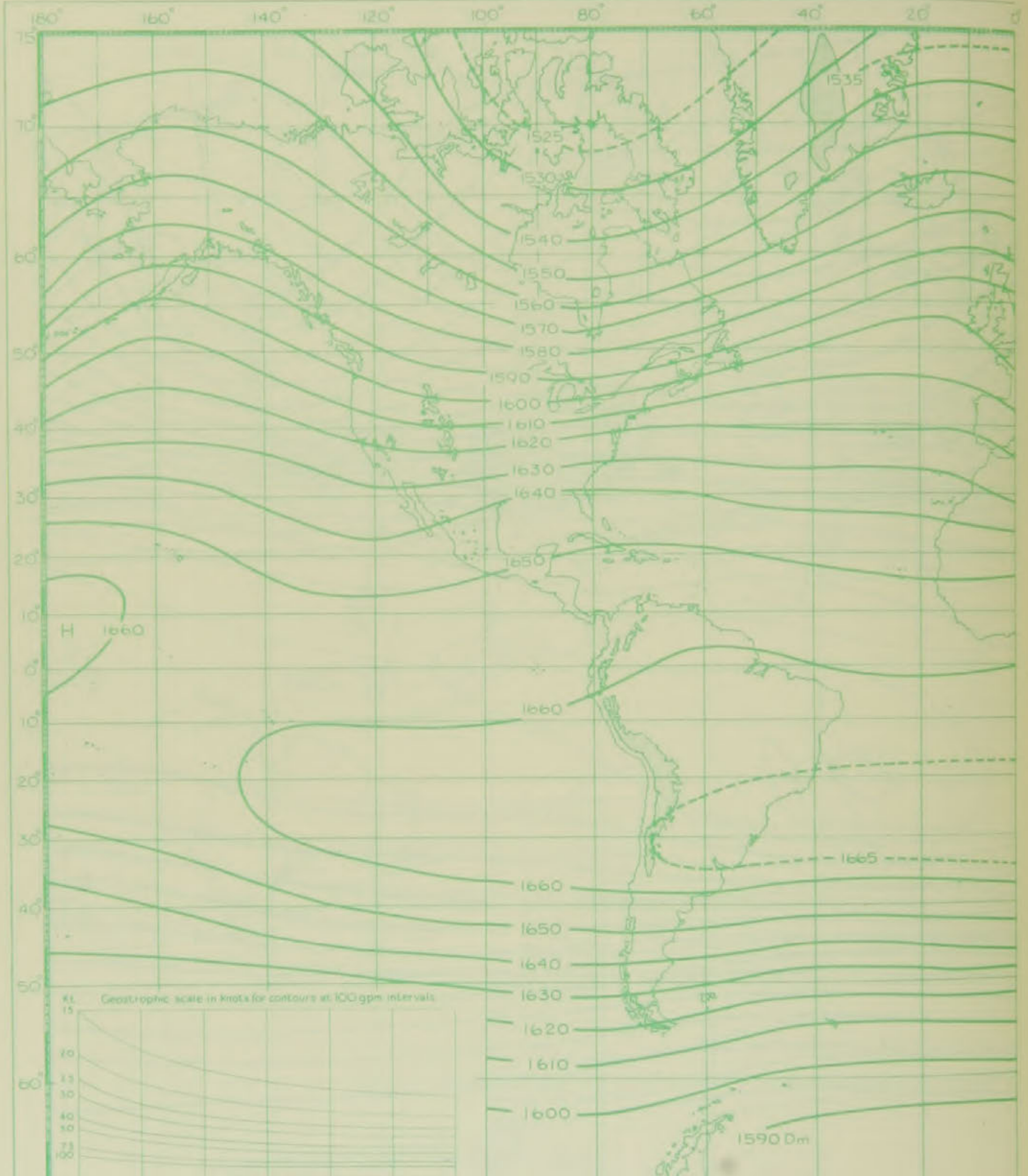


FIGURE 7—AVERAGE 100-MB. CONTOURS, JANUARY 1949–53
I.C.A.O. height = 53,083 ft. = 16,180 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

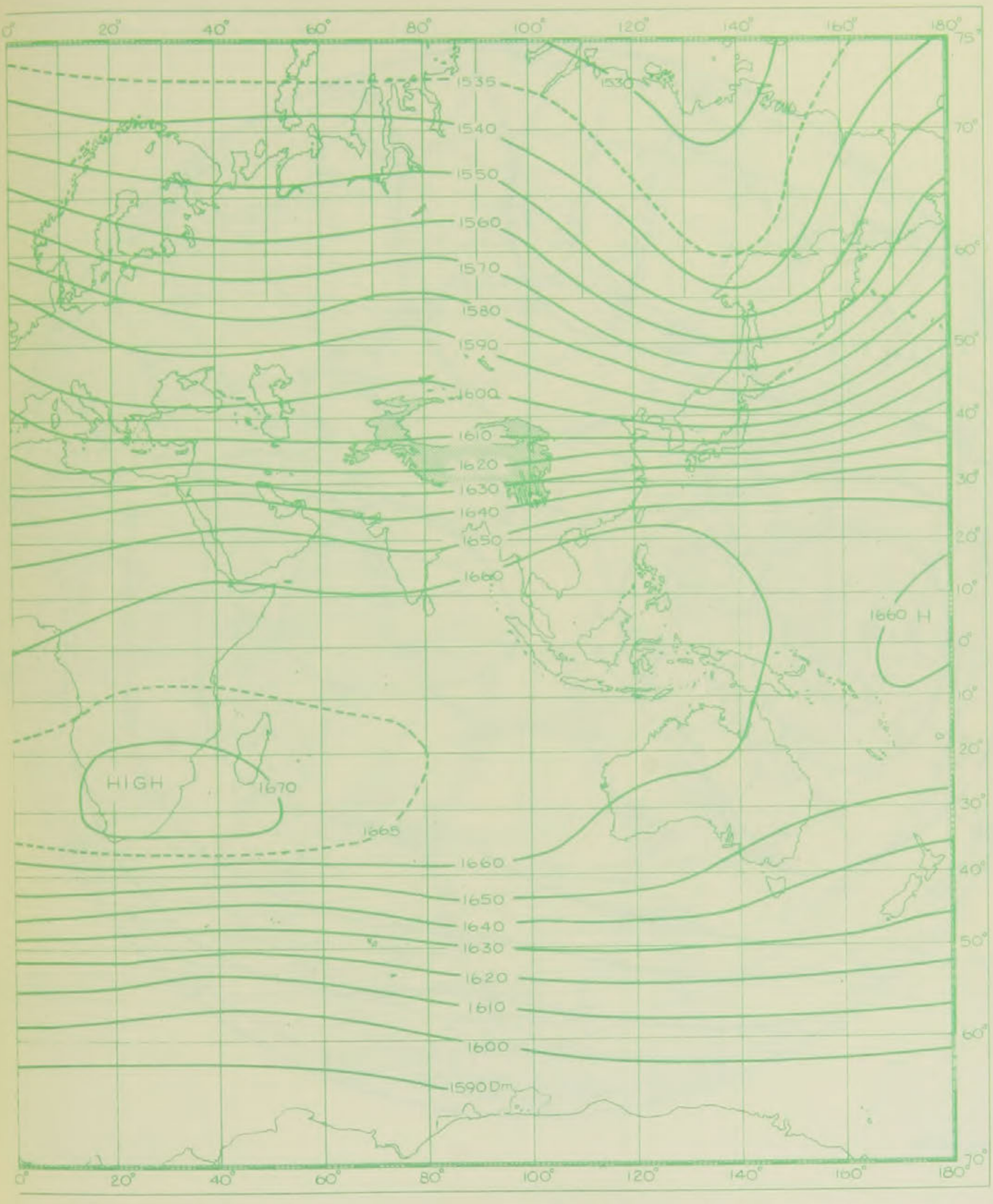


FIGURE 7—CONTINUED

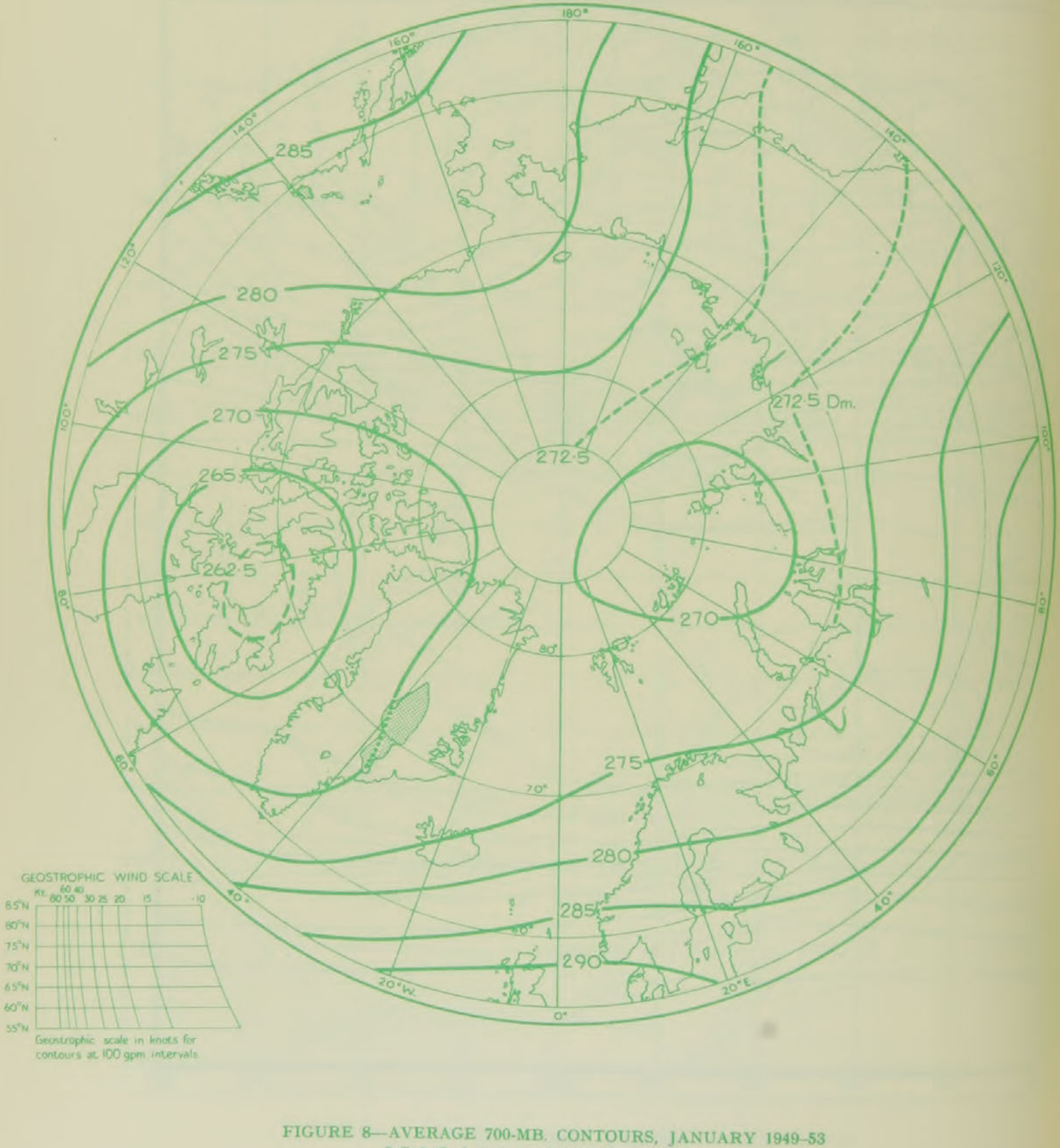


FIGURE 8—AVERAGE 700-MB. CONTOURS, JANUARY 1949–53
I.C.A.O. height = 9,882 ft. = 3,012 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

FIGURE 9—AVERAGE 500-MB. CONTOURS, JANUARY 1949–53
I.C.A.O. height = 18,289 ft. = 5,574 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

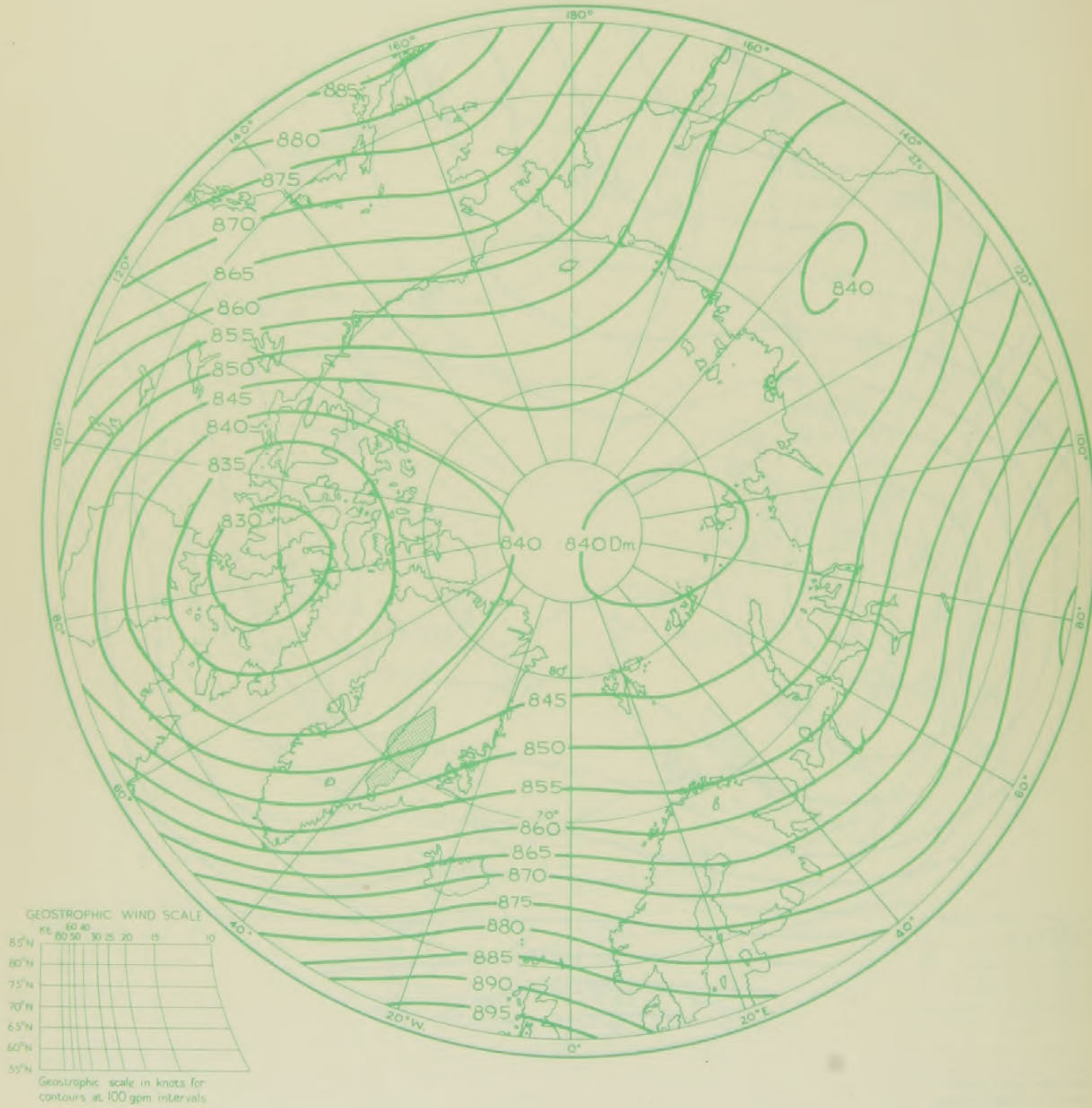


FIGURE 10—AVERAGE 300-MB. CONTOURS, JANUARY 1949–53

I.C.A.O. height = 30,065 ft. = 9,164 m.

Heights of isobaric surfaces are in geopotential decametres

Shaded areas represent land over 3,000 m.

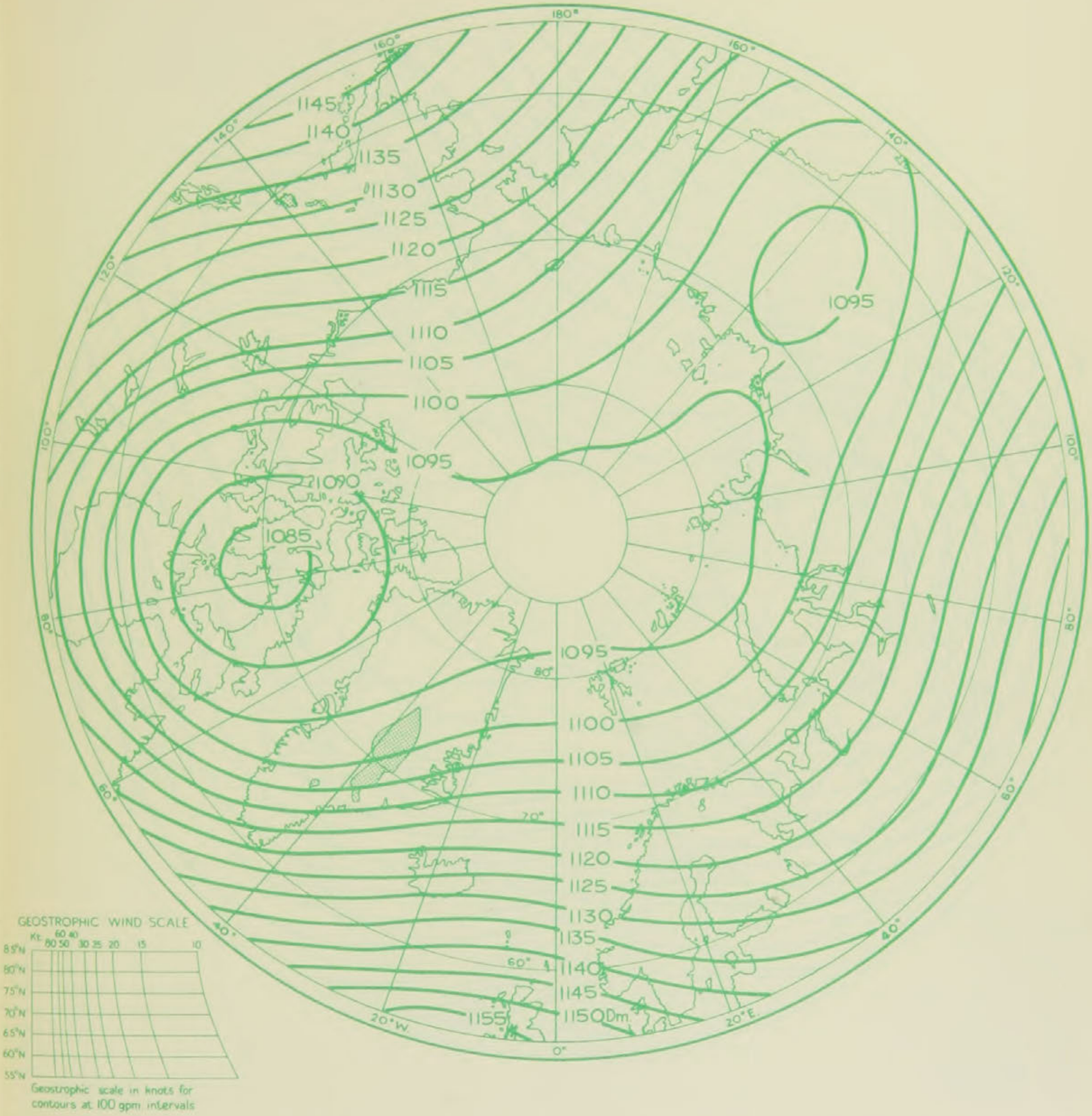


FIGURE 11—AVERAGE 200-MB. CONTOURS, JANUARY 1949–53
I.C.A.O. height = 38,663 ft. = 11,784 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

FIGURE 12—AVERAGE 150-MB. CONTOURS, JANUARY 1949–53
I.C.A.O. height = 44,647 ft. = 13,608 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

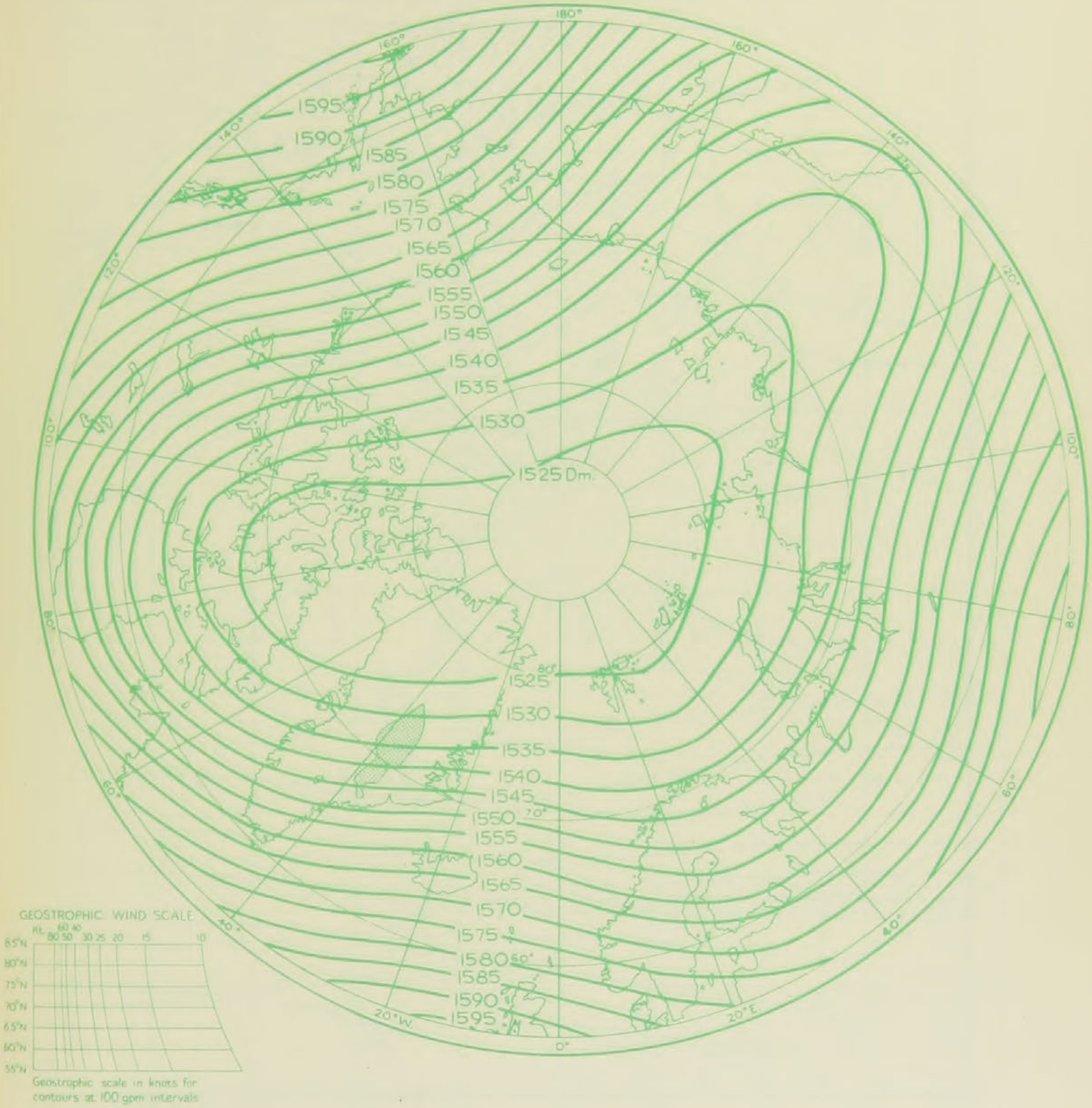


FIGURE 13—AVERAGE 100-MB. CONTOURS, JANUARY 1949–53

I.C.A.O. height = 53,083 ft. = 16,180 m.

Heights of isobaric surfaces are in geopotential decametres

Shaded areas represent land over 3,000 m.

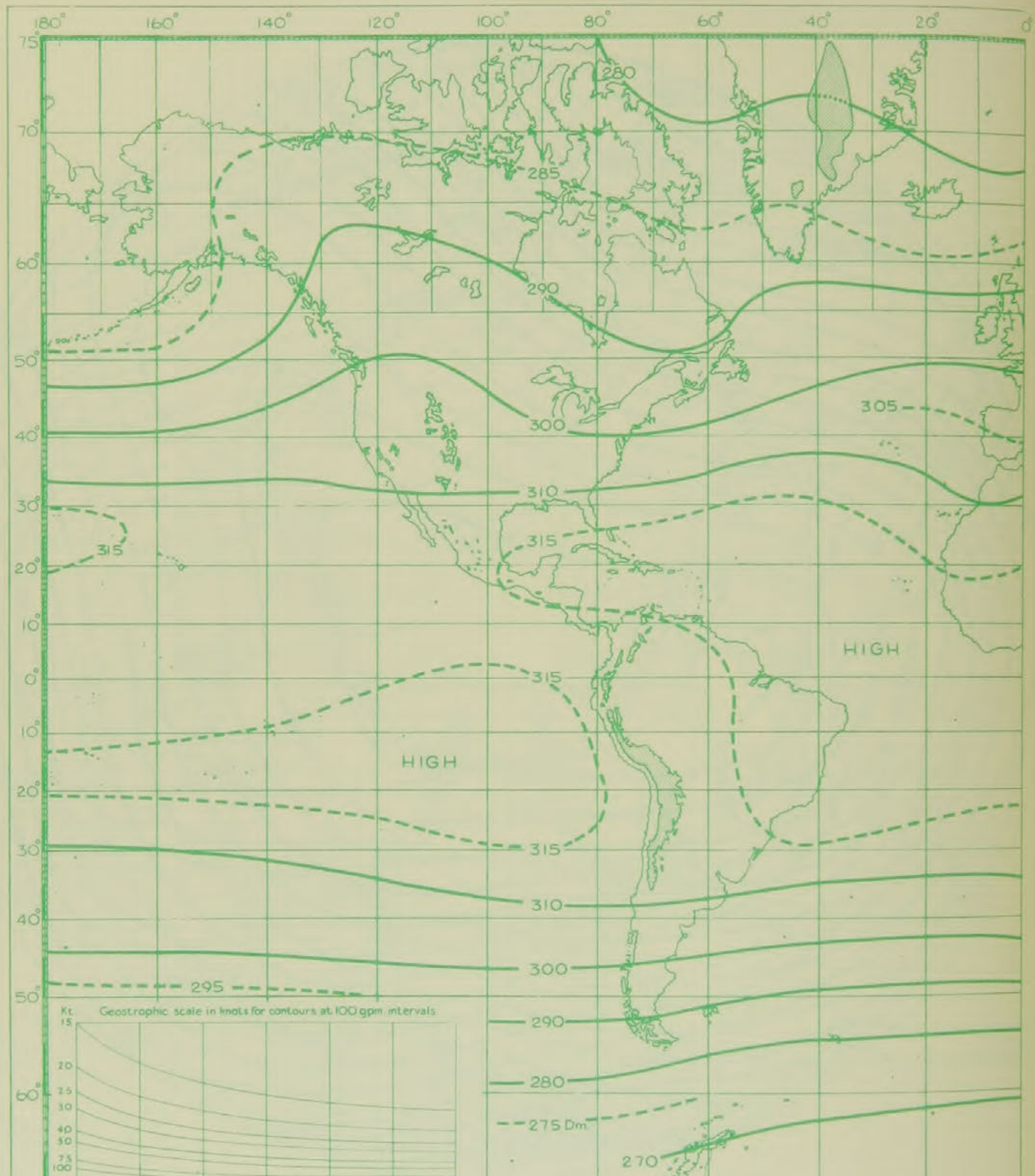


FIGURE 14—AVERAGE 700-MB. CONTOURS, APRIL 1949–53
I.C.A.O. height = 9,882 ft. = 3,012 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

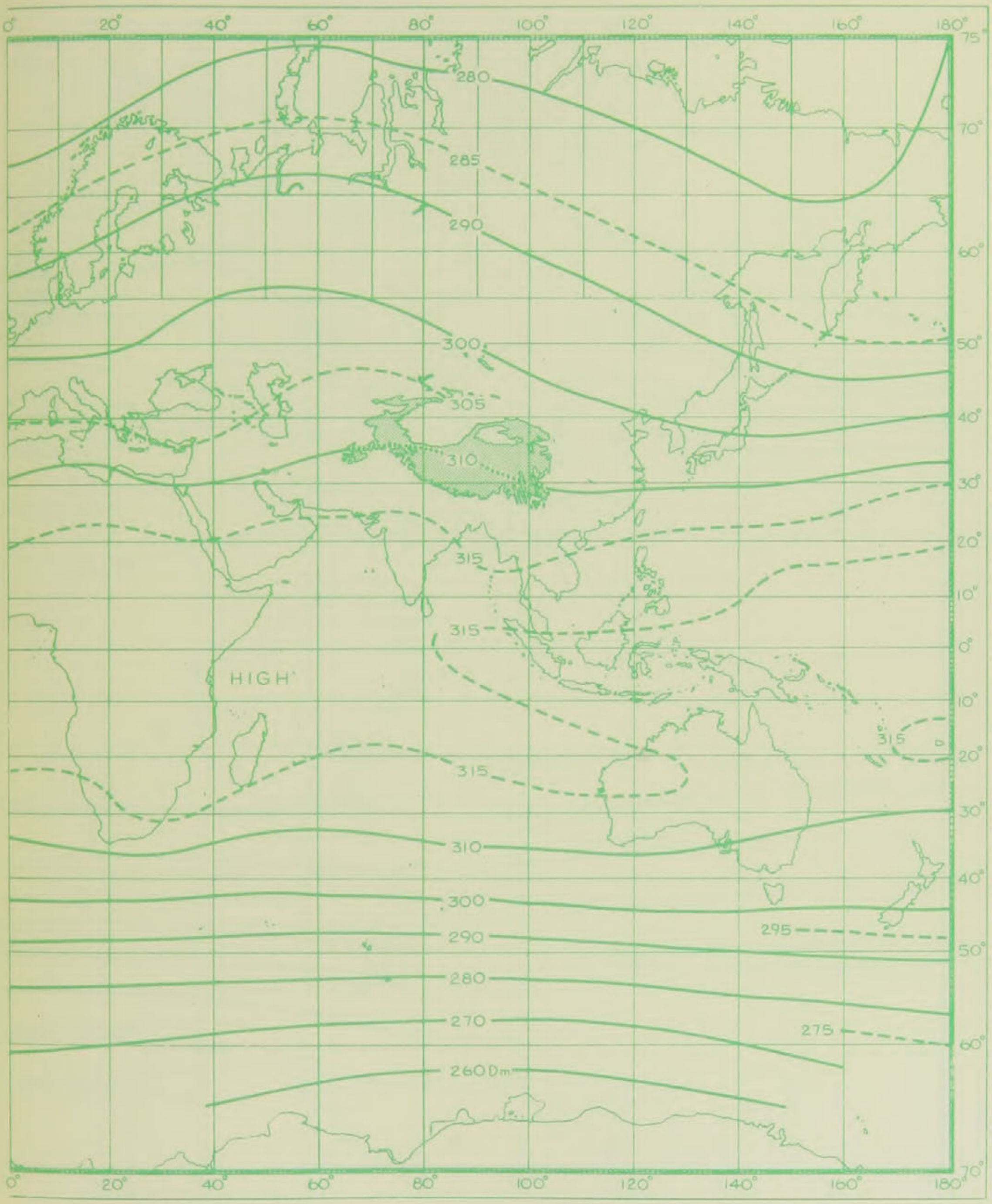


FIGURE 14—CONTINUED

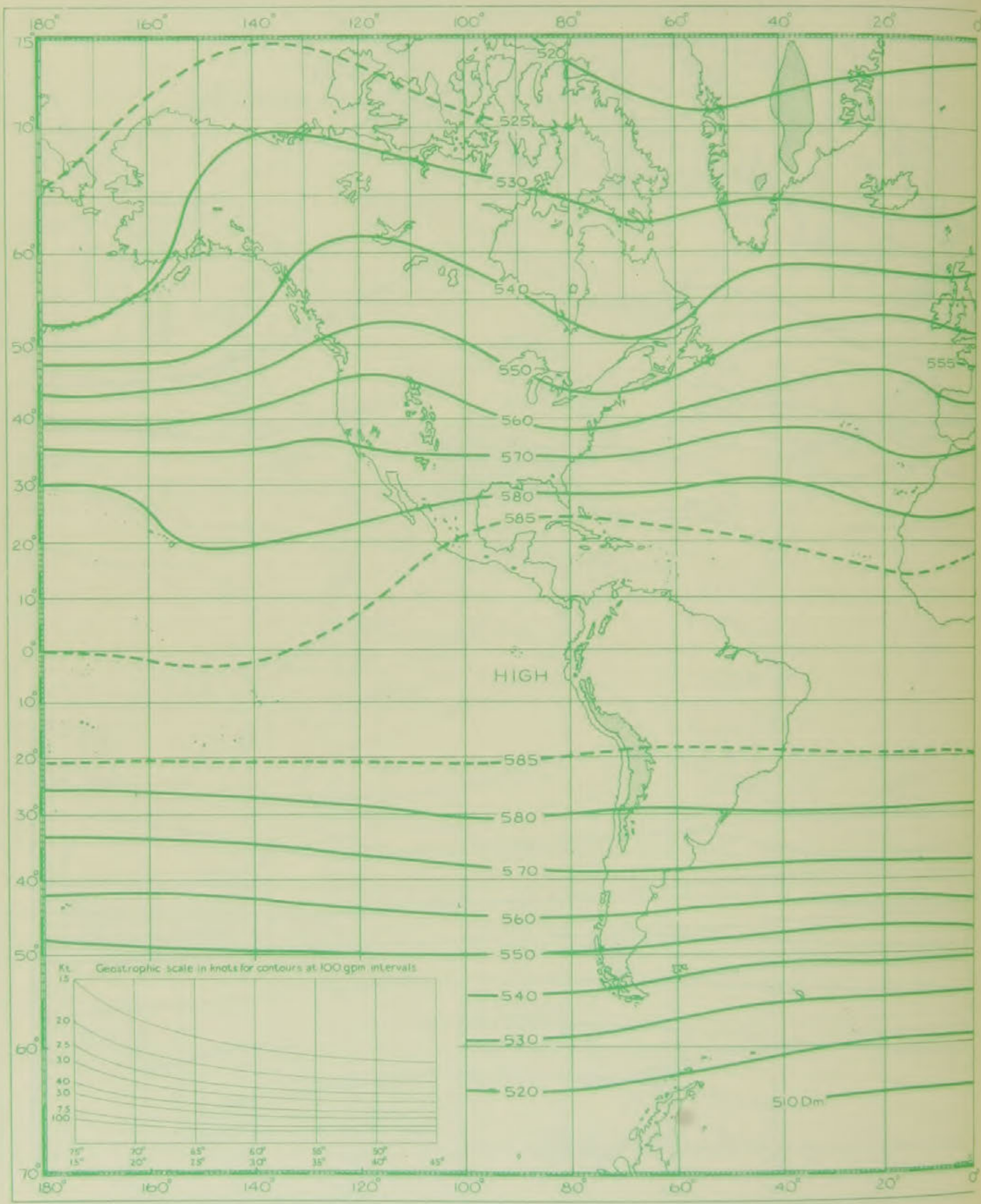


FIGURE 15—AVERAGE 500-MB. CONTOURS, APRIL 1949–53

I.C.A.O. height = 18,289 ft. = 5,574 m.

Heights of isobaric surfaces are in geopotential decametres

Shaded areas represent land over 3,000 m.

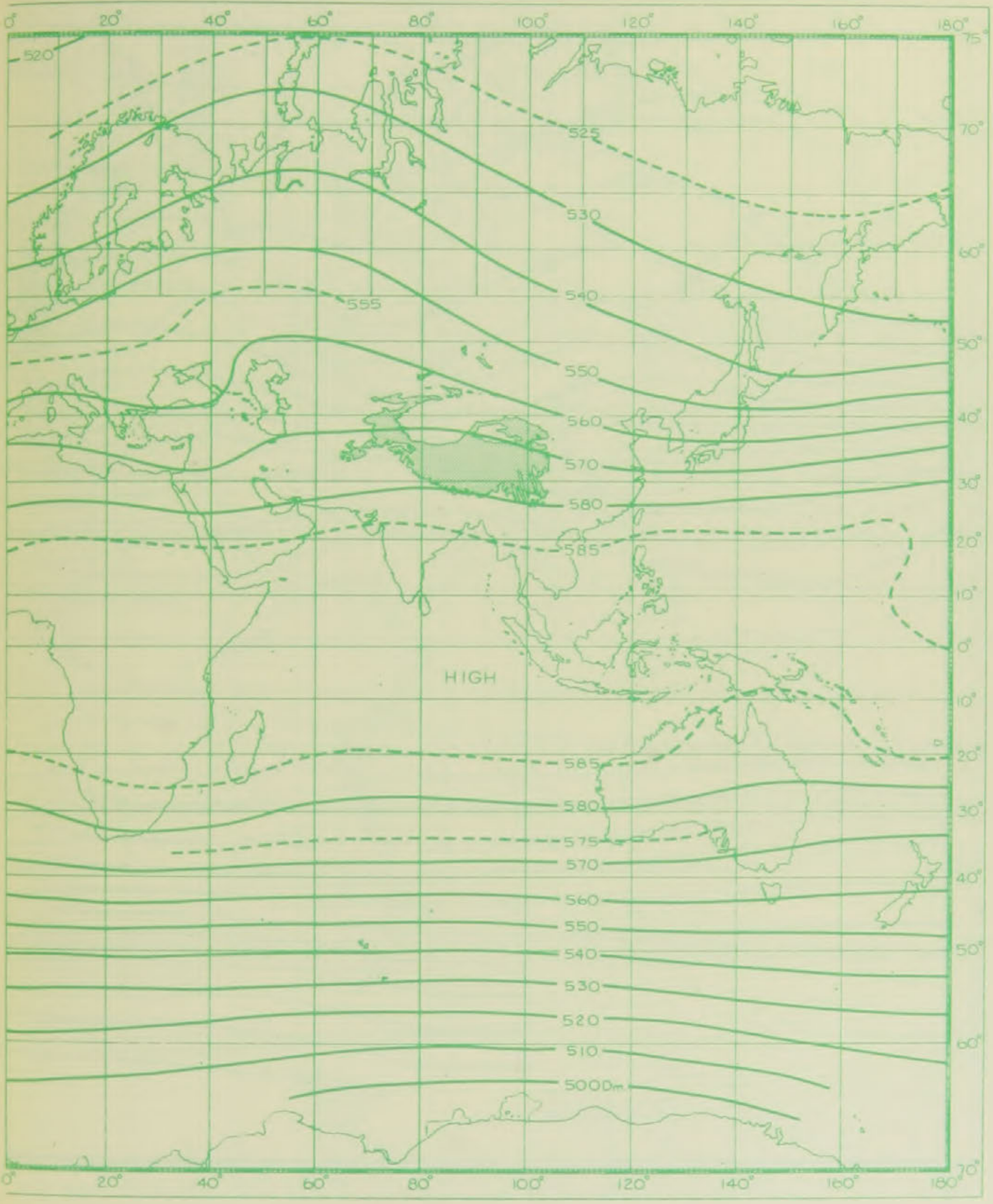


FIGURE 15—CONTINUED

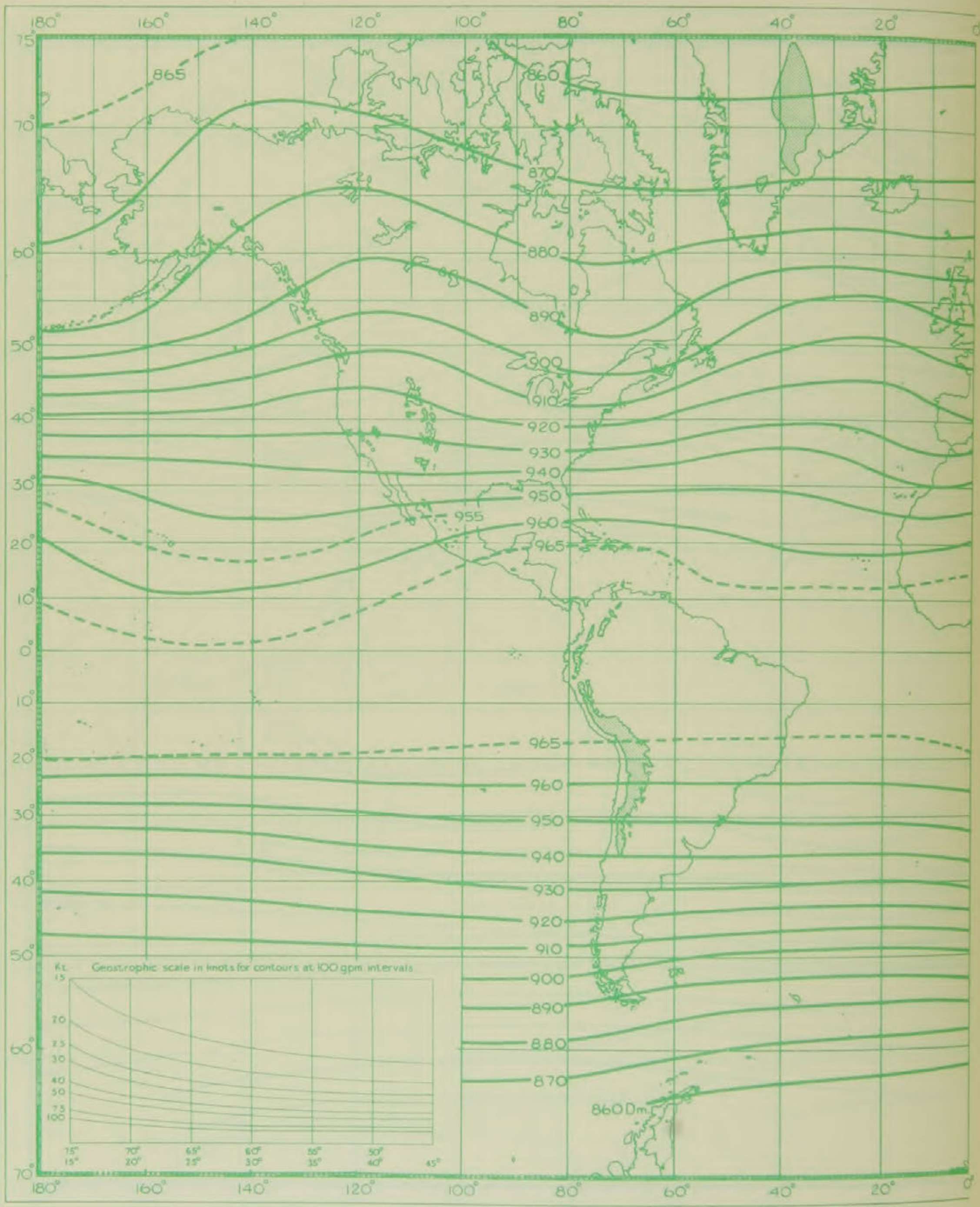


FIGURE 16—AVERAGE 300-MB. CONTOURS, APRIL 1949–53
I.C.A.O. height = 30,065 ft. = 9,164 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

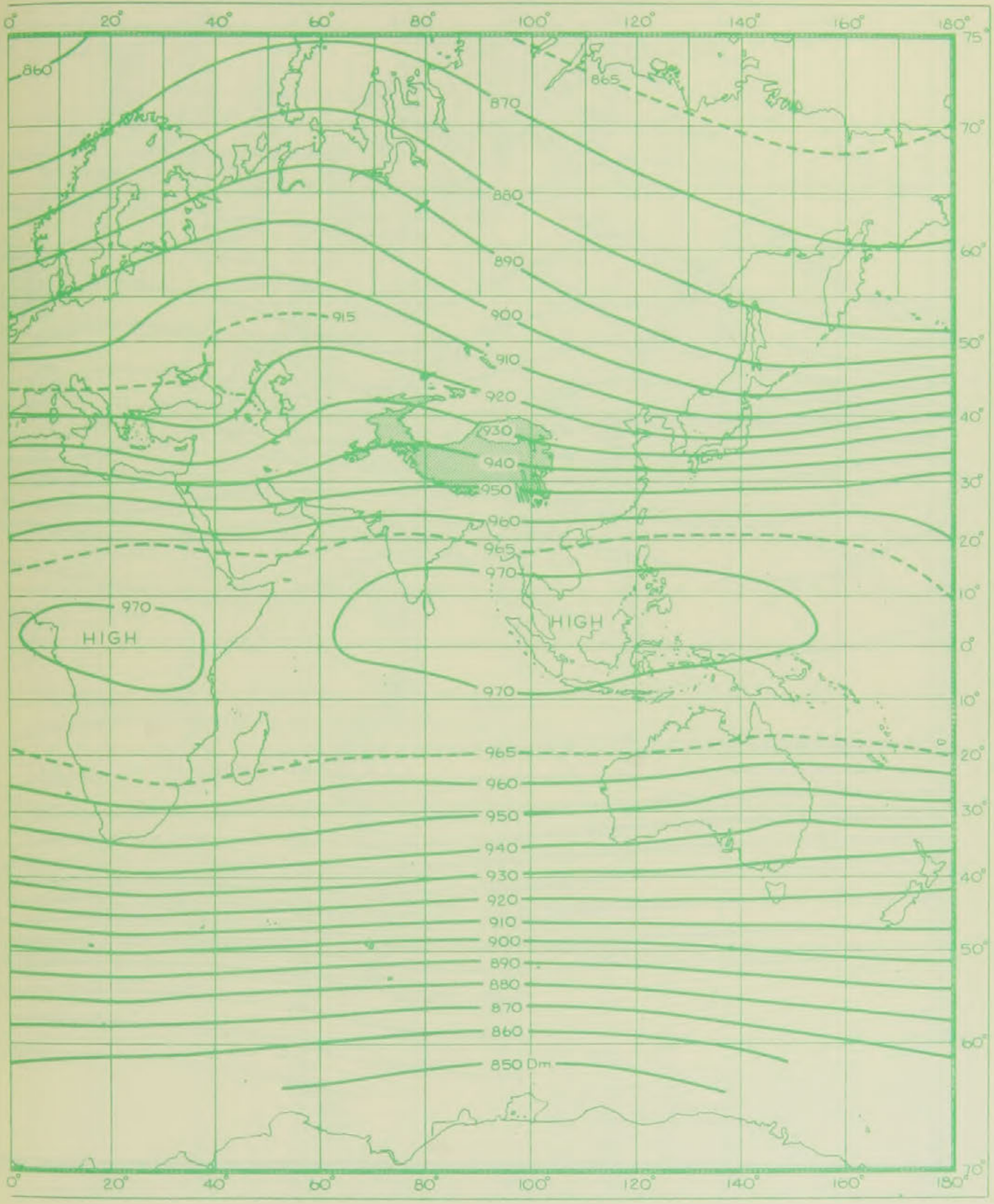


FIGURE 16—CONTINUED

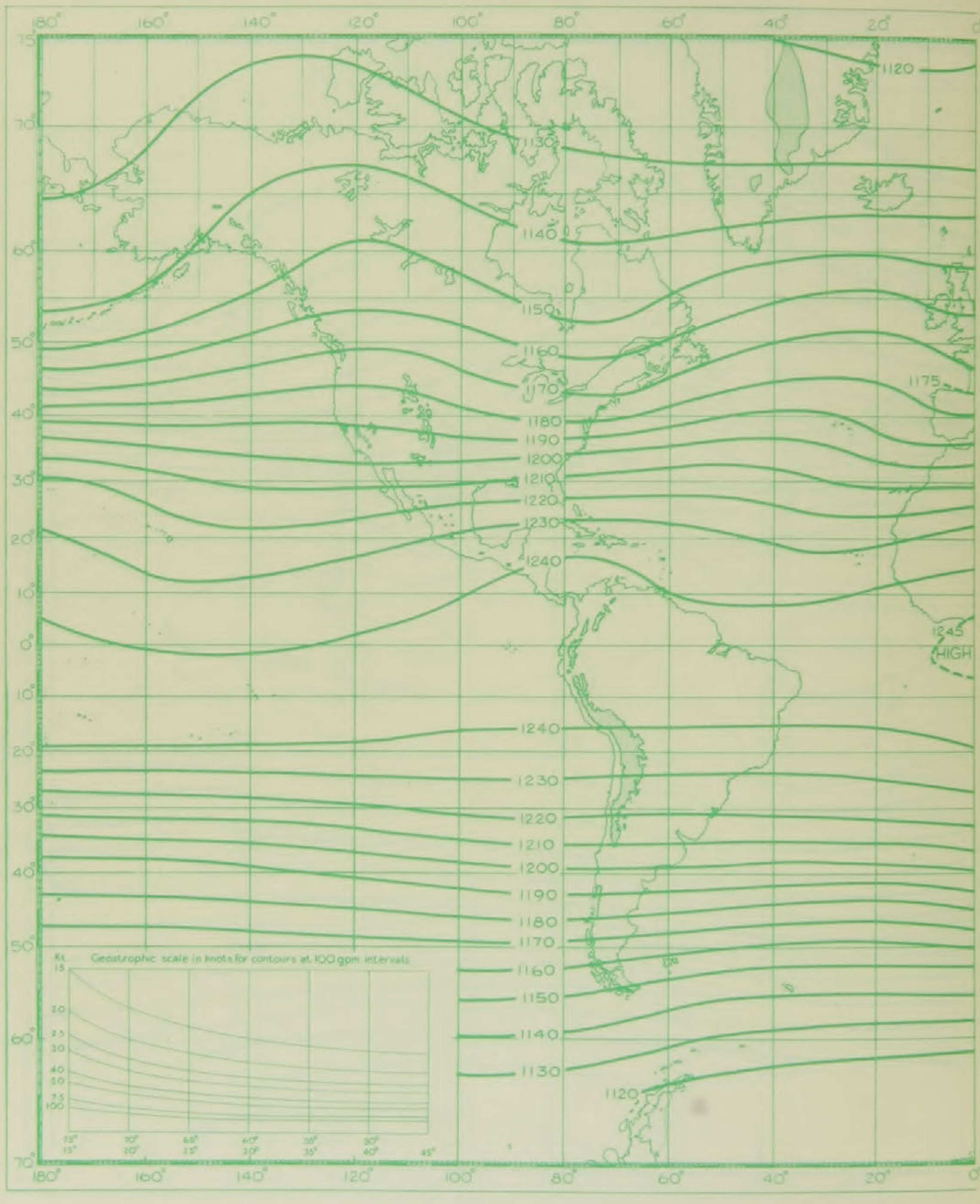


FIGURE 17—AVERAGE 200-MB. CONTOURS, APRIL 1949–53
I.C.A.O. height = 38,662 ft. = 11,784 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

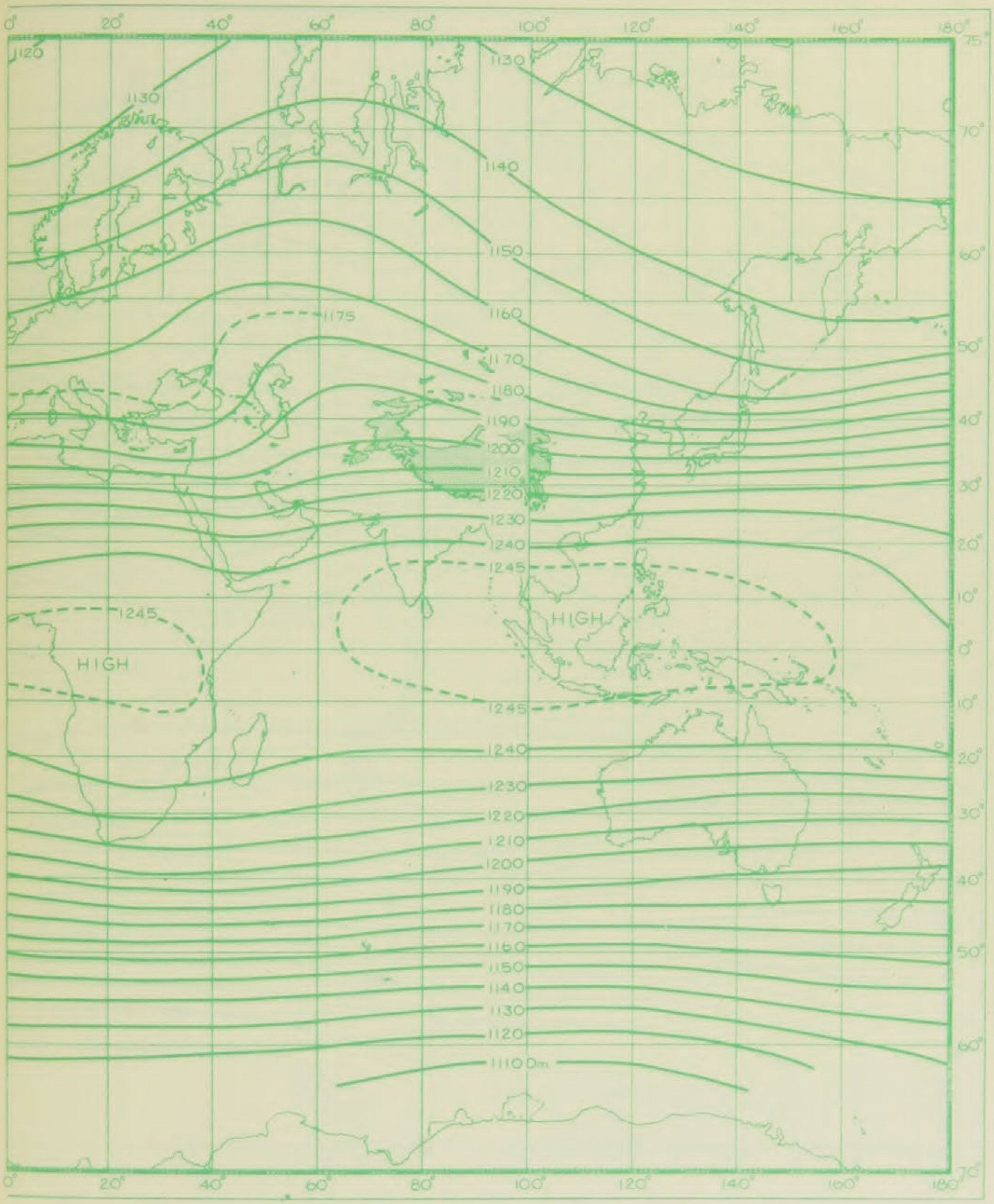


FIGURE 17—CONTINUED

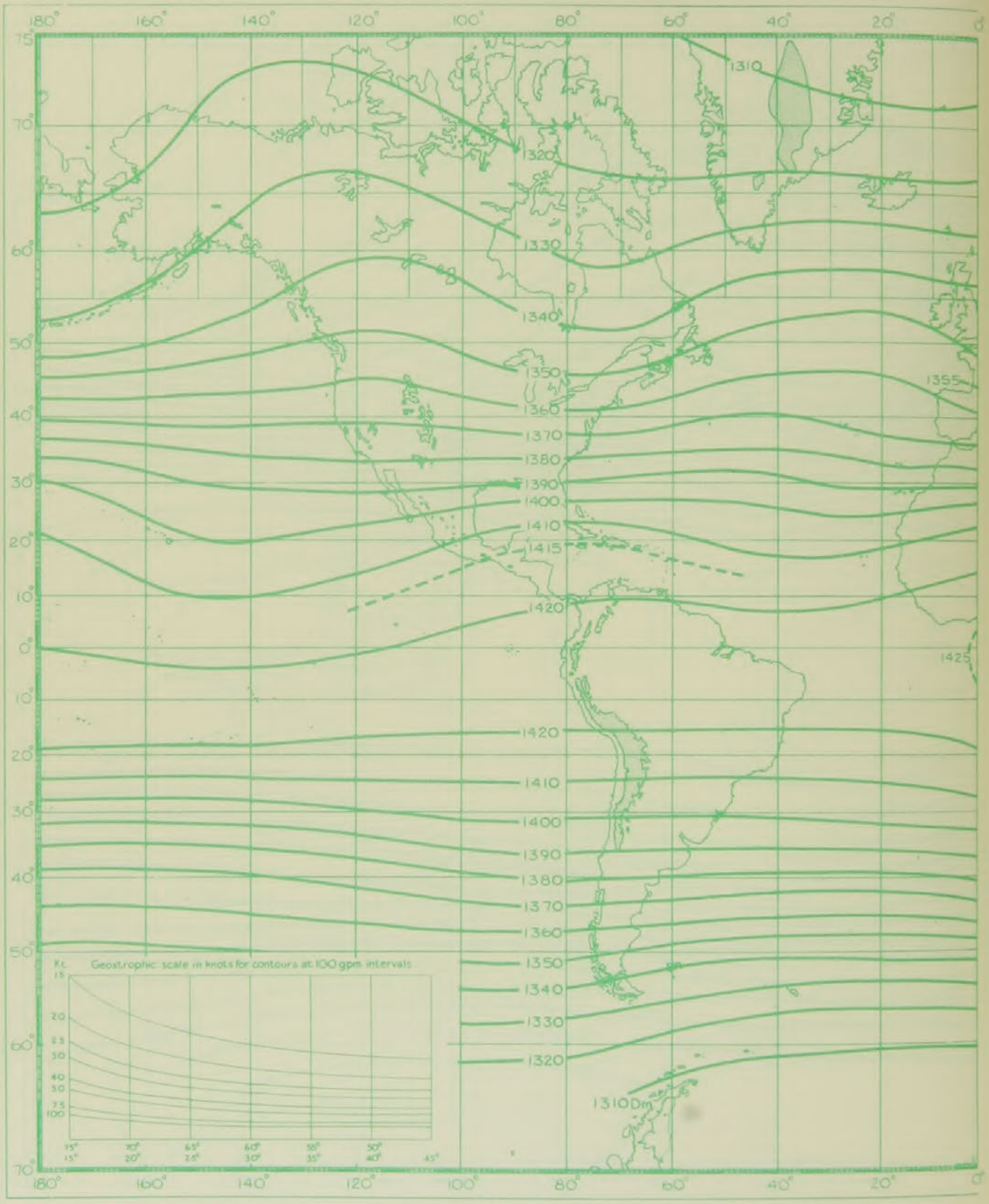


FIGURE 18—AVERAGE 150-MB. CONTOURS, APRIL 1949–53
I.C.A.O. height = 44,647 ft. = 13,608 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

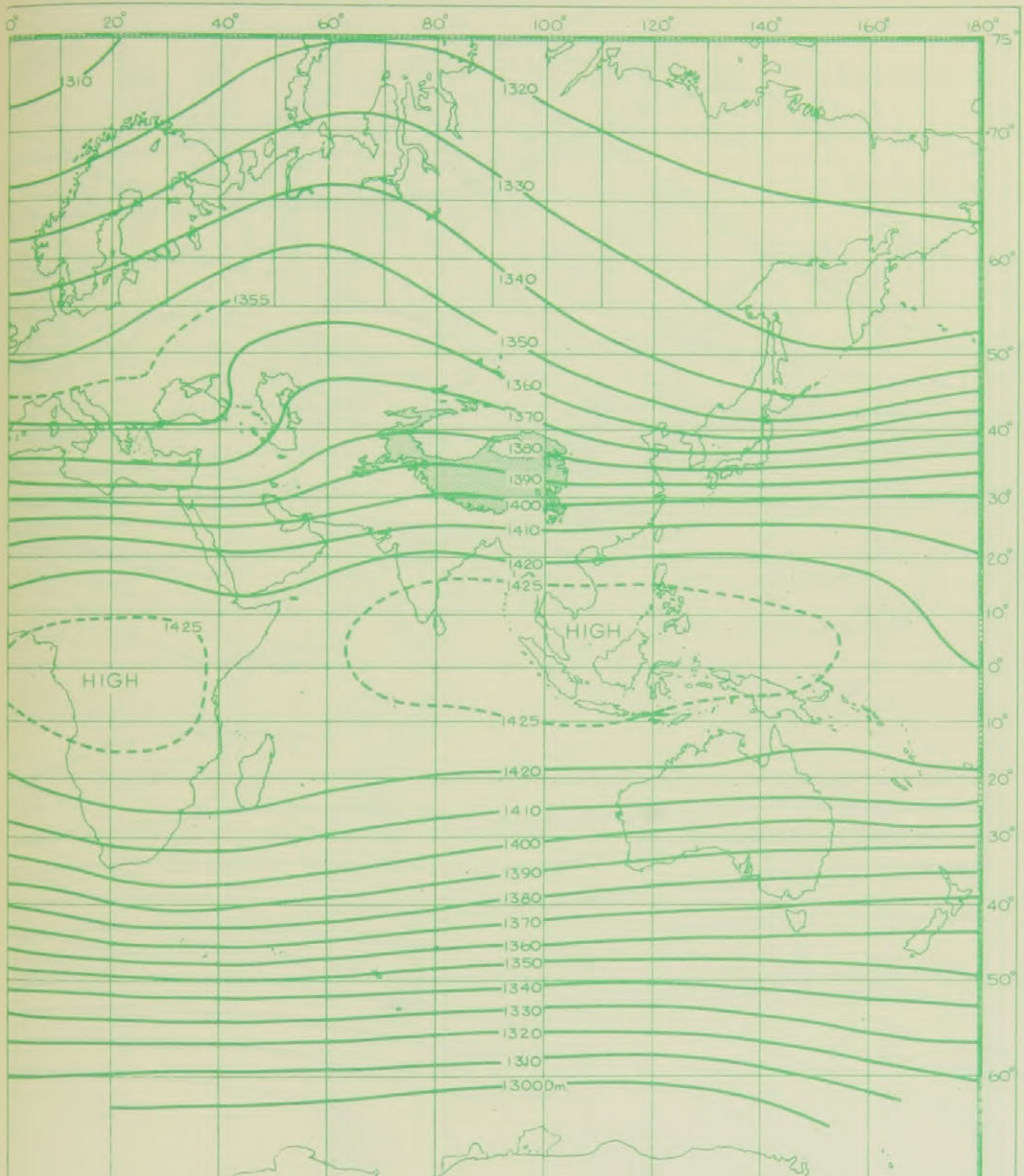


FIGURE 18—CONTINUED

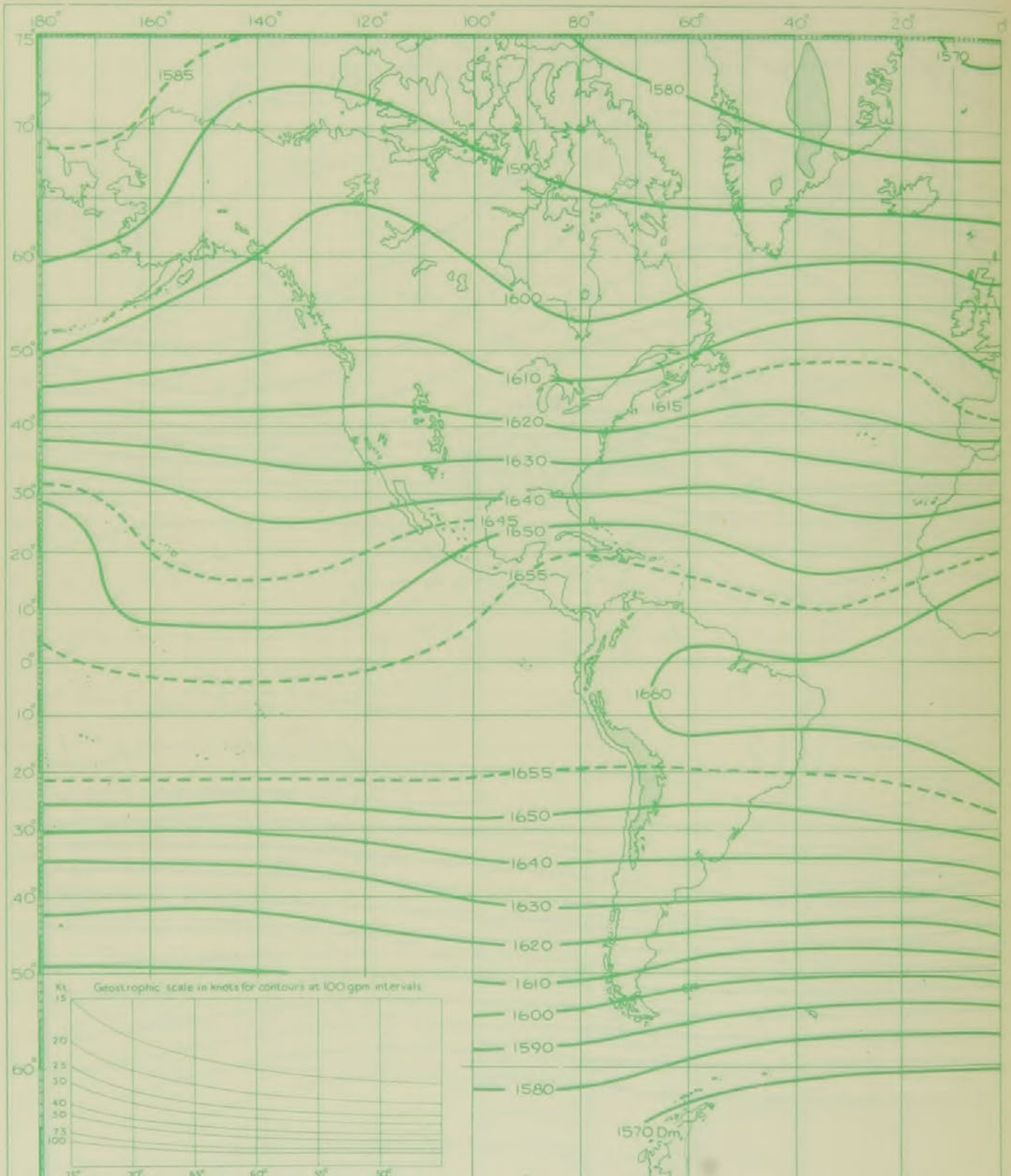


FIGURE 19—AVERAGE 100-MB. CONTOURS, APRIL 1949–53
I.C.A.O. height = 53,083 ft. = 16,180 m.
Heights of isobaric surfaces are in geopotential decametres
. Shaded areas represent land over 3,000 m.

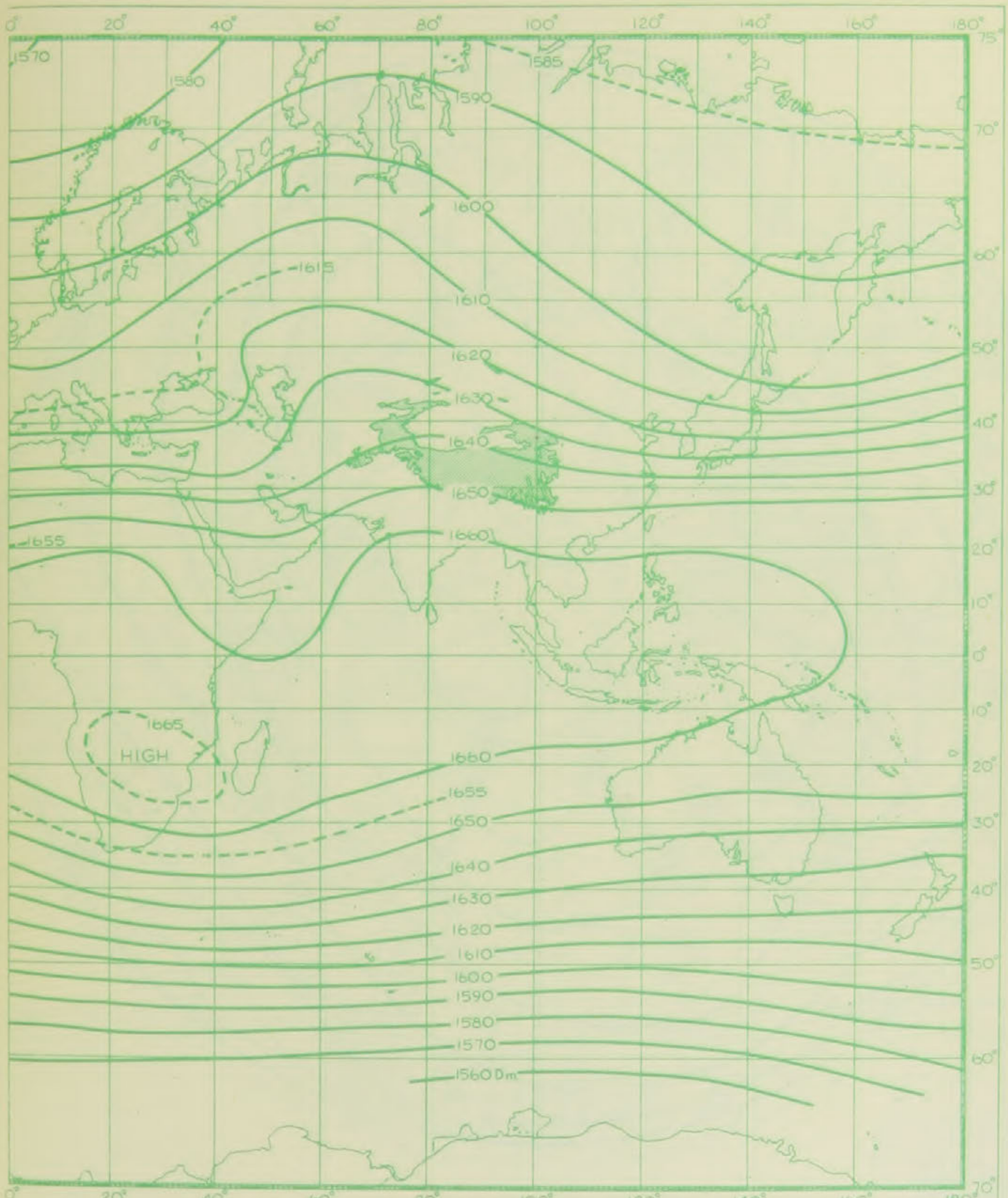


FIGURE 19—CONTINUED

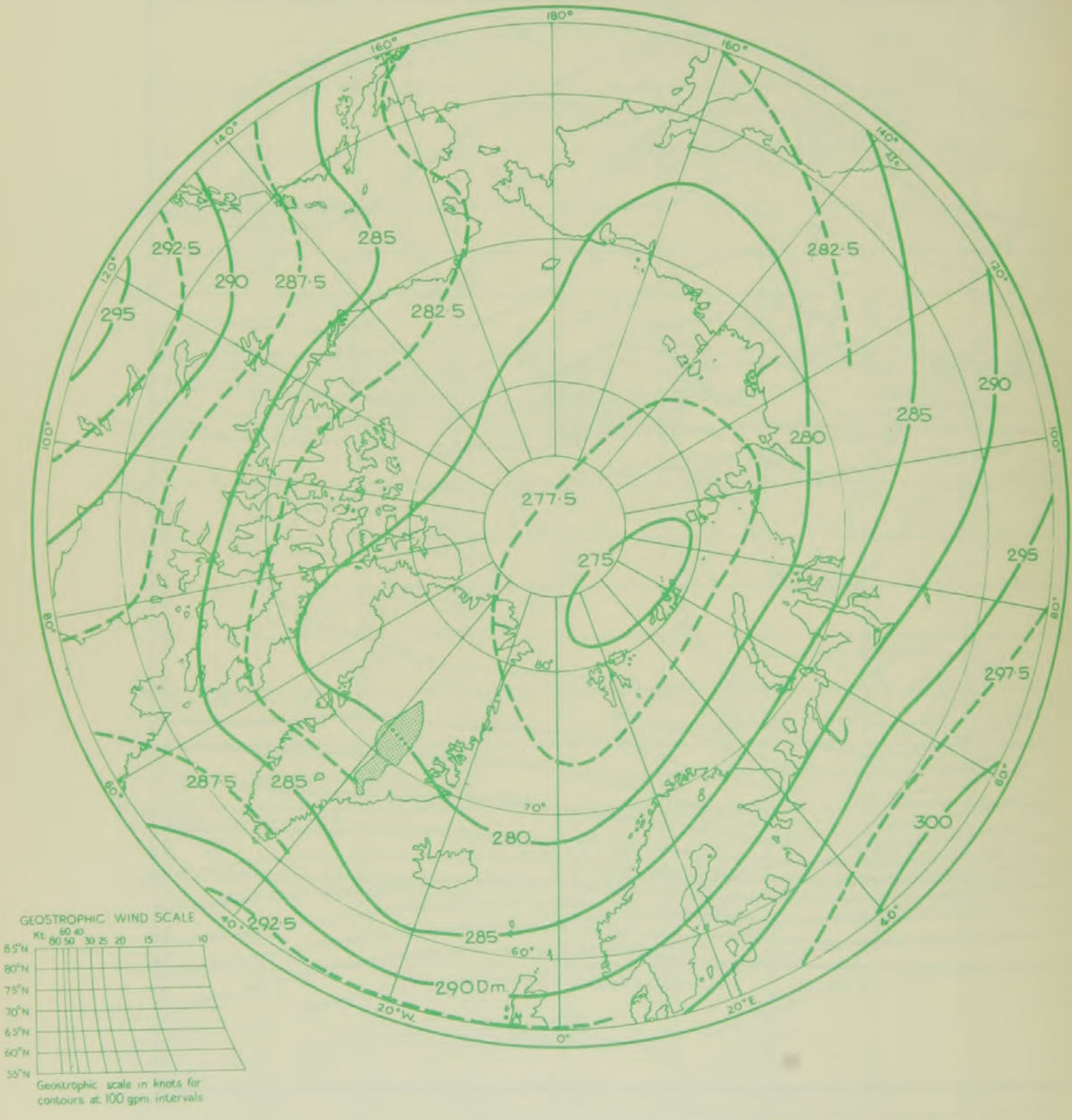


FIGURE 20—AVERAGE 700-MB. CONTOURS, APRIL 1949–53
I.C.A.O. height = 9,882 ft. = 3,012 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

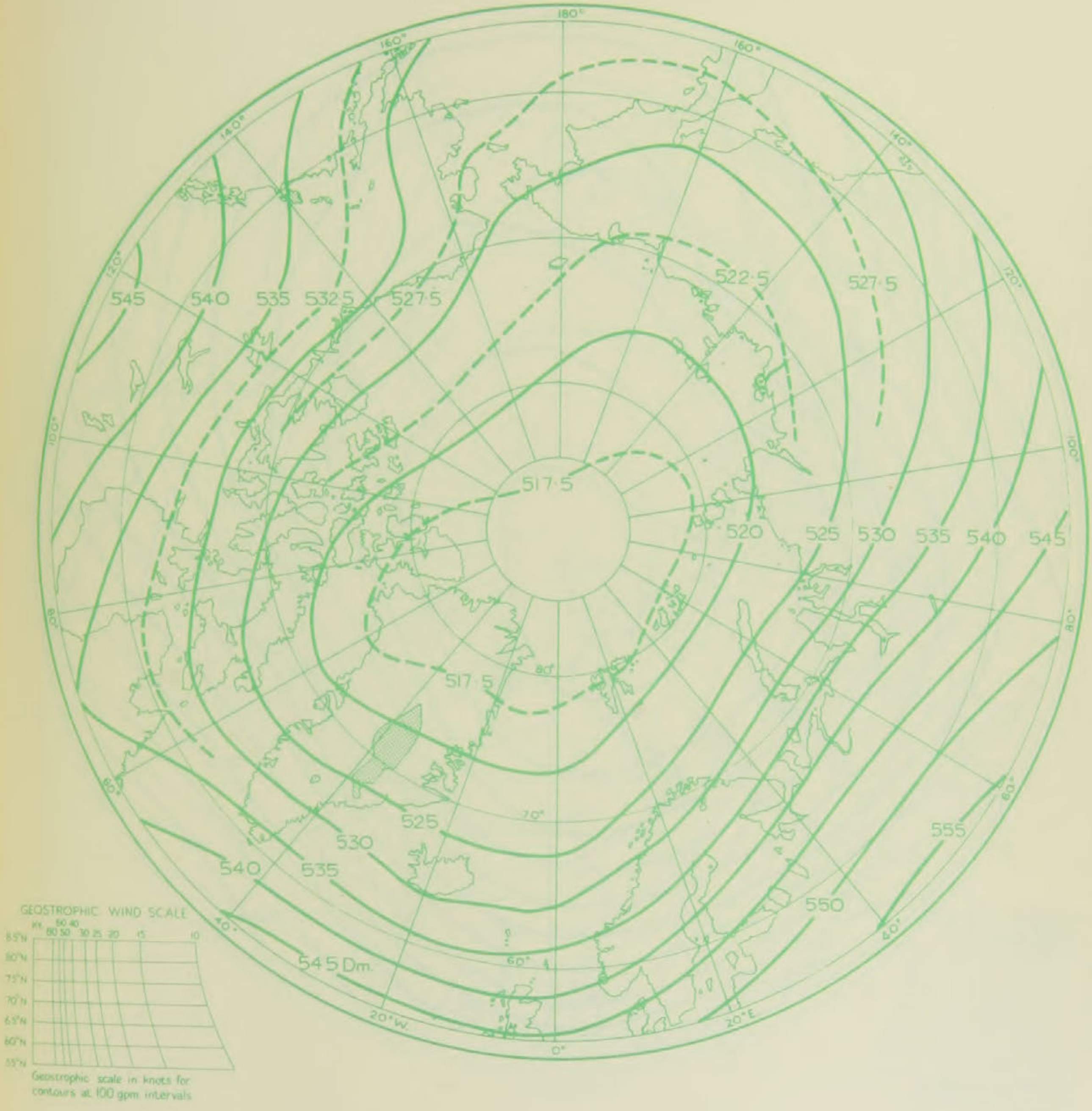


FIGURE 21—AVERAGE 500-MB. CONTOURS, APRIL 1949–53
I.C.A.O. height = 18,289 ft. = 5,574 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

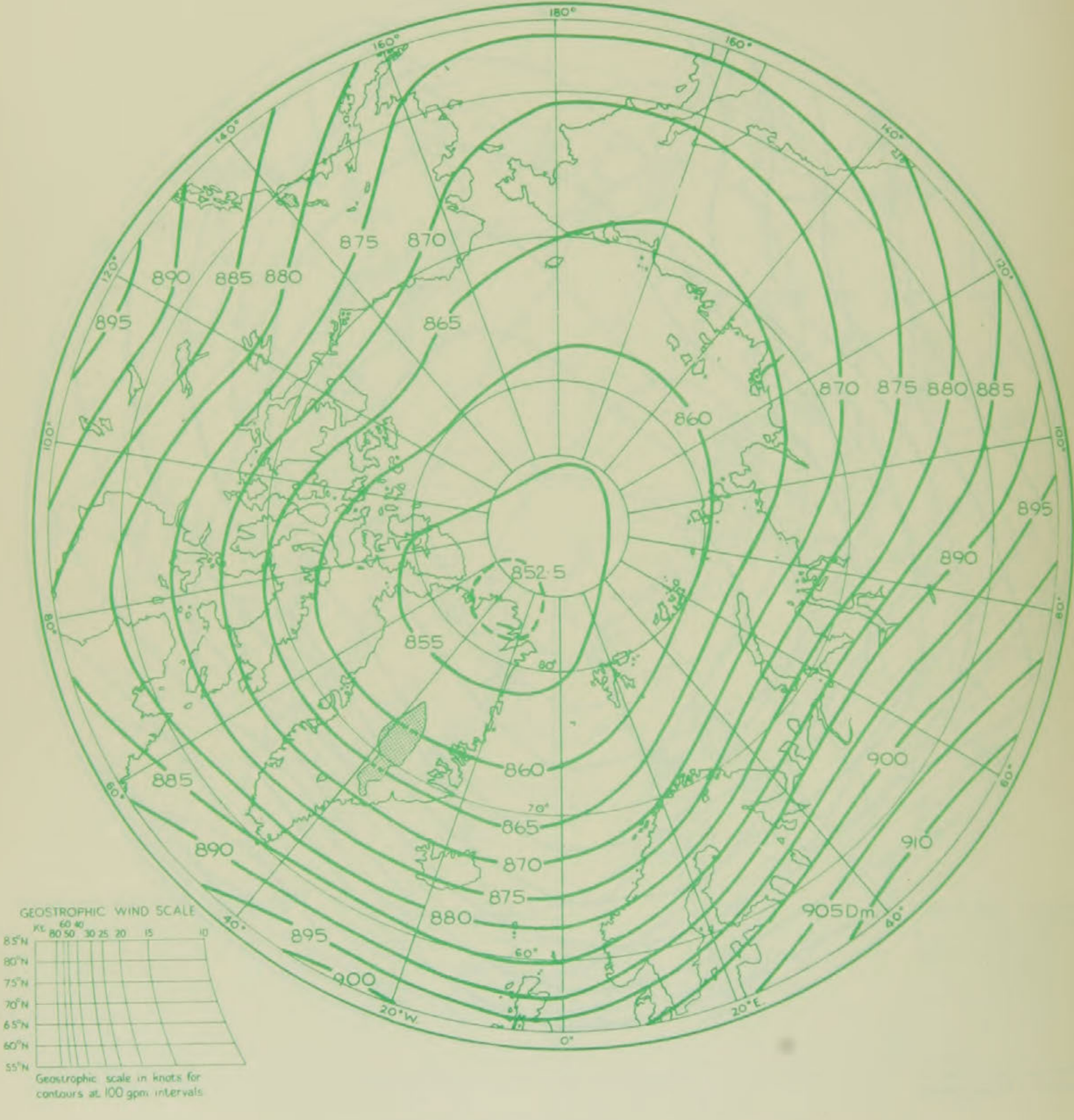


FIGURE 22—AVERAGE 300-MB. CONTOURS, APRIL 1949–53
I.C.A.O. height = 30,065 ft. = 9,164 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

FIGURE 23—AVERAGE 200-MB. CONTOURS, APRIL 1949–53

I.C.A.O. height = 38,662 ft. = 11,784 m.

Heights of isobaric surfaces are in geopotential decametres

Shaded areas represent land over 3,000 m.

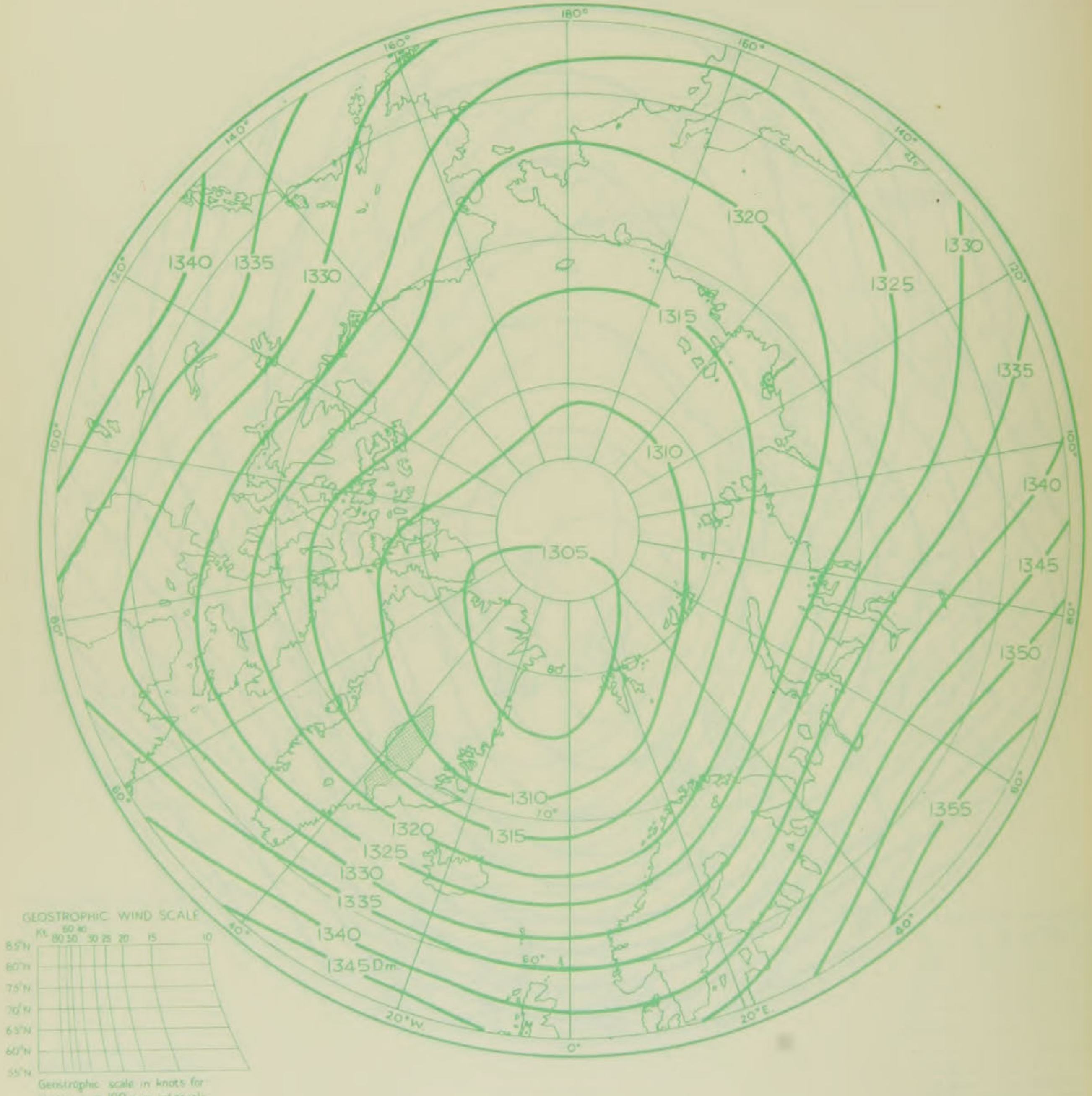


FIGURE 24—AVERAGE 150-MB. CONTOURS, APRIL 1949–53
I.C.A.O. height = 44,647 ft. = 13,608 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

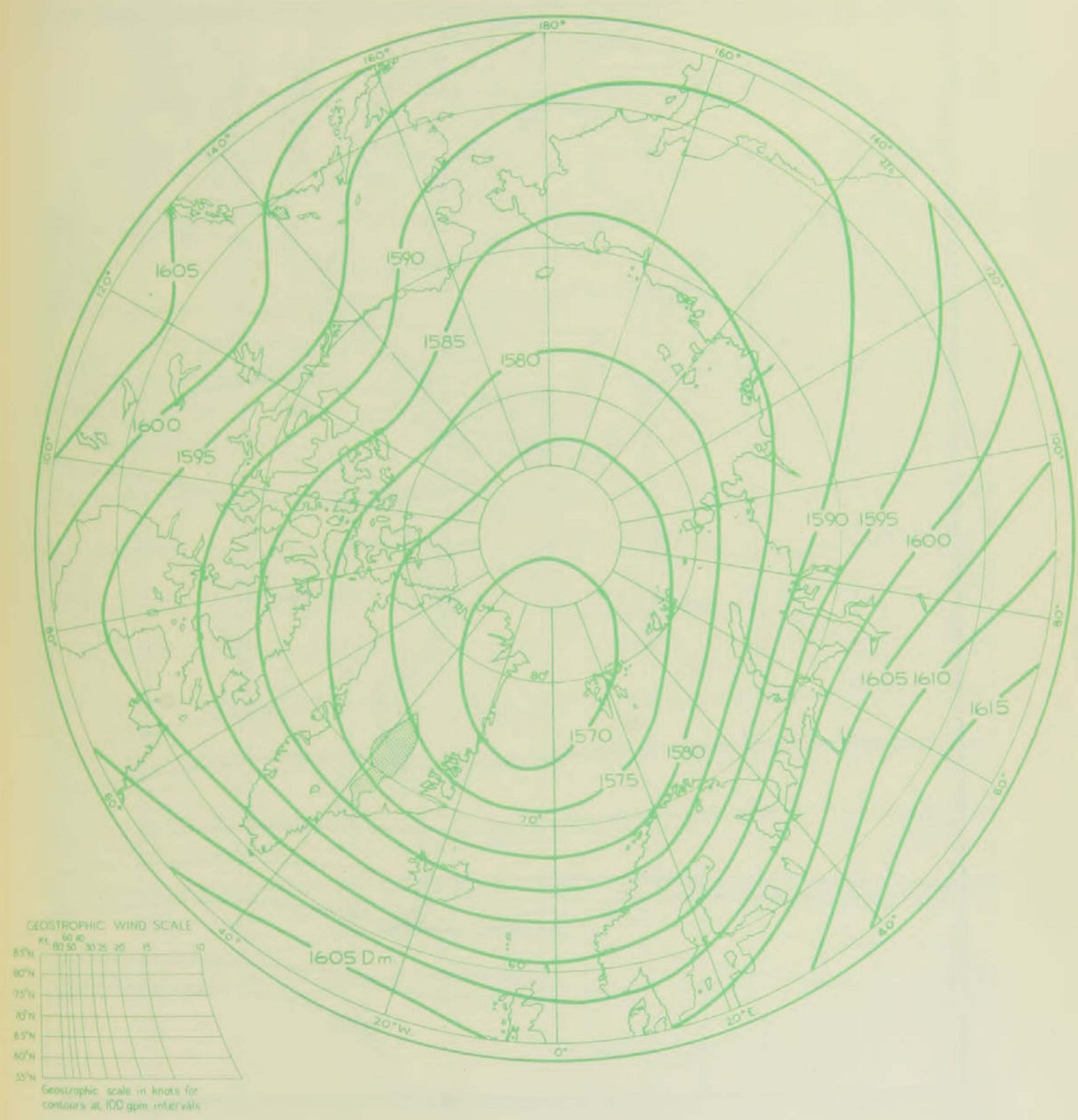


FIGURE 25—AVERAGE 100-MB. CONTOURS, APRIL 1949–53
I.C.A.O. height = 53,083 ft. = 16,180 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

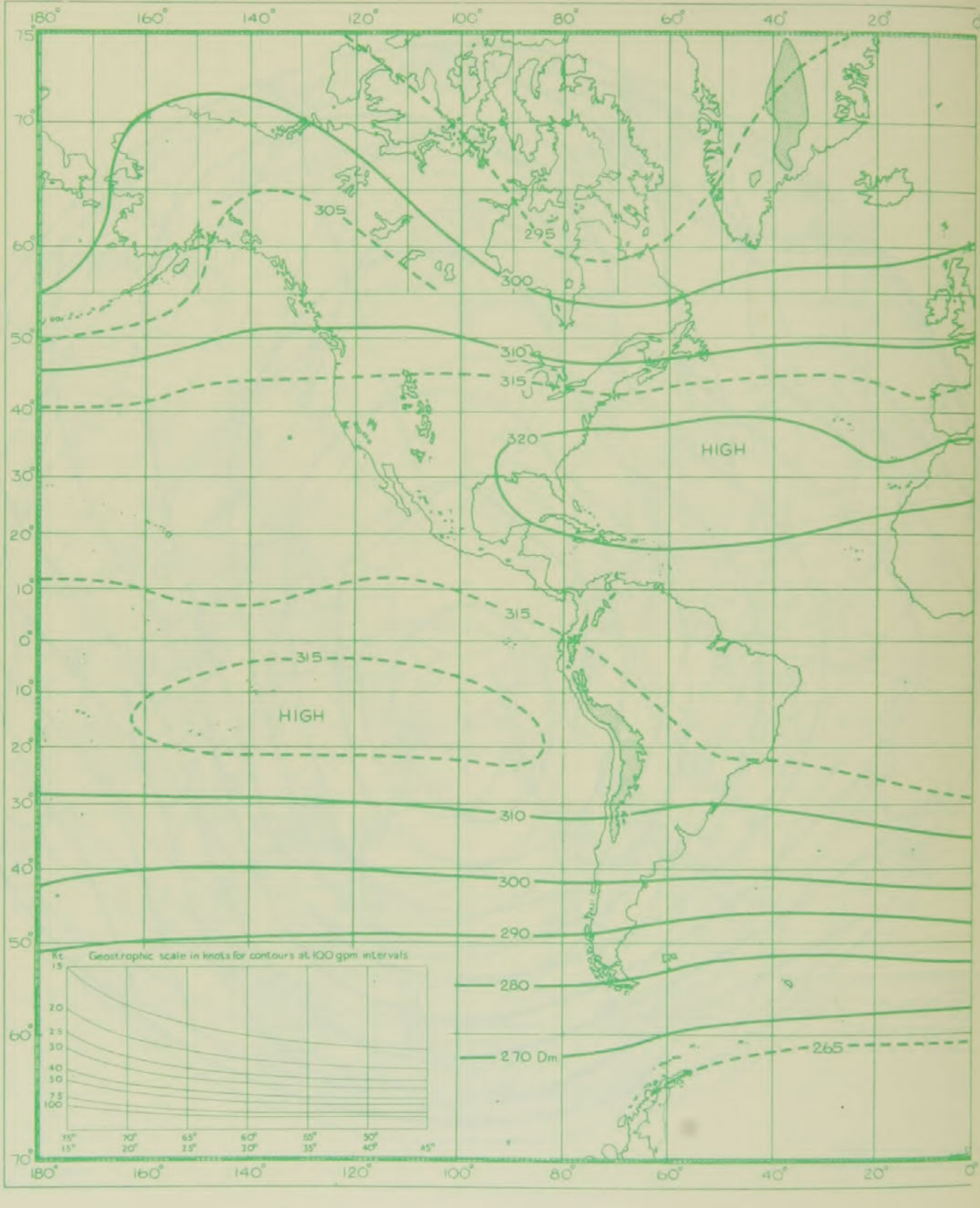


FIGURE 26—AVERAGE 700-MB. CONTOURS, JULY 1949-53

I.C.A.O. height = 9,882 ft. = 3,012 m.

Heights of isobaric surfaces are in geopotential decametres

Shaded areas represent land over 3,000 m.

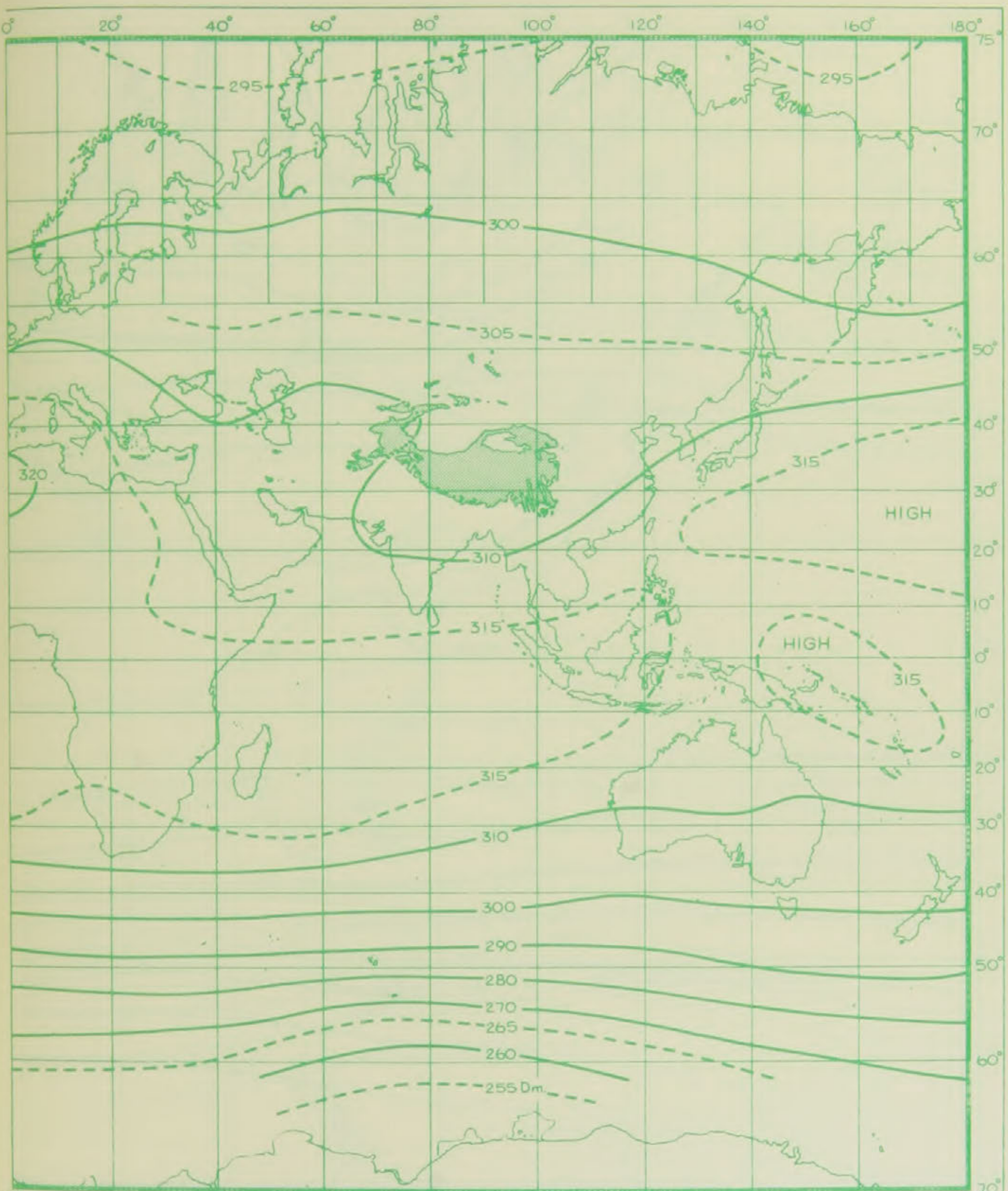


FIGURE 26—CONTINUED

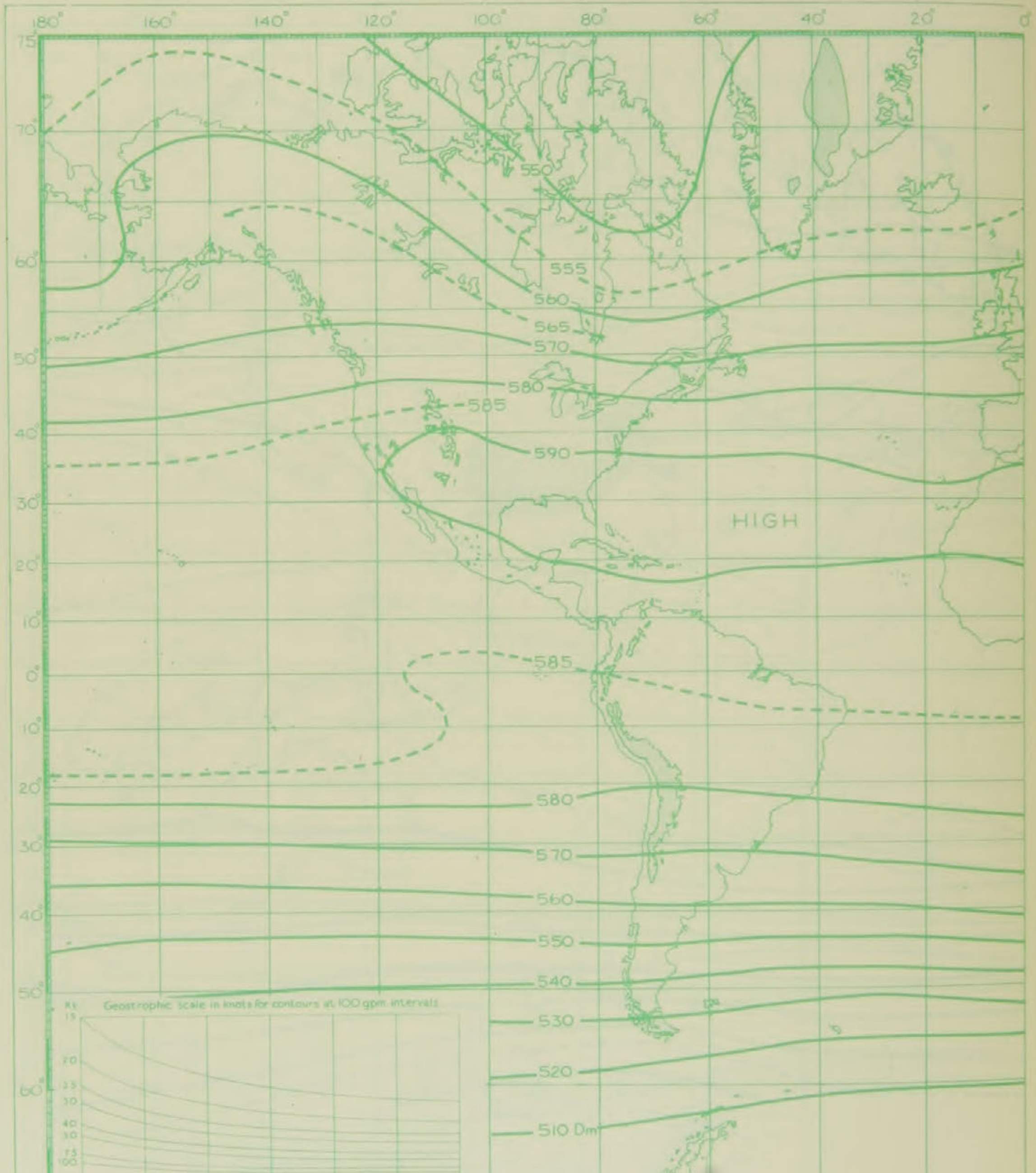


FIGURE 27—AVERAGE 500-MB. CONTOURS, JULY 1949–53
I.C.A.O. height = 18,289 ft. = 5,574 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

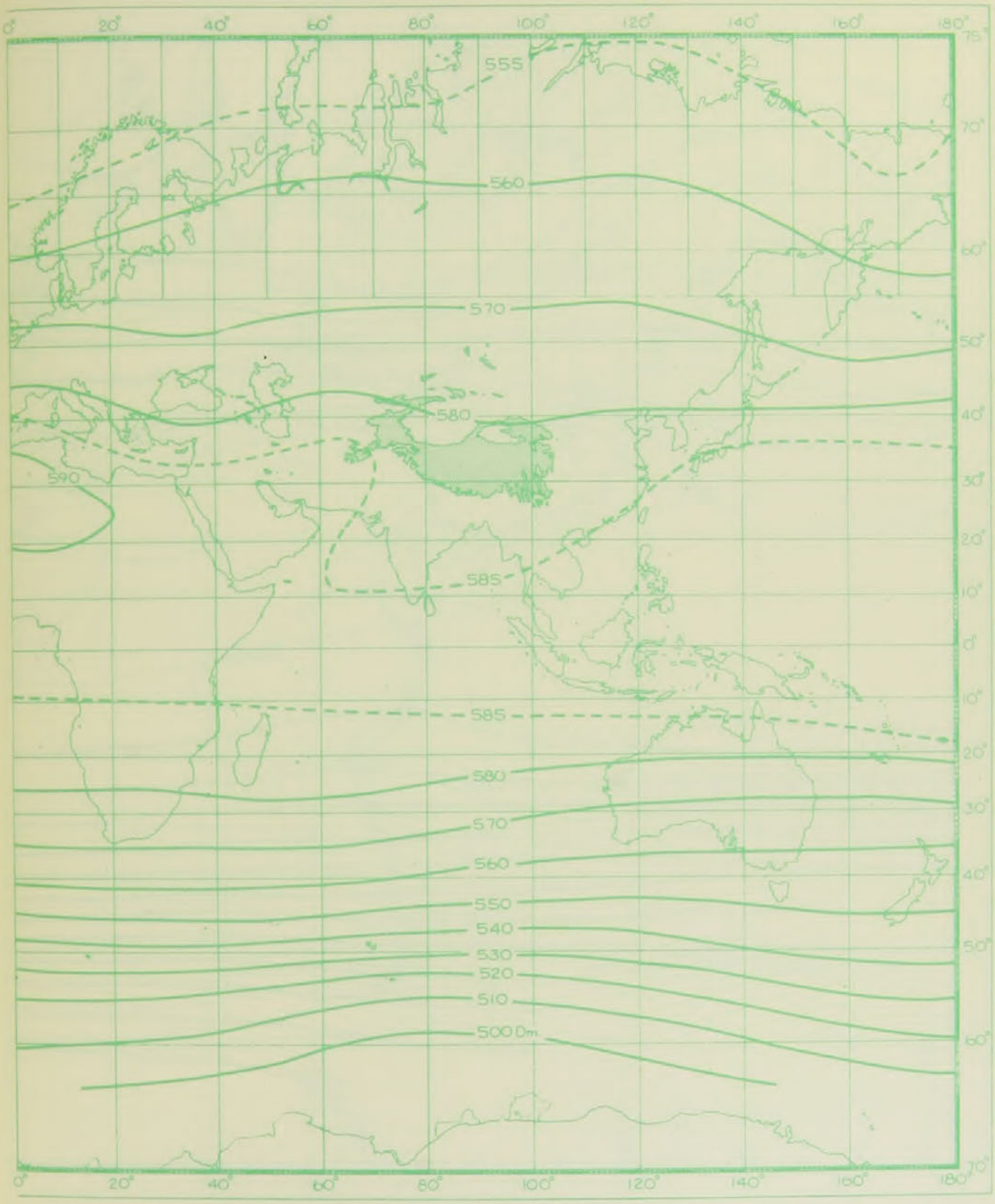


FIGURE 27—CONTINUED

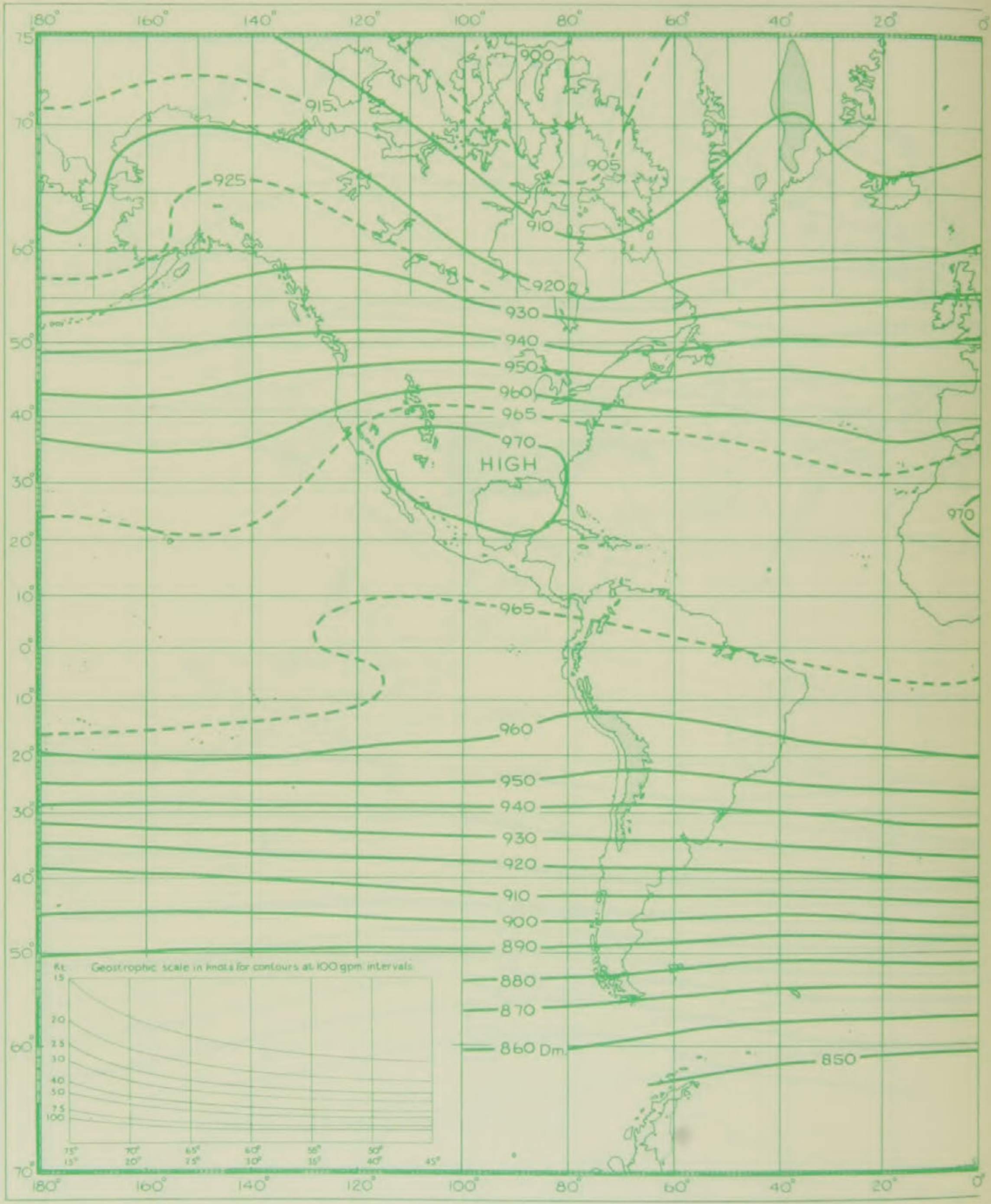


FIGURE 28—AVERAGE 300-MB. CONTOURS, JULY 1949–53
I.C.A.O. height = 30,065 ft. = 9,164 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

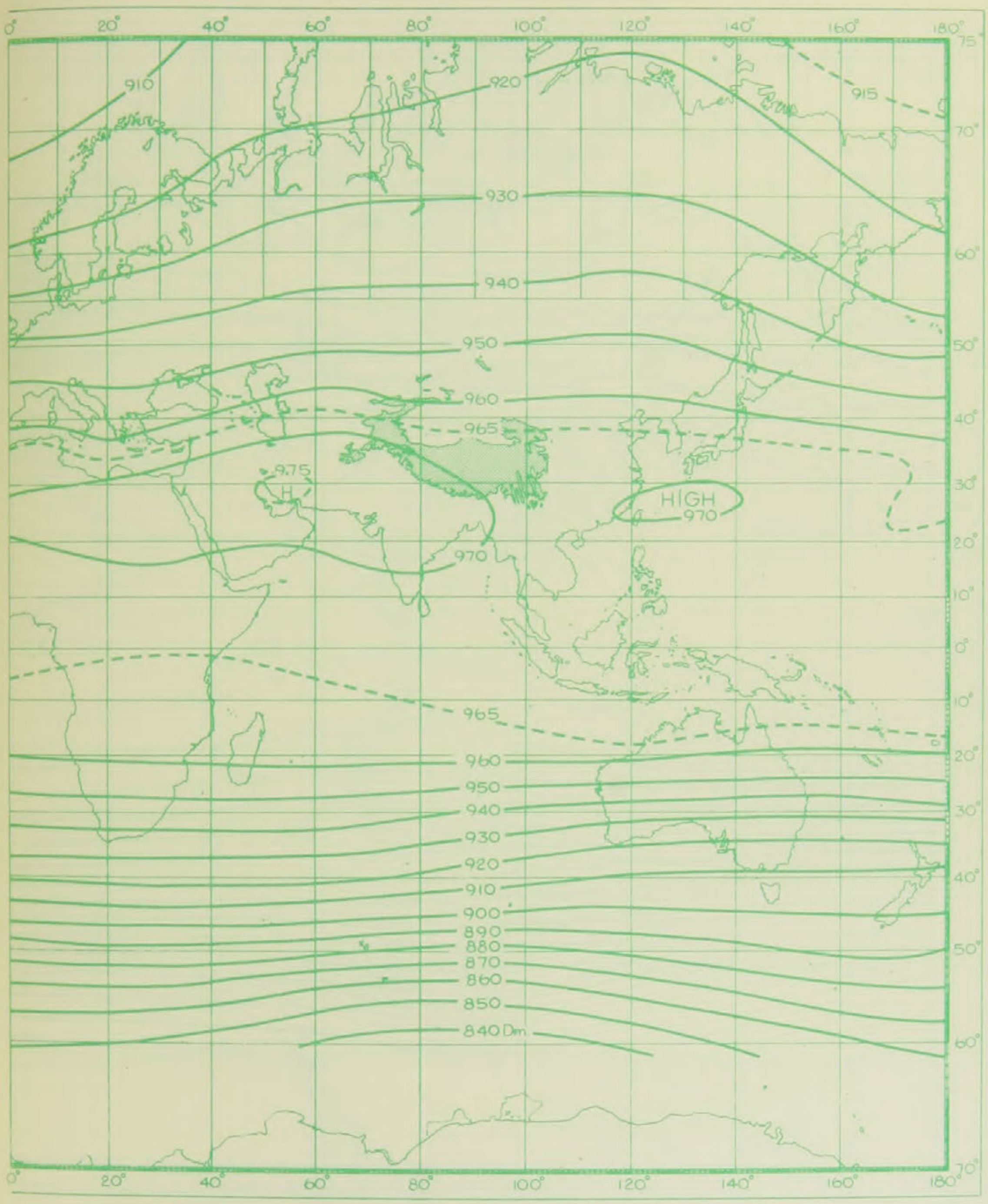


FIGURE 28—CONTINUED

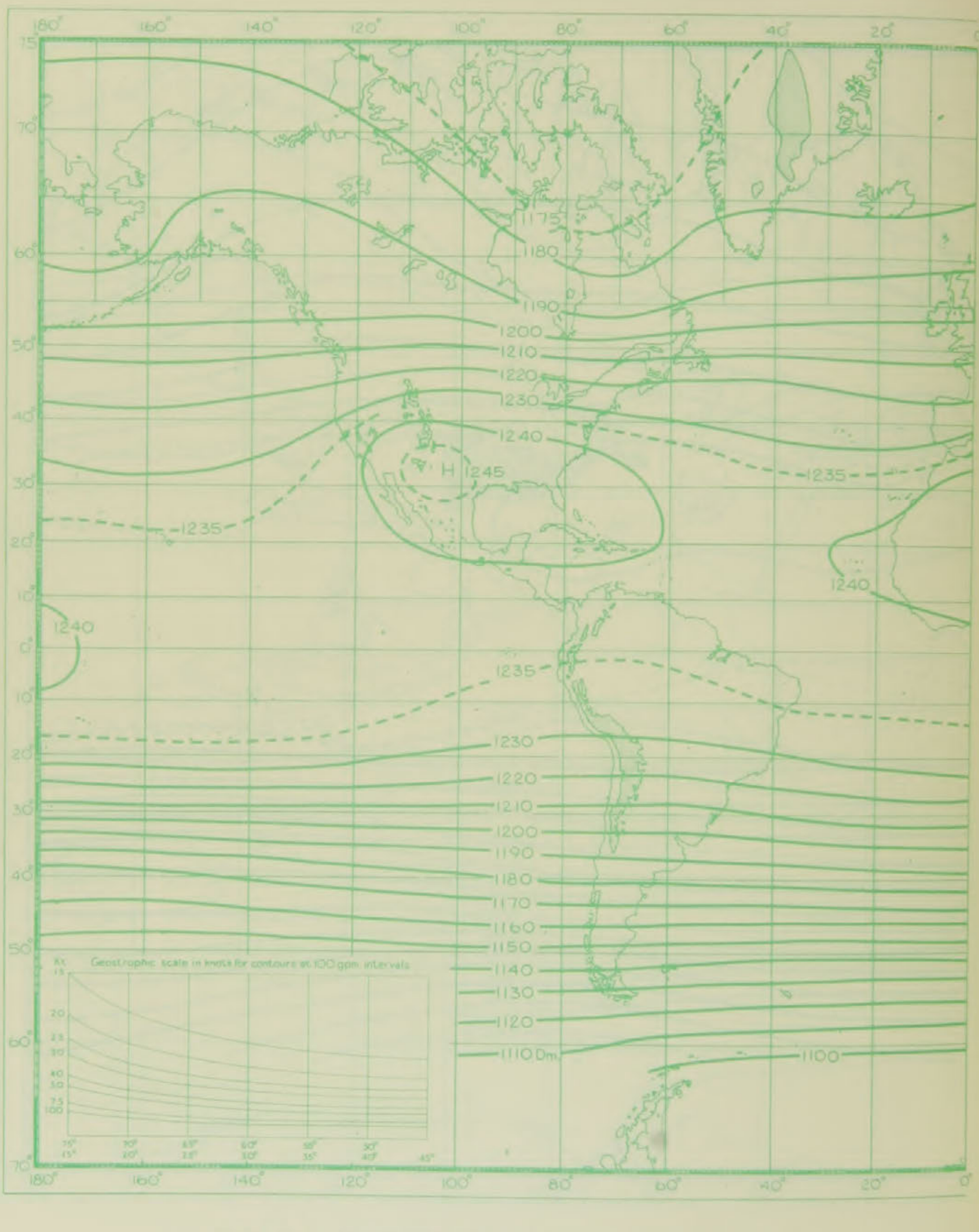


FIGURE 29—AVERAGE 200-MB. CONTOURS, JULY 1949–53
I.C.A.O. height = 38,662 ft. = 11,784 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

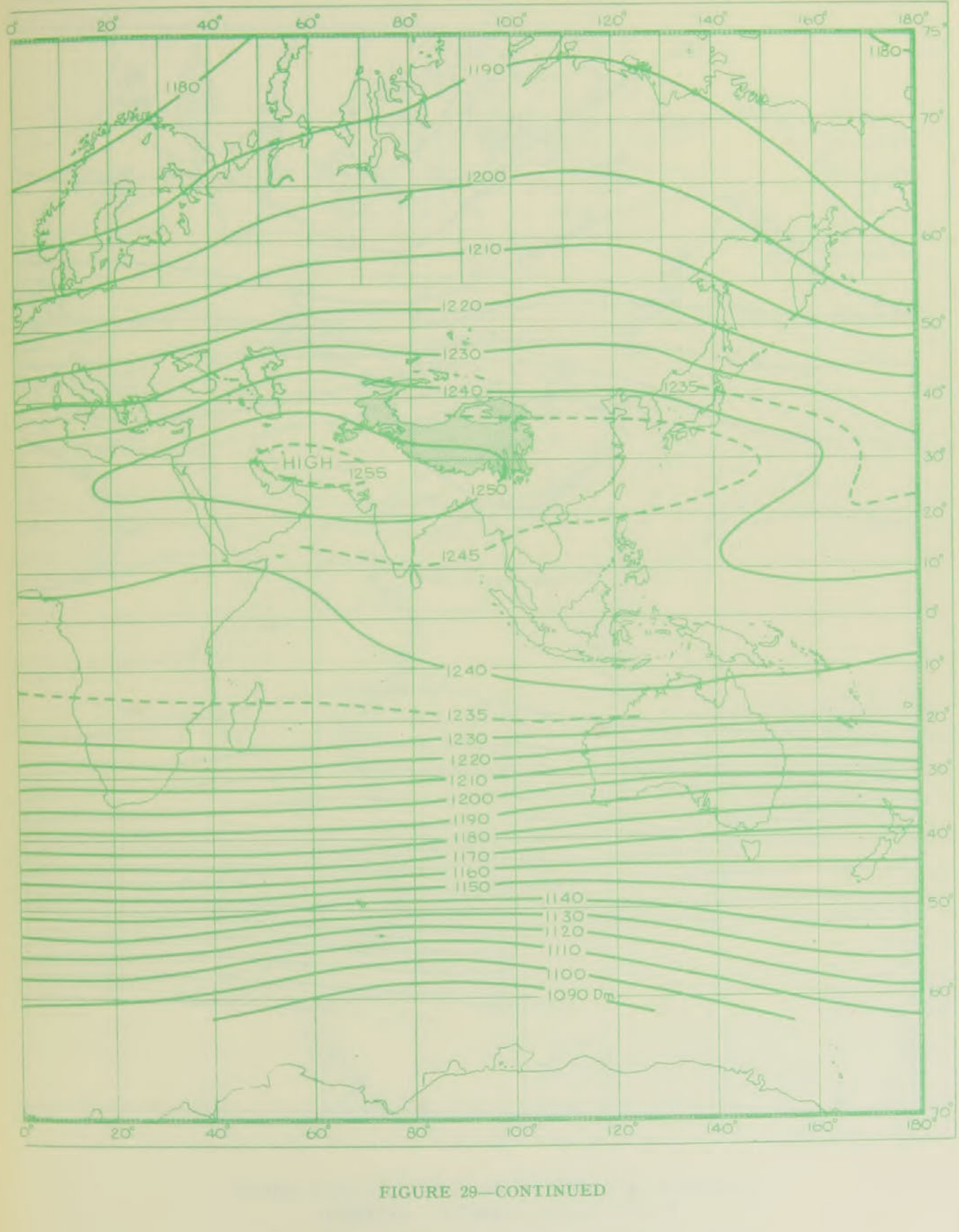


FIGURE 29—CONTINUED

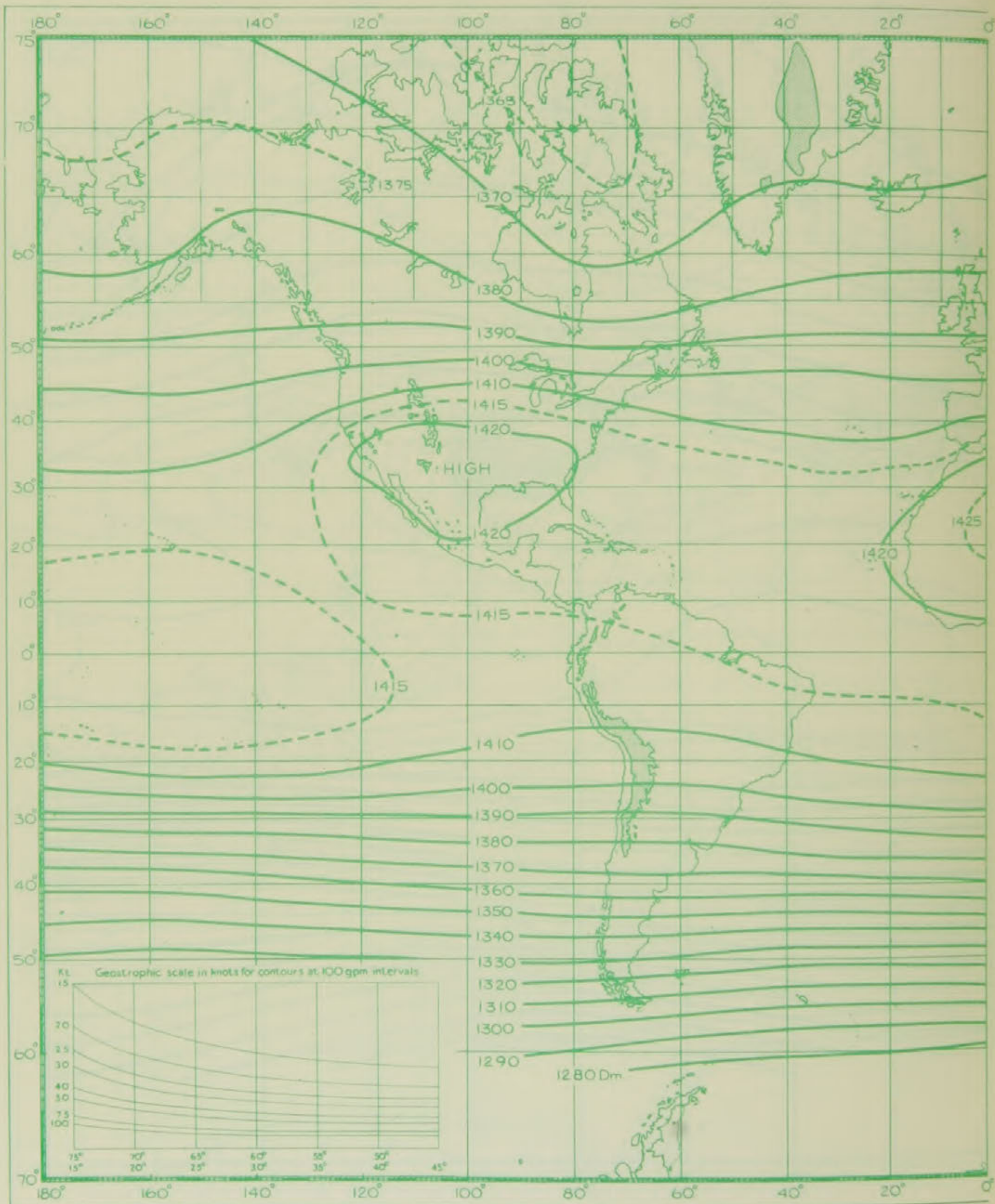


FIGURE 30—AVERAGE 150-MB. CONTOURS, JULY 1949–53
I.C.A.O. height = 44,647 ft. = 13,608 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

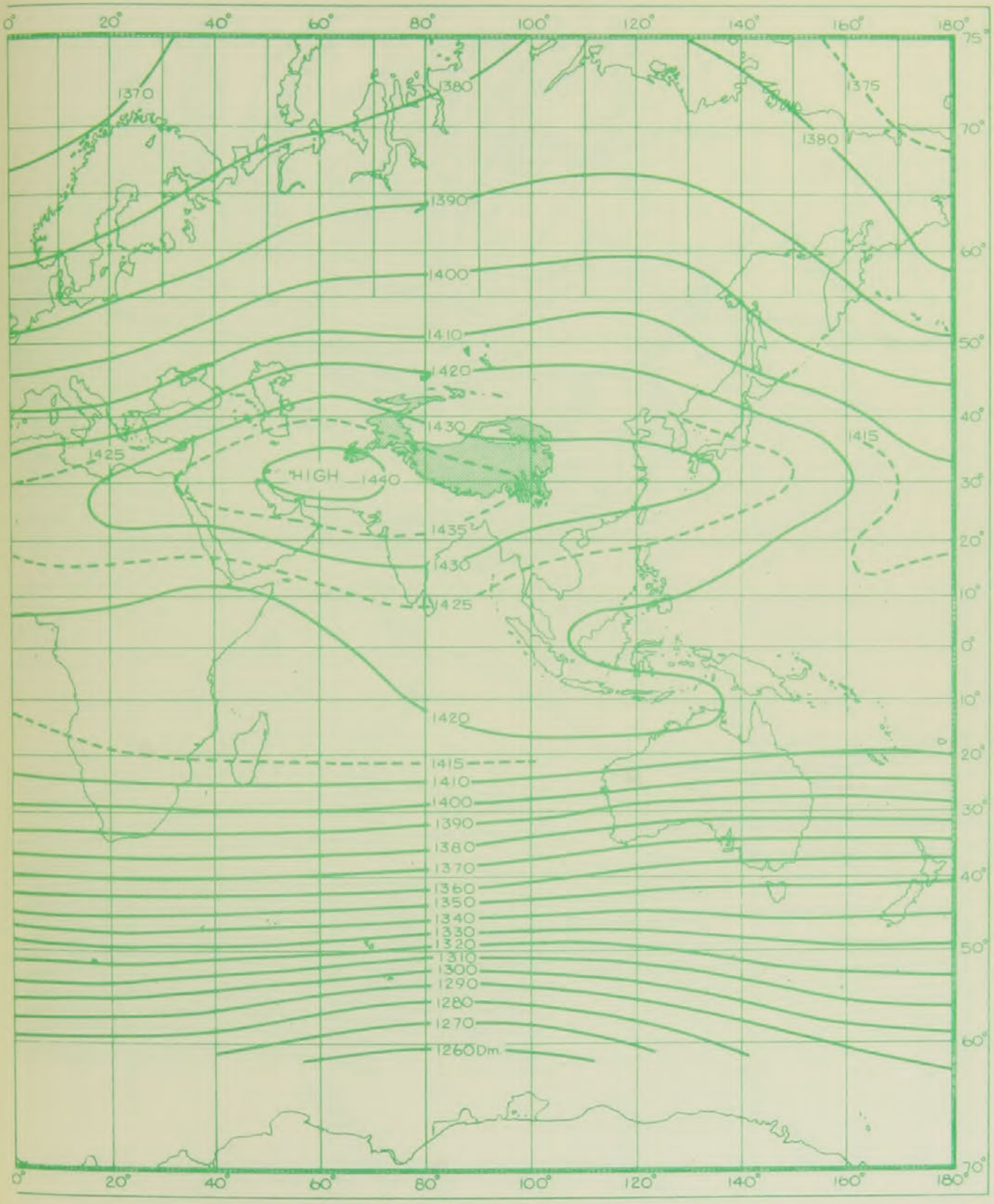


FIGURE 30—CONTINUED

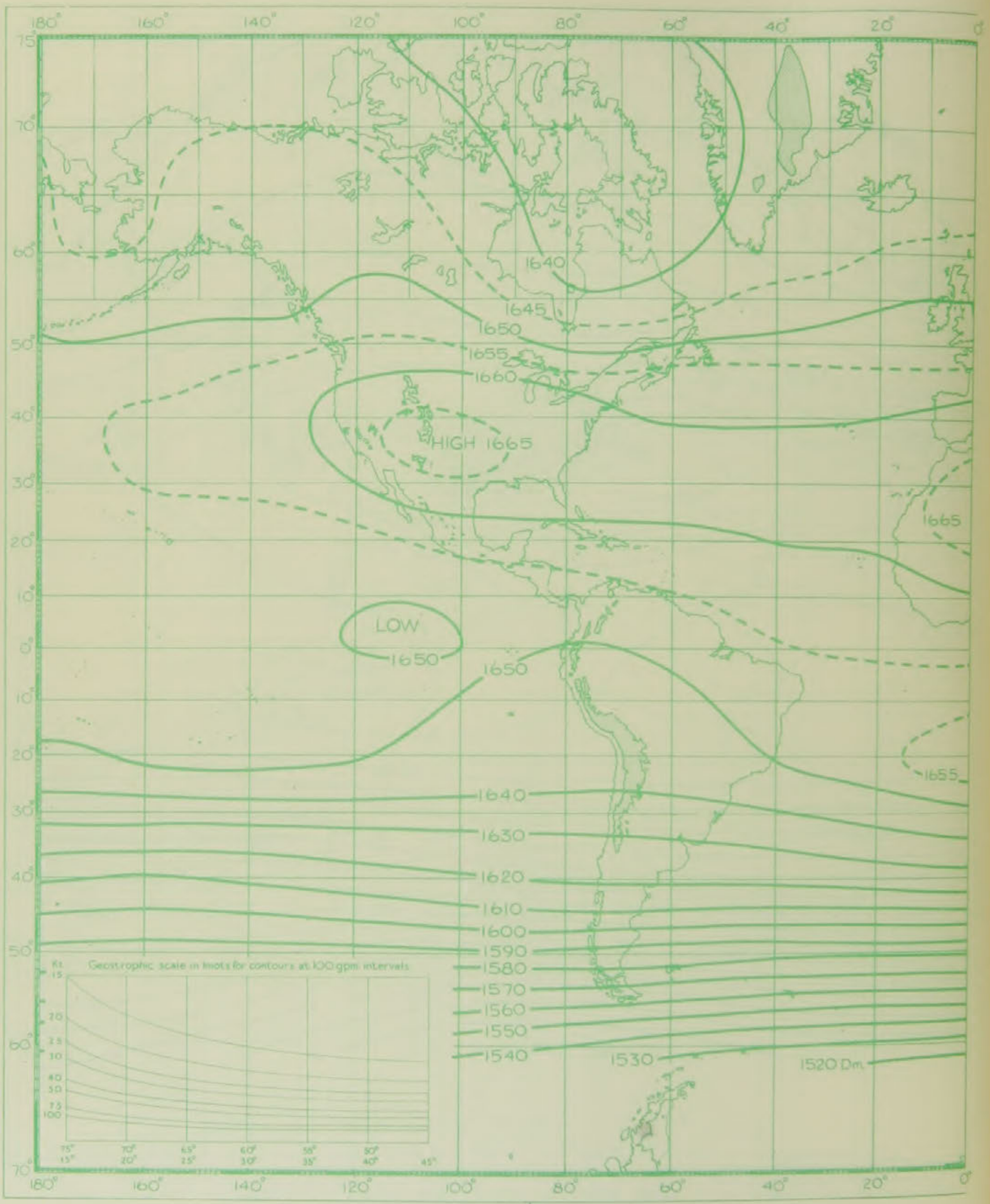


FIGURE 31—AVERAGE 100-MB. CONTOURS, JULY 1949–53
I.C.A.O. height = 53,083 ft. = 16,180 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

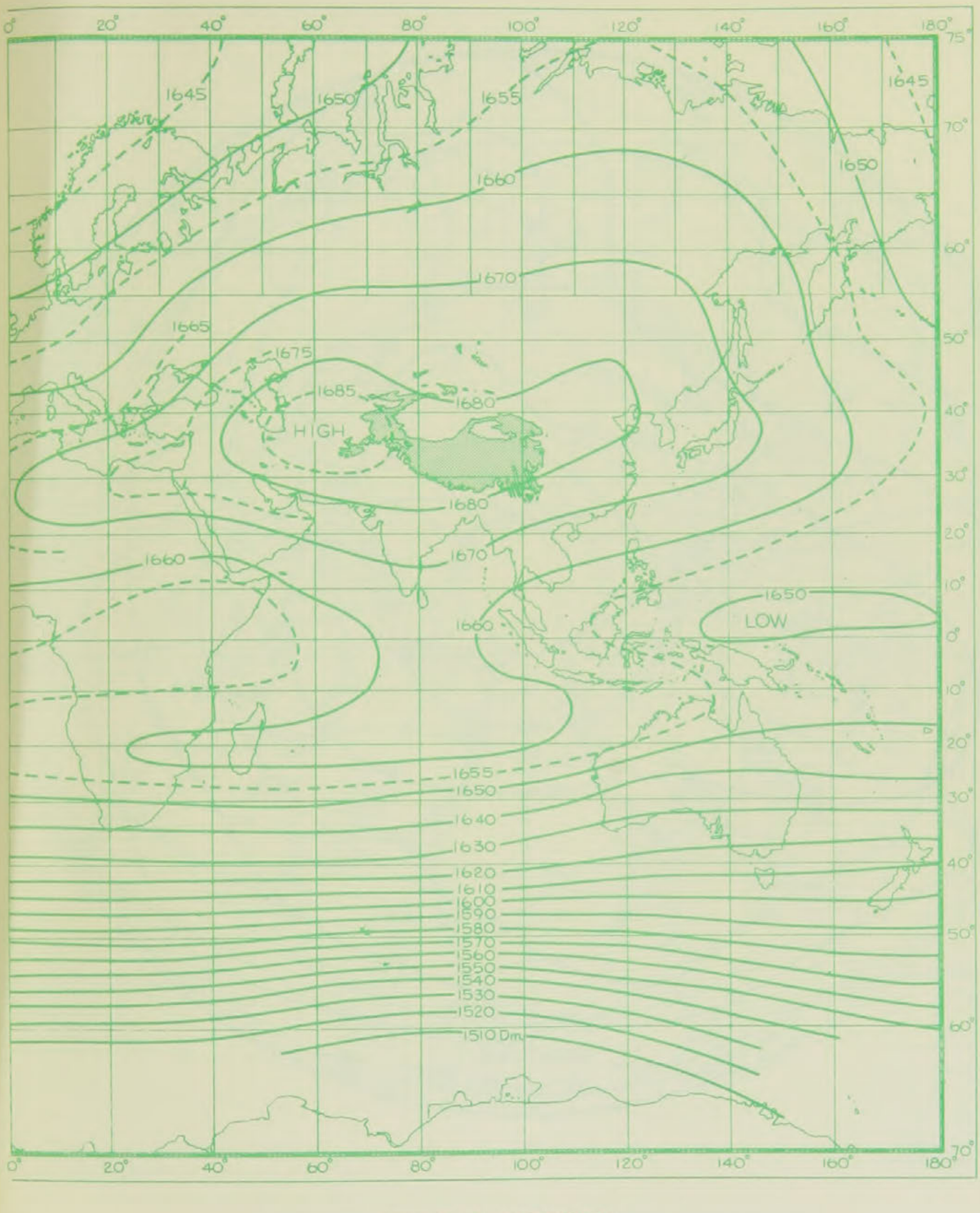


FIGURE 31—CONTINUED

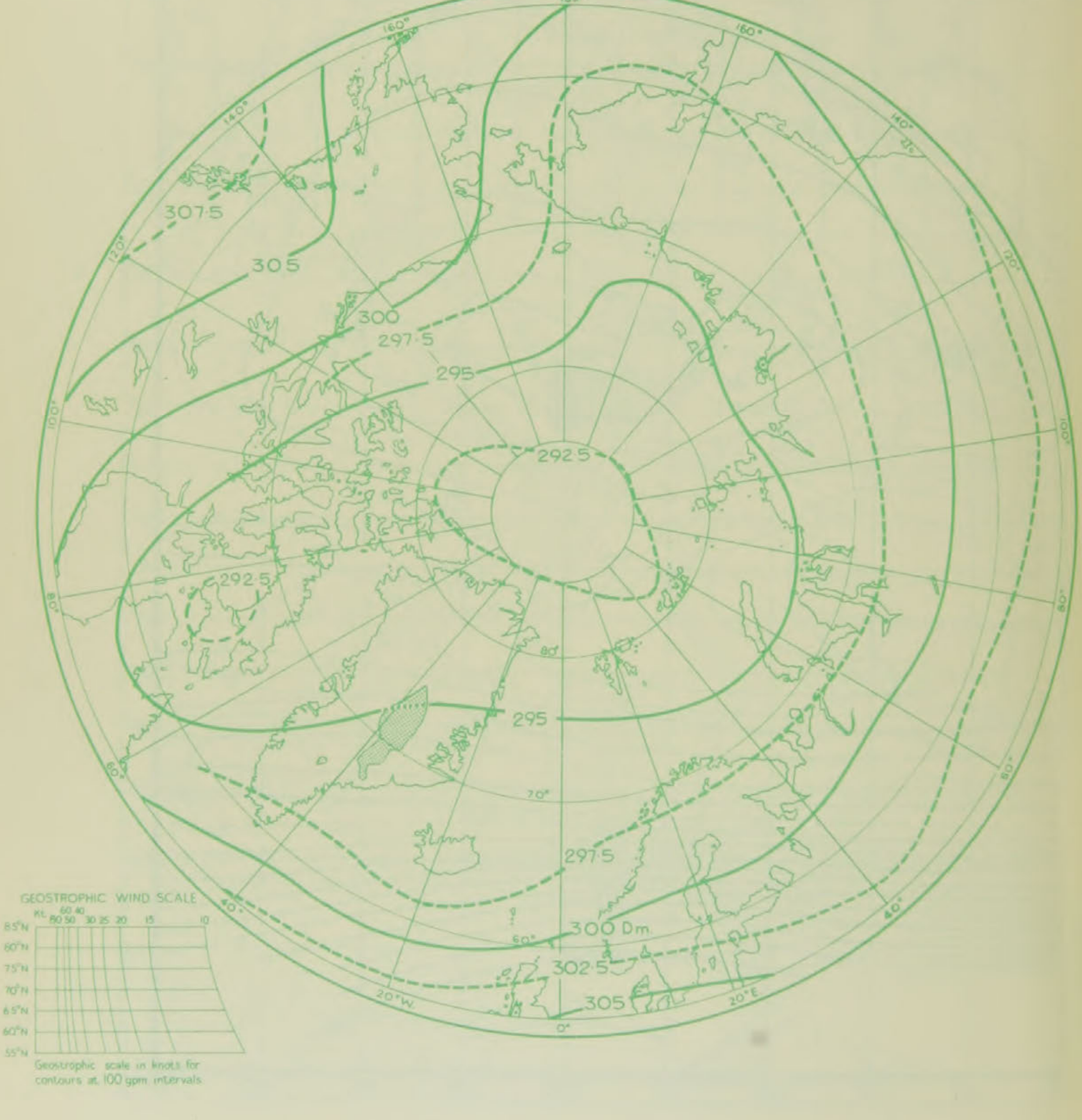


FIGURE 32—AVERAGE 700-MB. CONTOURS, JULY 1949–53
I.C.A.O. height = 9,882 ft. = 3,012 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

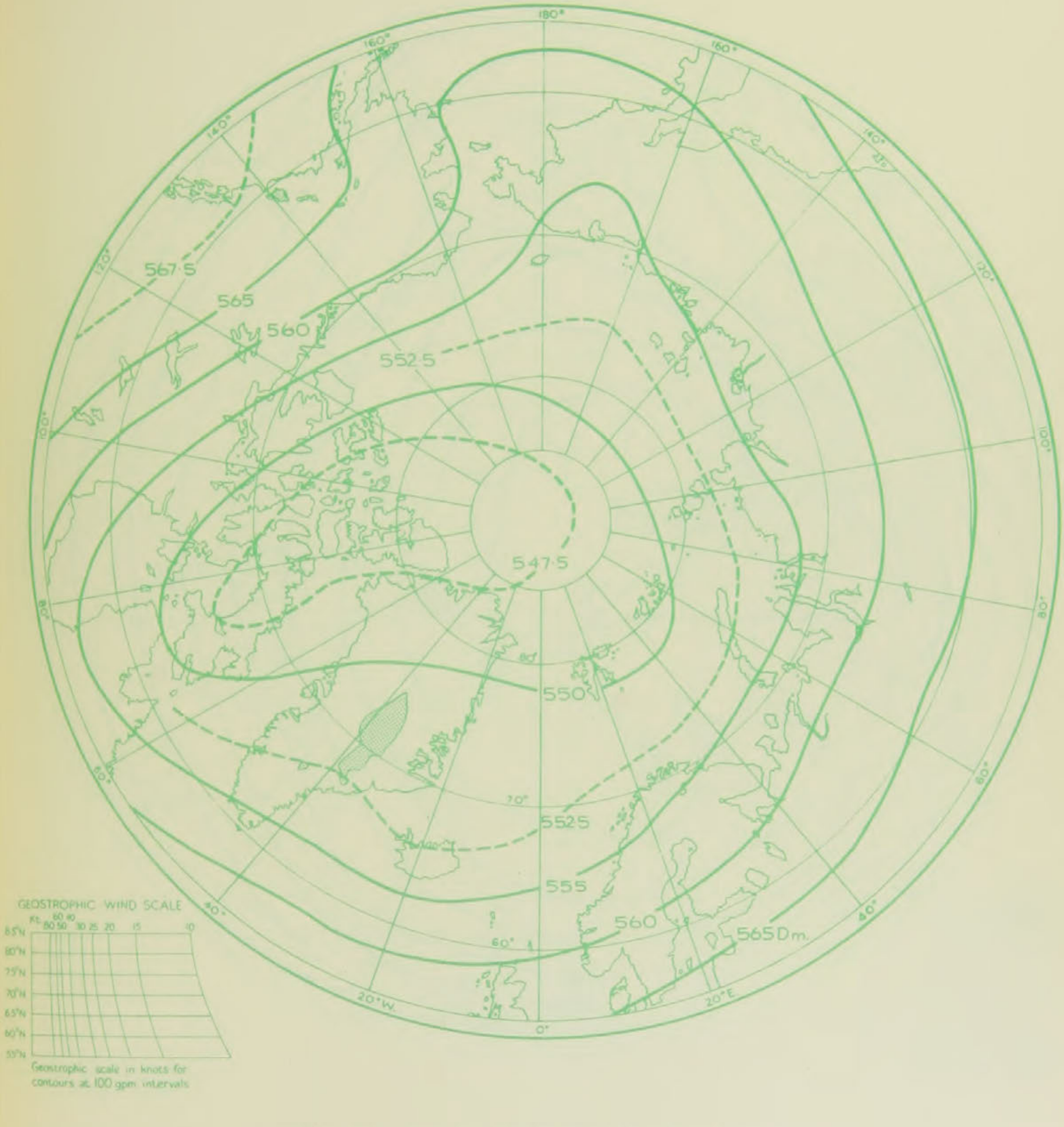


FIGURE 33—AVERAGE 500-MB. CONTOURS, JULY 1949–53
I.C.A.O. height = 18,289 ft. = 5,574 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

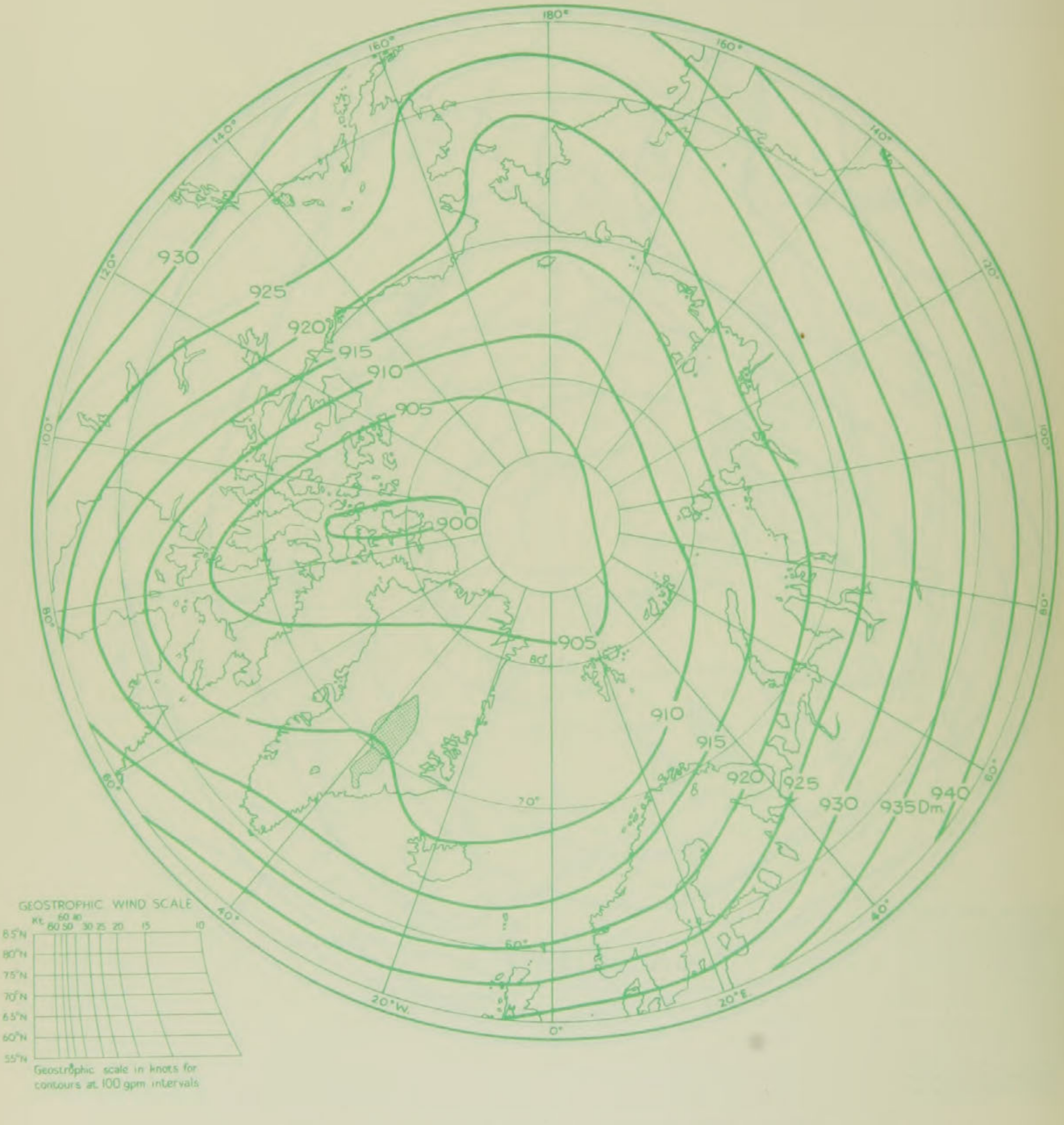


FIGURE 34—AVERAGE 300-MB. CONTOURS, JULY 1949–53
I.C.A.O. height = 30,065 ft. = 9,164 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

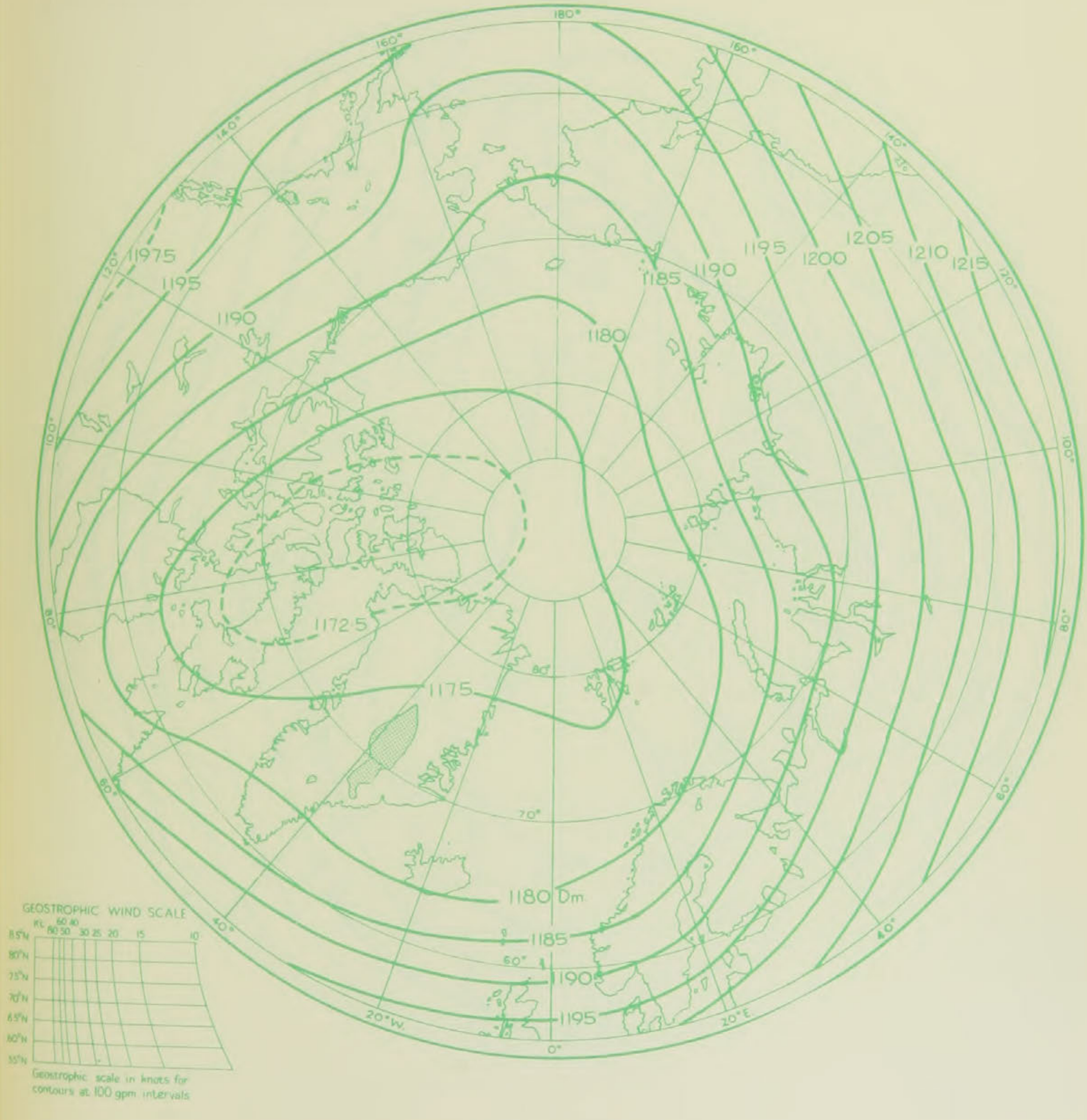


FIGURE 35—AVERAGE 200-MB. CONTOURS, JULY 1949–53
I.C.A.O. height = 38,662 ft. = 11,784 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

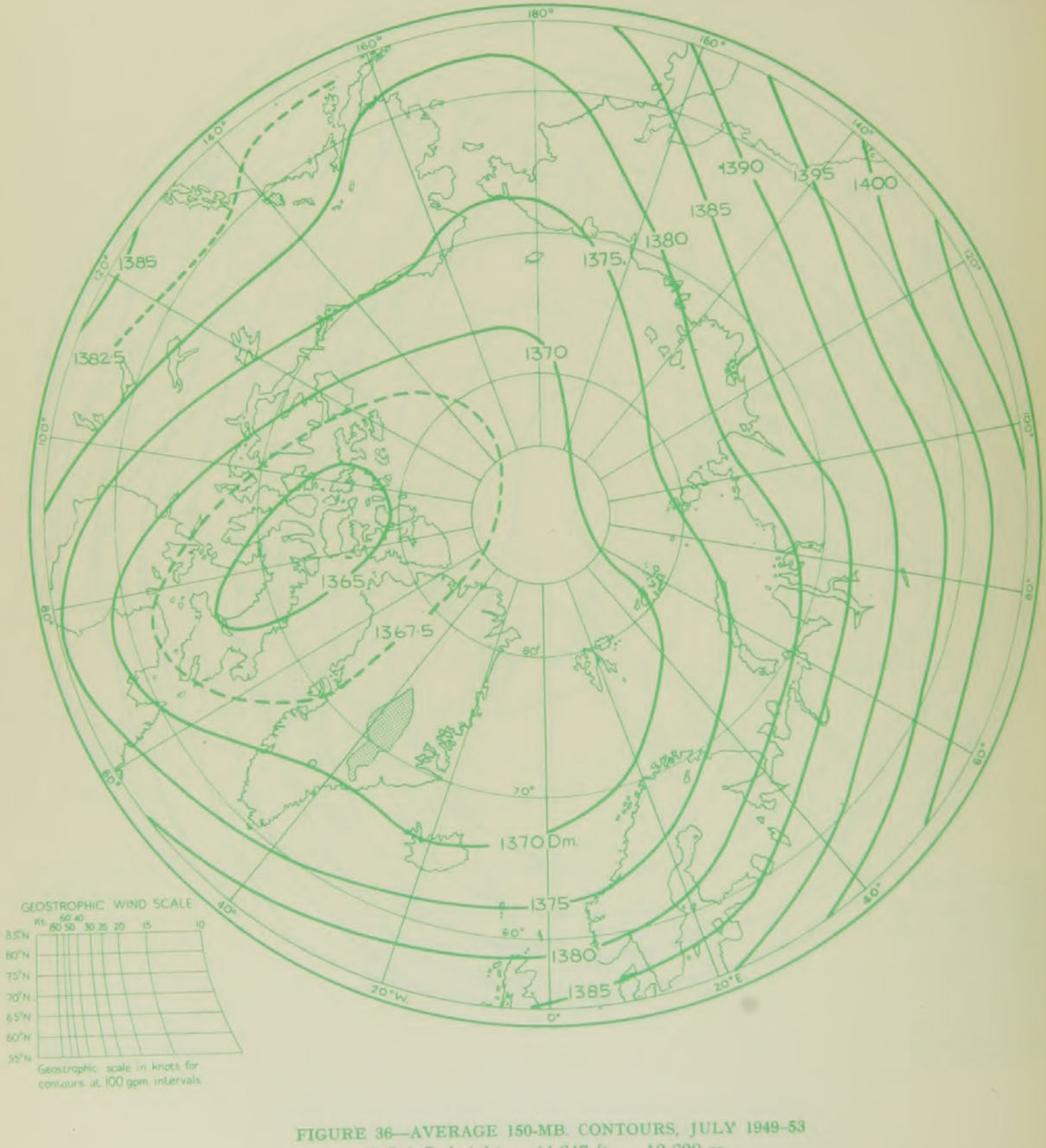


FIGURE 36—AVERAGE 150-MB. CONTOURS, JULY 1949–53
I.C.A.O. height = 44,647 ft. = 13,608 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

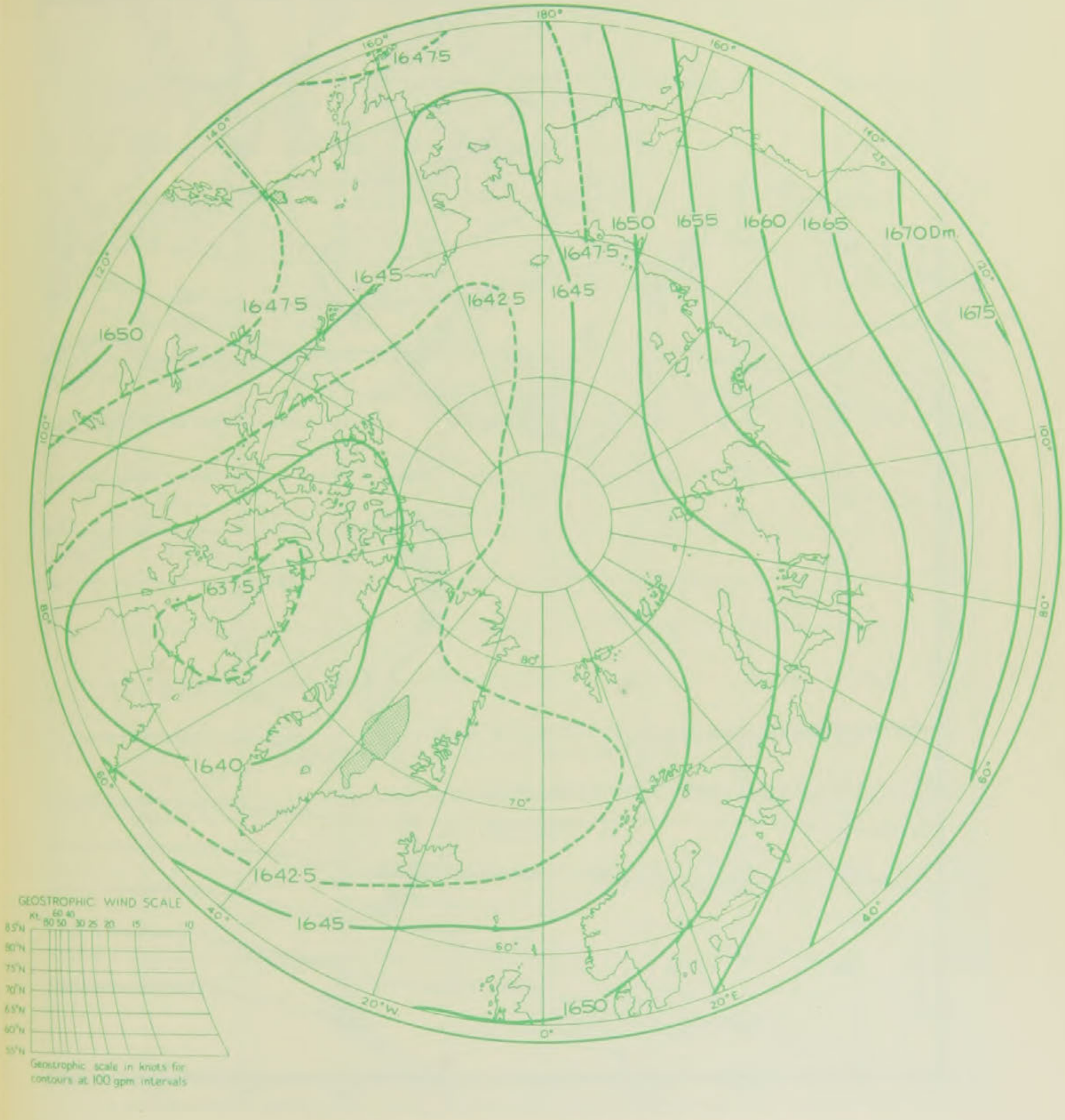


FIGURE 37—AVERAGE 100-MB. CONTOURS, JULY 1949–53
I.C.A.O. height = 53,083 ft. = 16,180 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

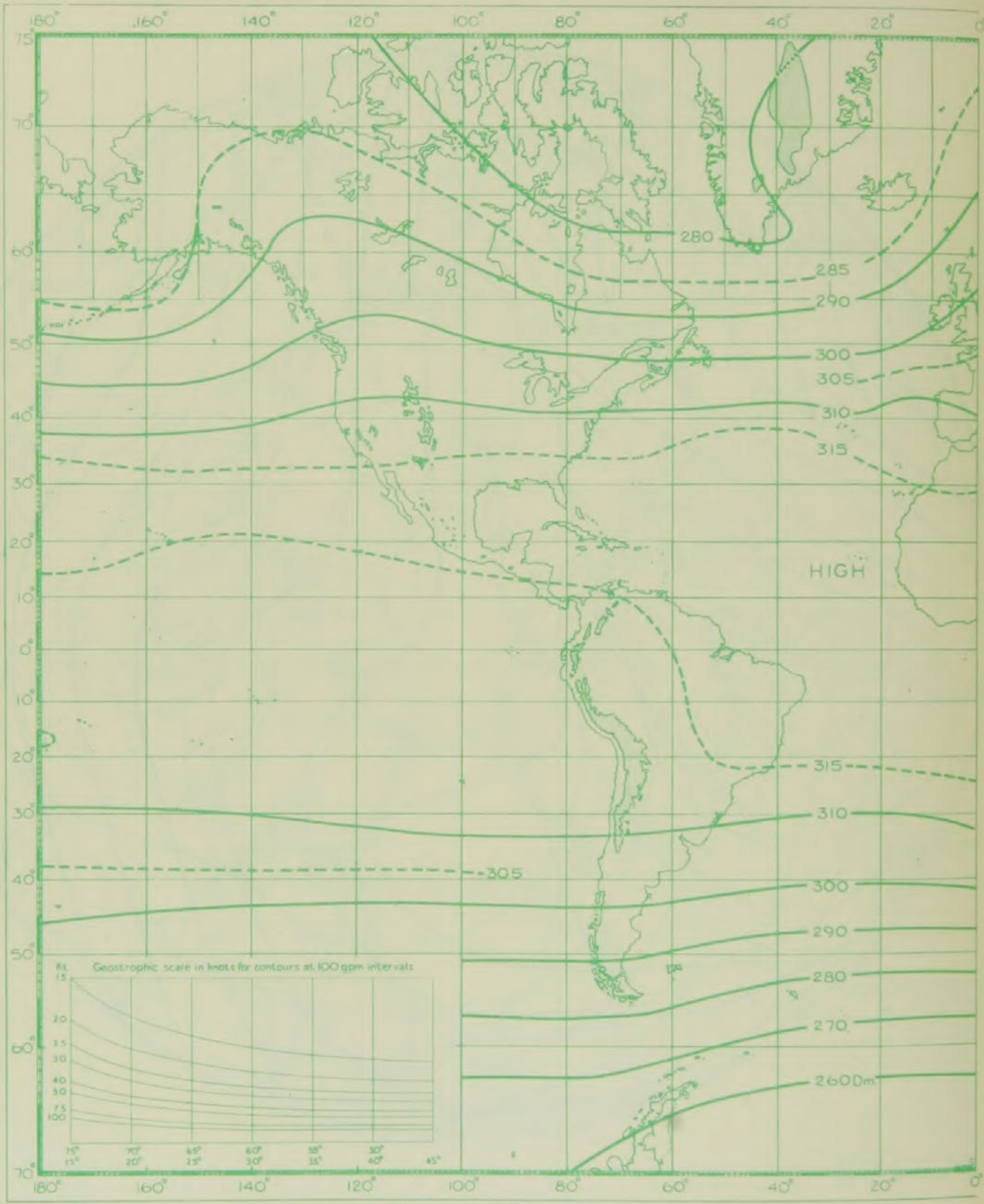


FIGURE 38—AVERAGE 700-MB. CONTOURS, OCTOBER 1949–53
I.C.A.O. height = 9,882 ft. = 3,012 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

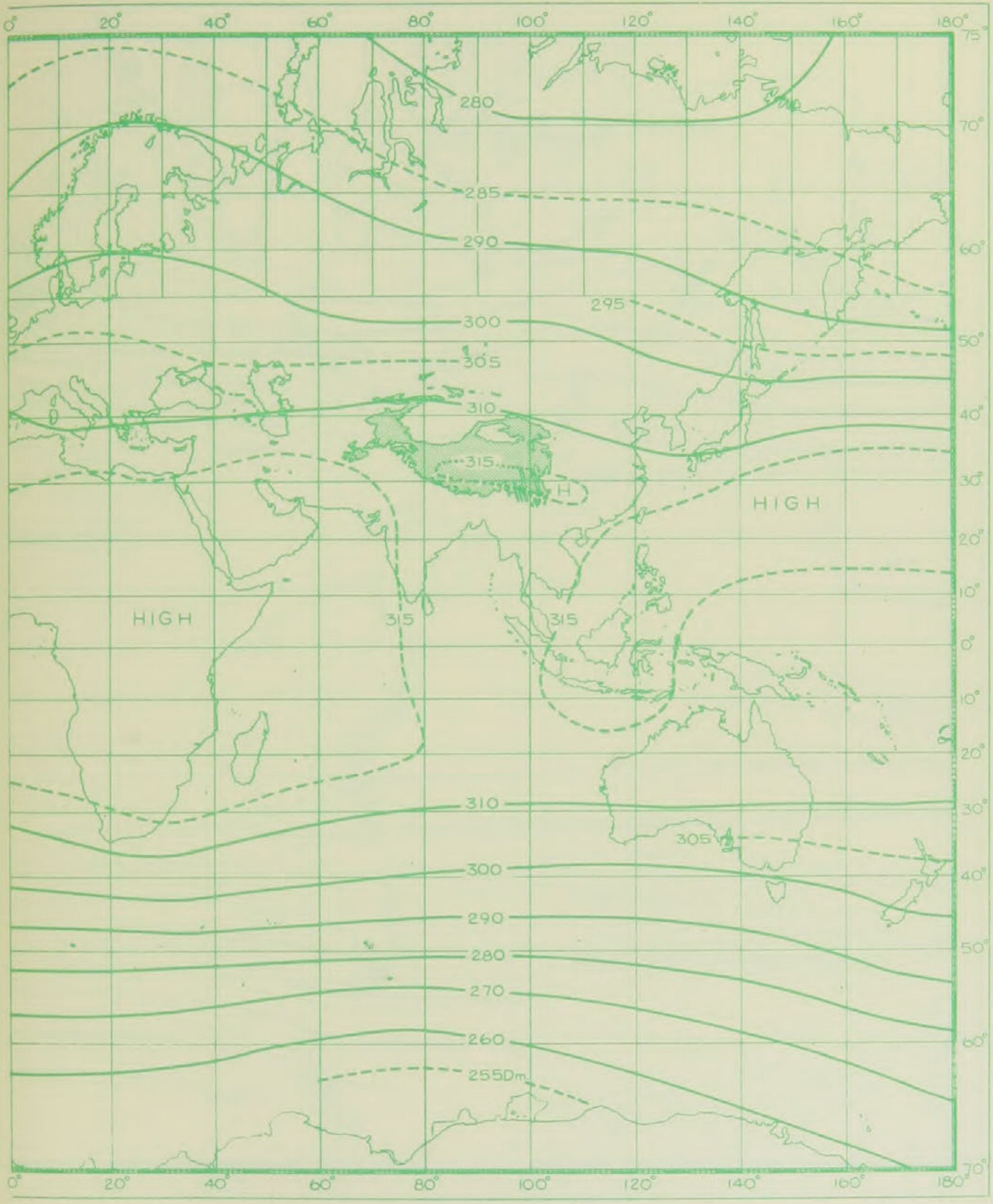


FIGURE 38—CONTINUED

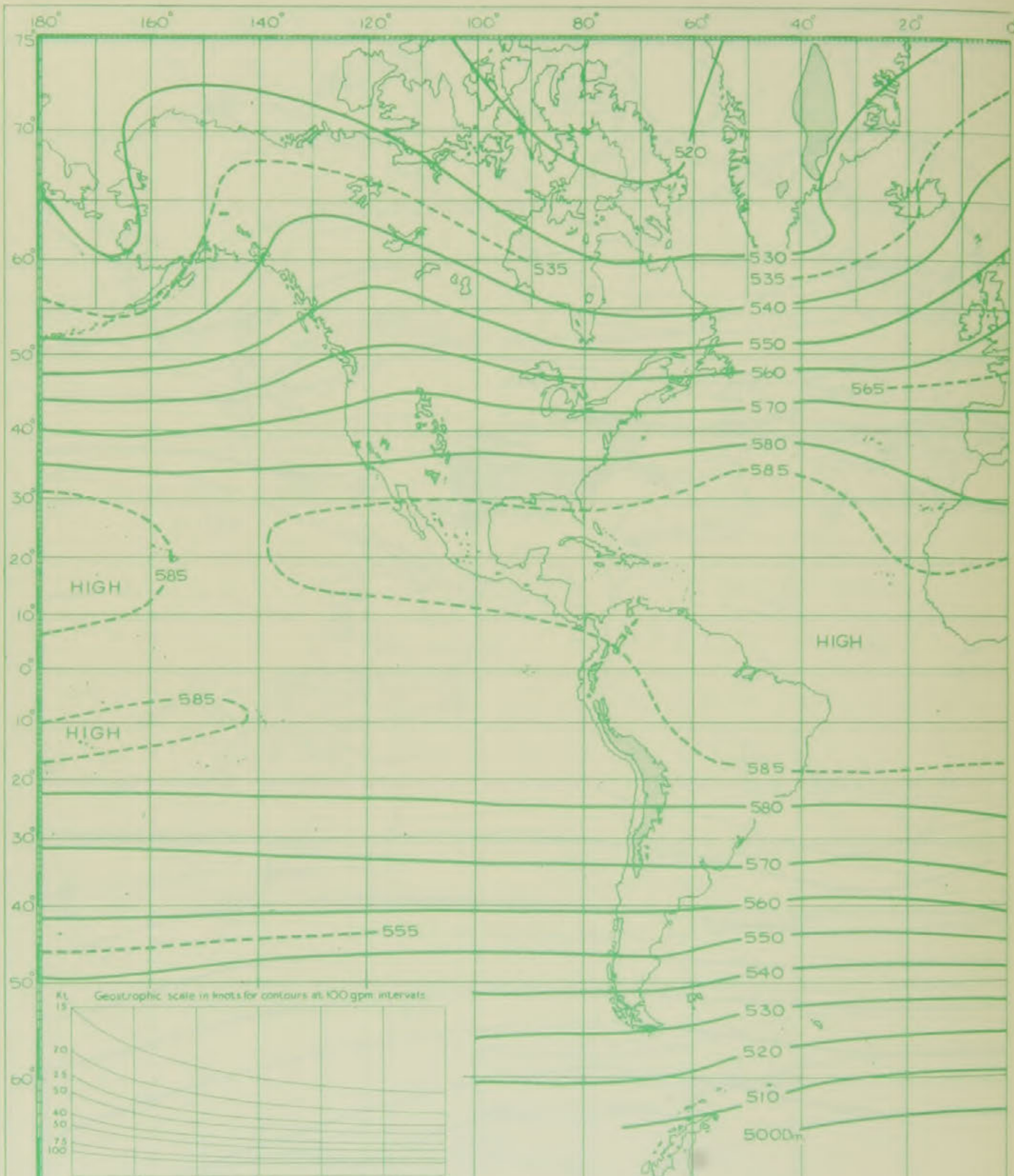


FIGURE 39—AVERAGE 500-MB. CONTOURS, OCTOBER 1949–53
I.C.A.O. height = 18,289 ft. = 5,574 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

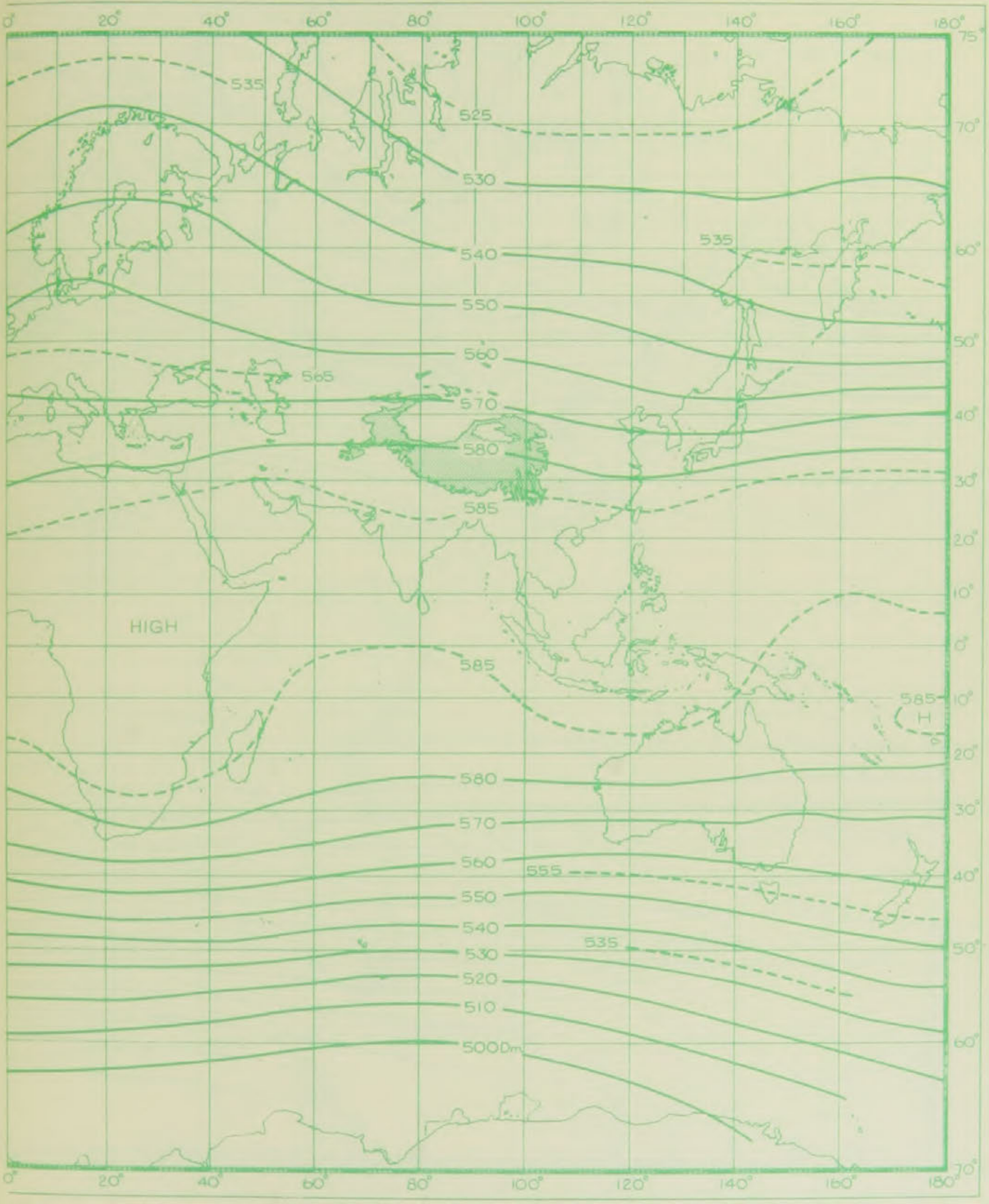


FIGURE 39—CONTINUED

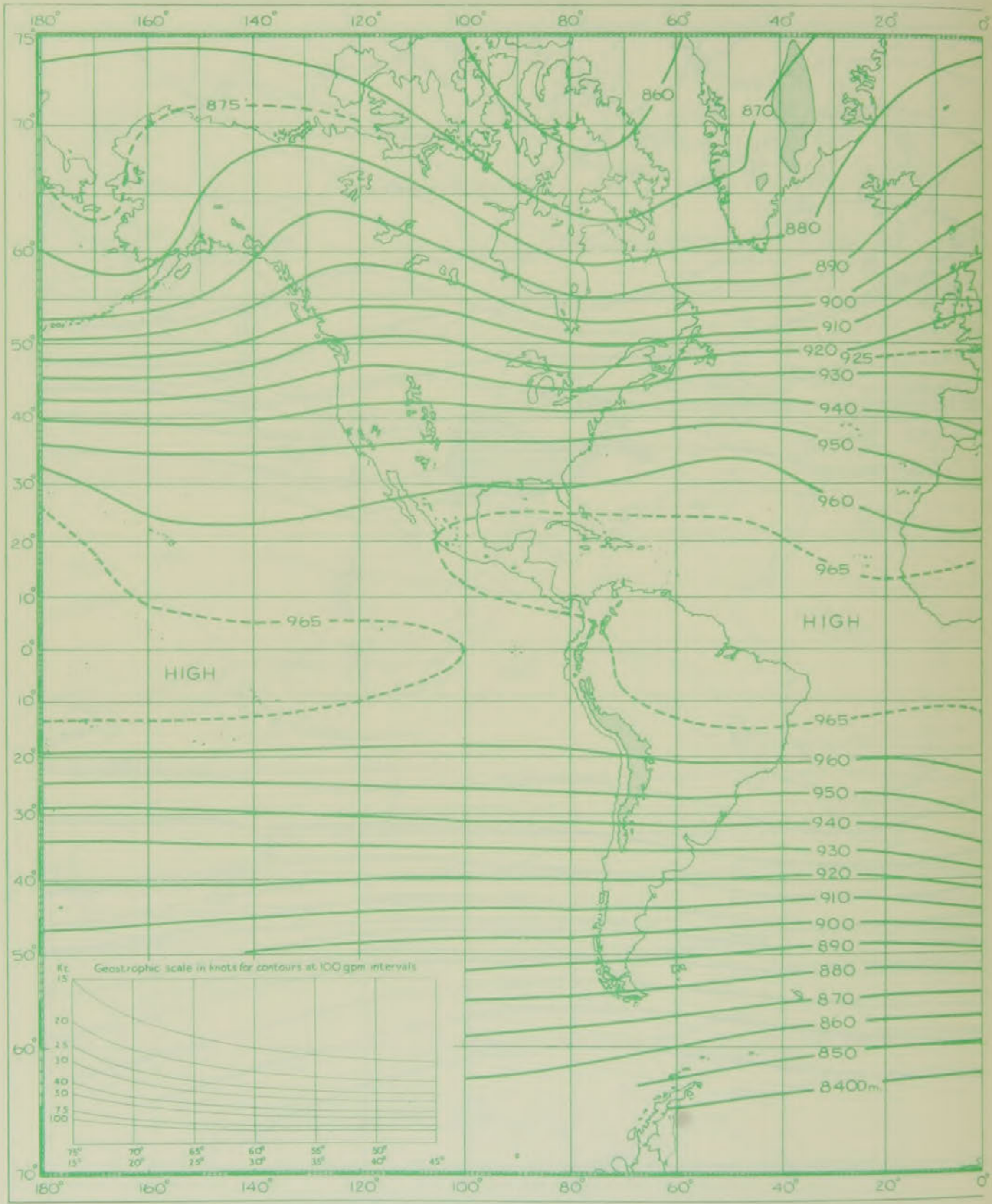


FIGURE 40—AVERAGE 300-MB. CONTOURS, OCTOBER 1949–53
I.C.A.O. height = 30,065 ft. = 9,164 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

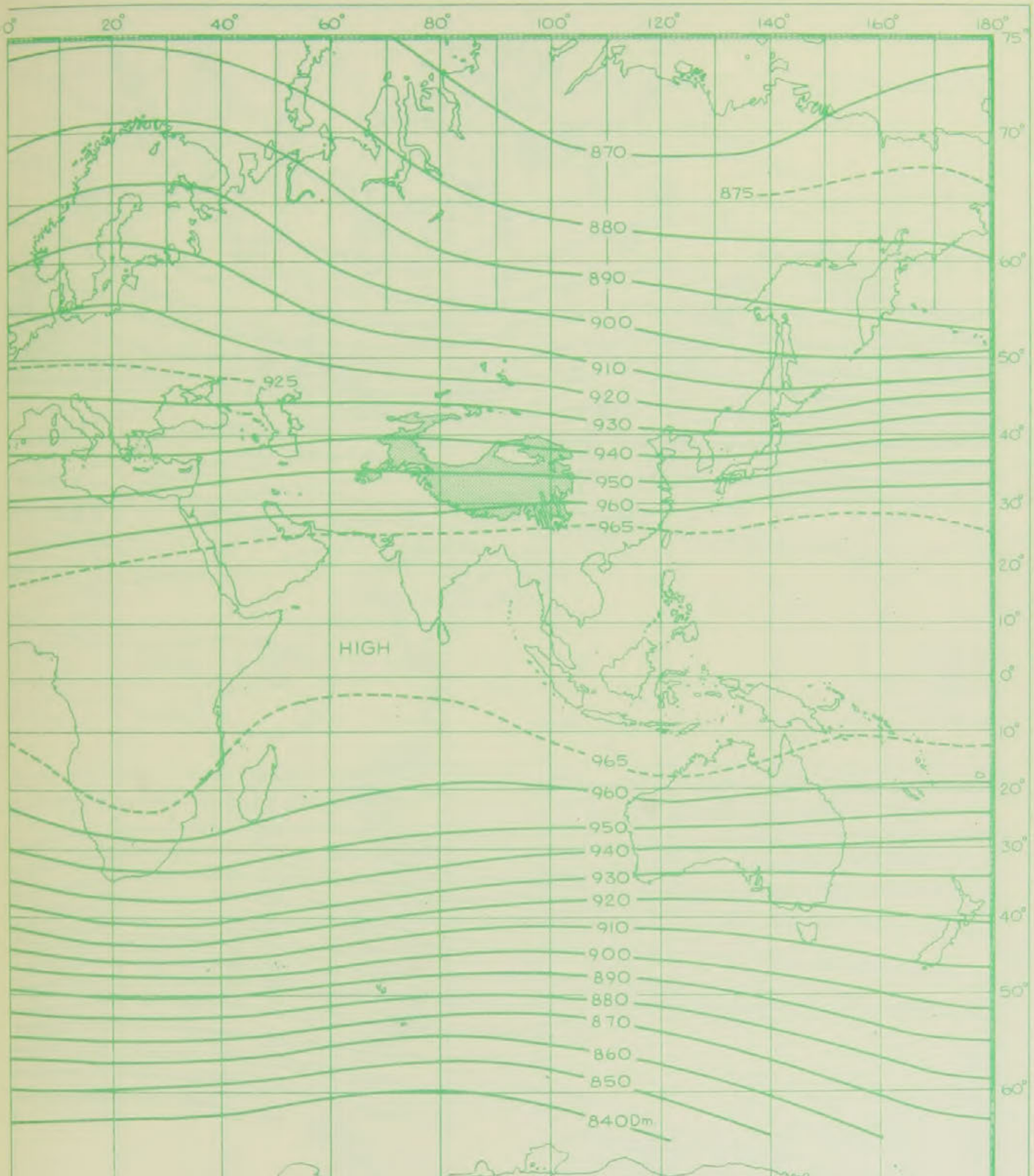


FIGURE 40—CONTINUED.

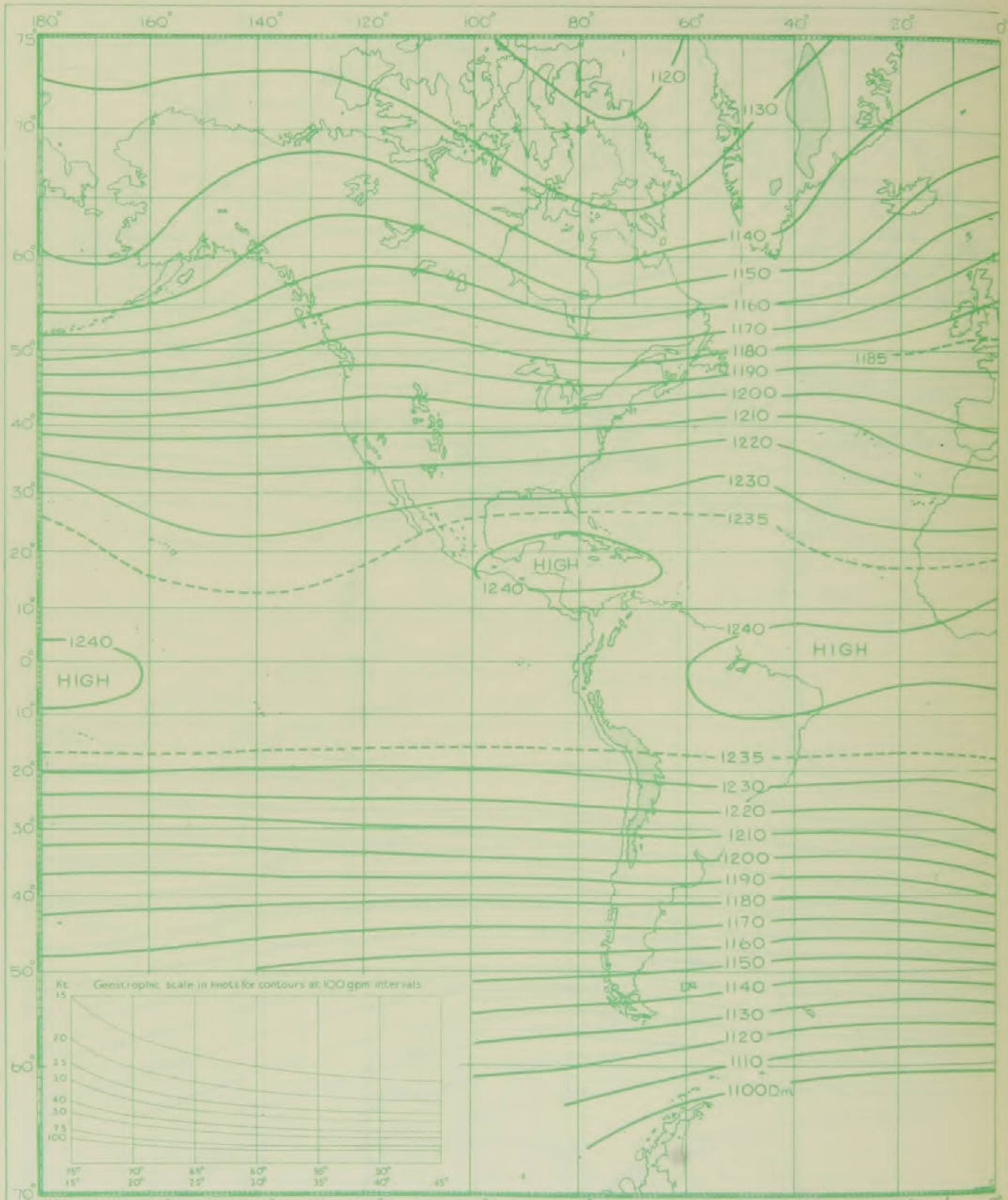


FIGURE 41—AVERAGE 200-MB. CONTOURS, OCTOBER 1949–53
I.C.A.O. height = 38,662 ft. = 11,784 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

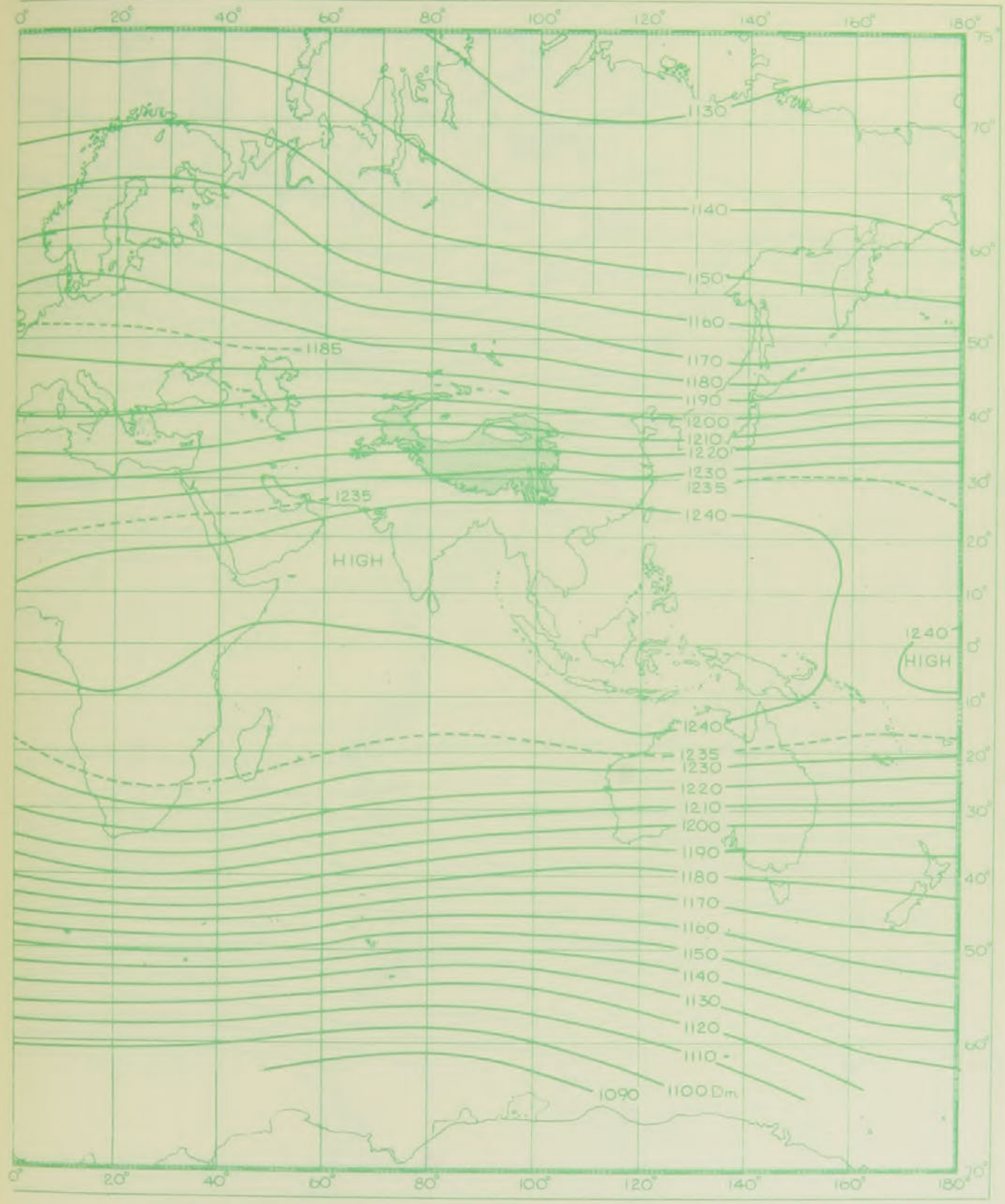


FIGURE 41—CONTINUED

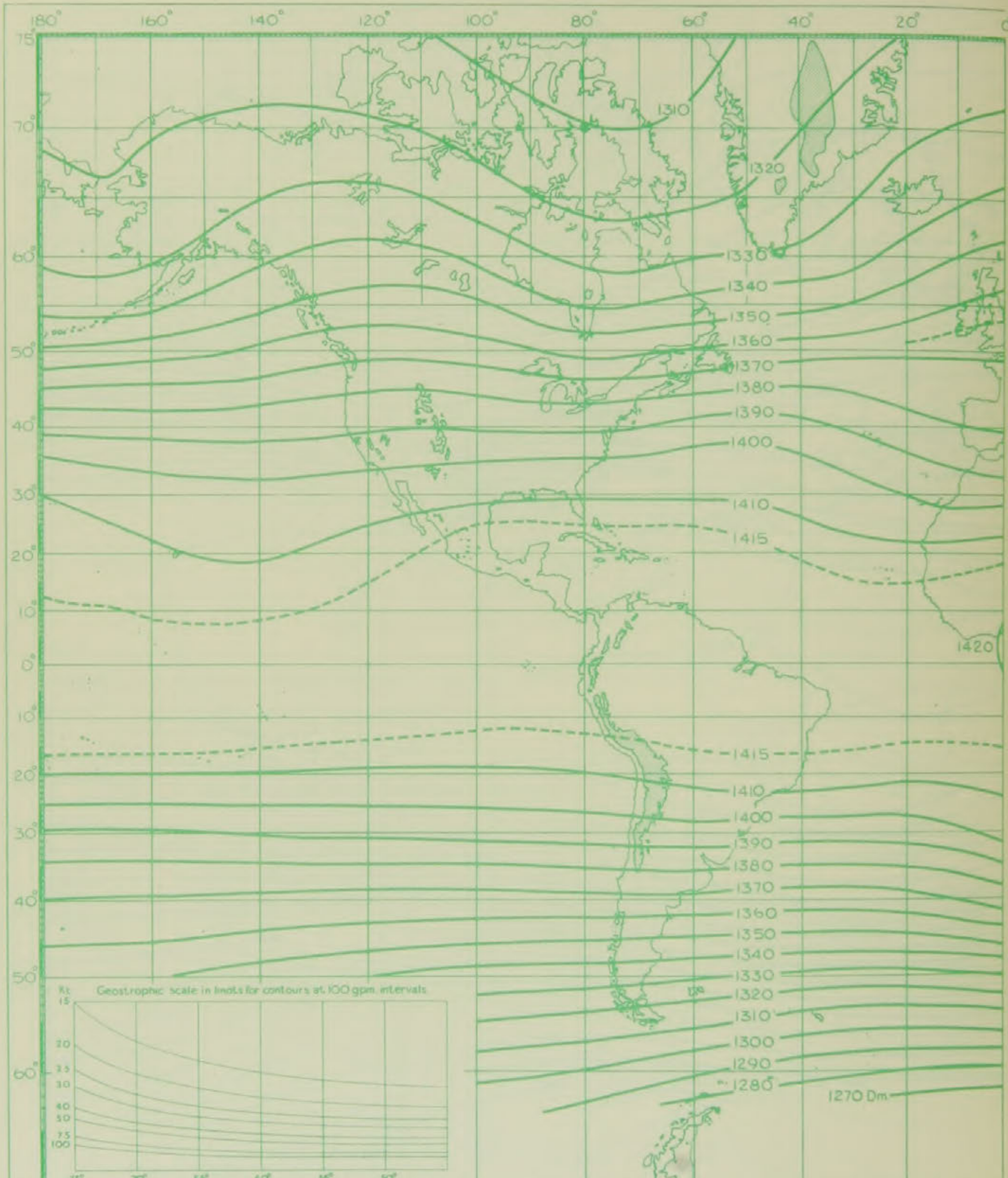


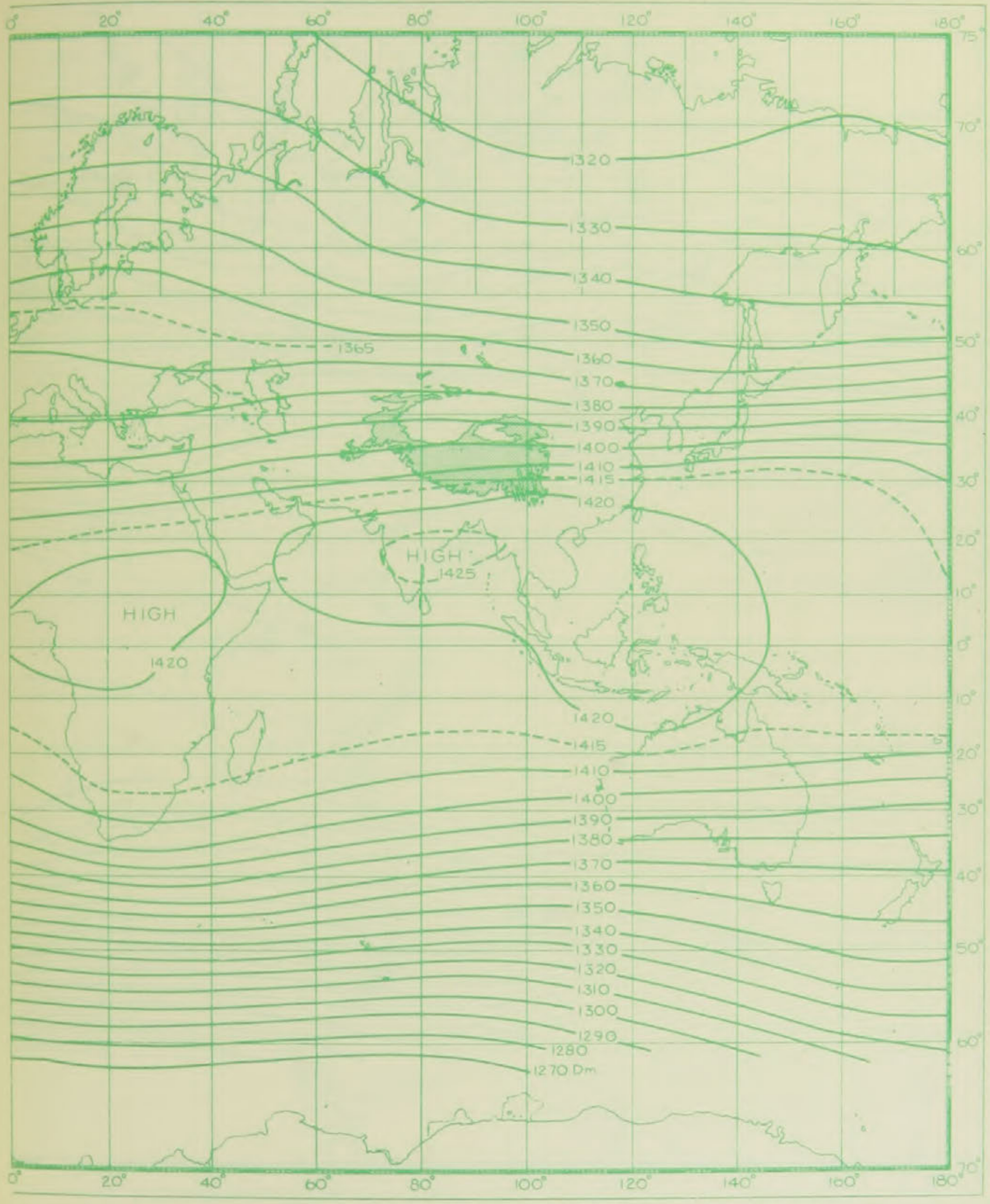
FIGURE 42—AVERAGE 150-MB. CONTOURS, OCTOBER 1949–53

I.C.A.O. height = 44,647 ft. = 13,608 m.

Heights of isobaric surfaces are in geopotential decametres

Shaded areas represent land over 3,000 m.

103



E

FIGURE 42—CONTINUED

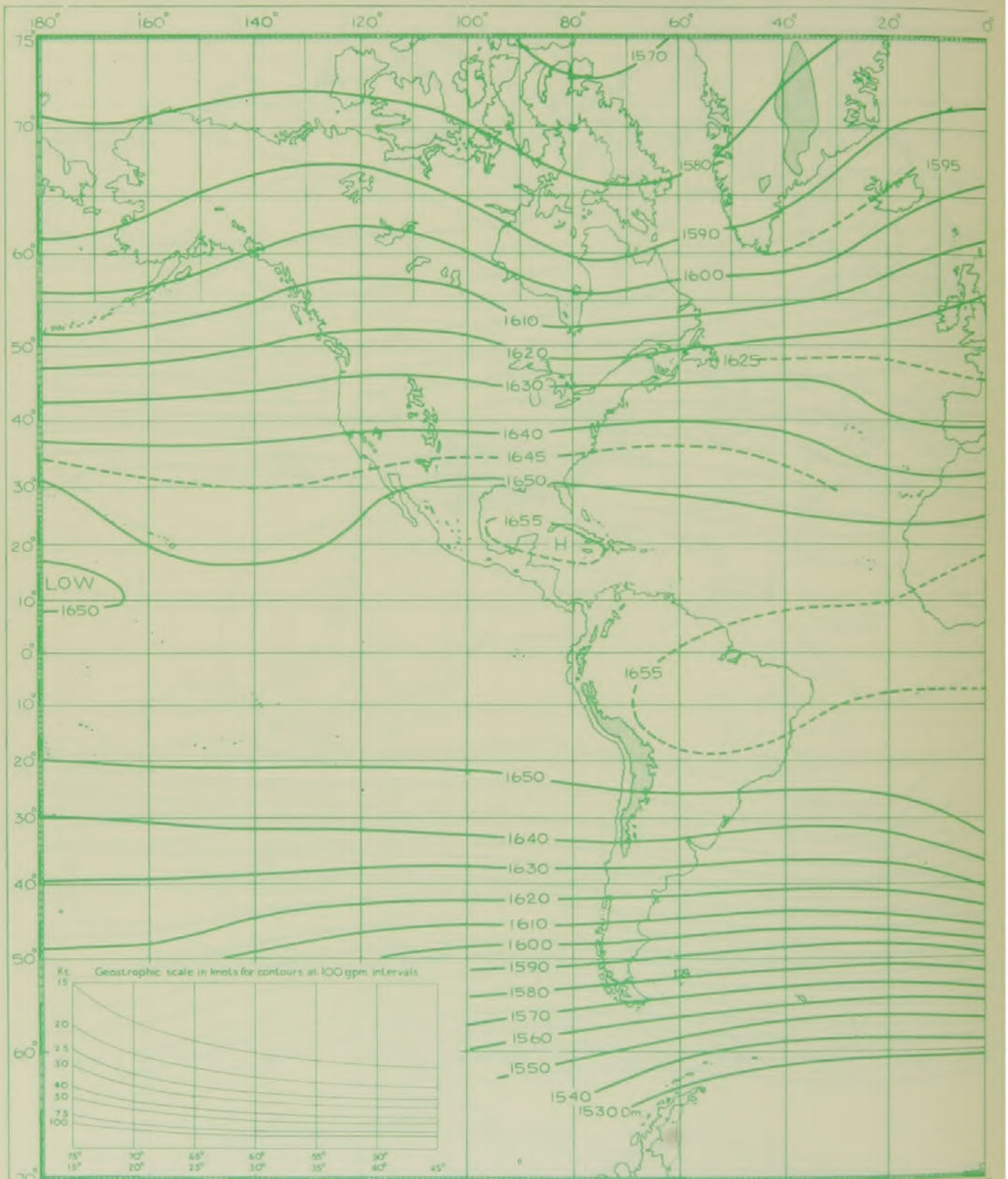


FIGURE 43—AVERAGE 100-MB. CONTOURS, OCTOBER 1949–53
I.C.A.O. height = 53,083 ft. = 16,180 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

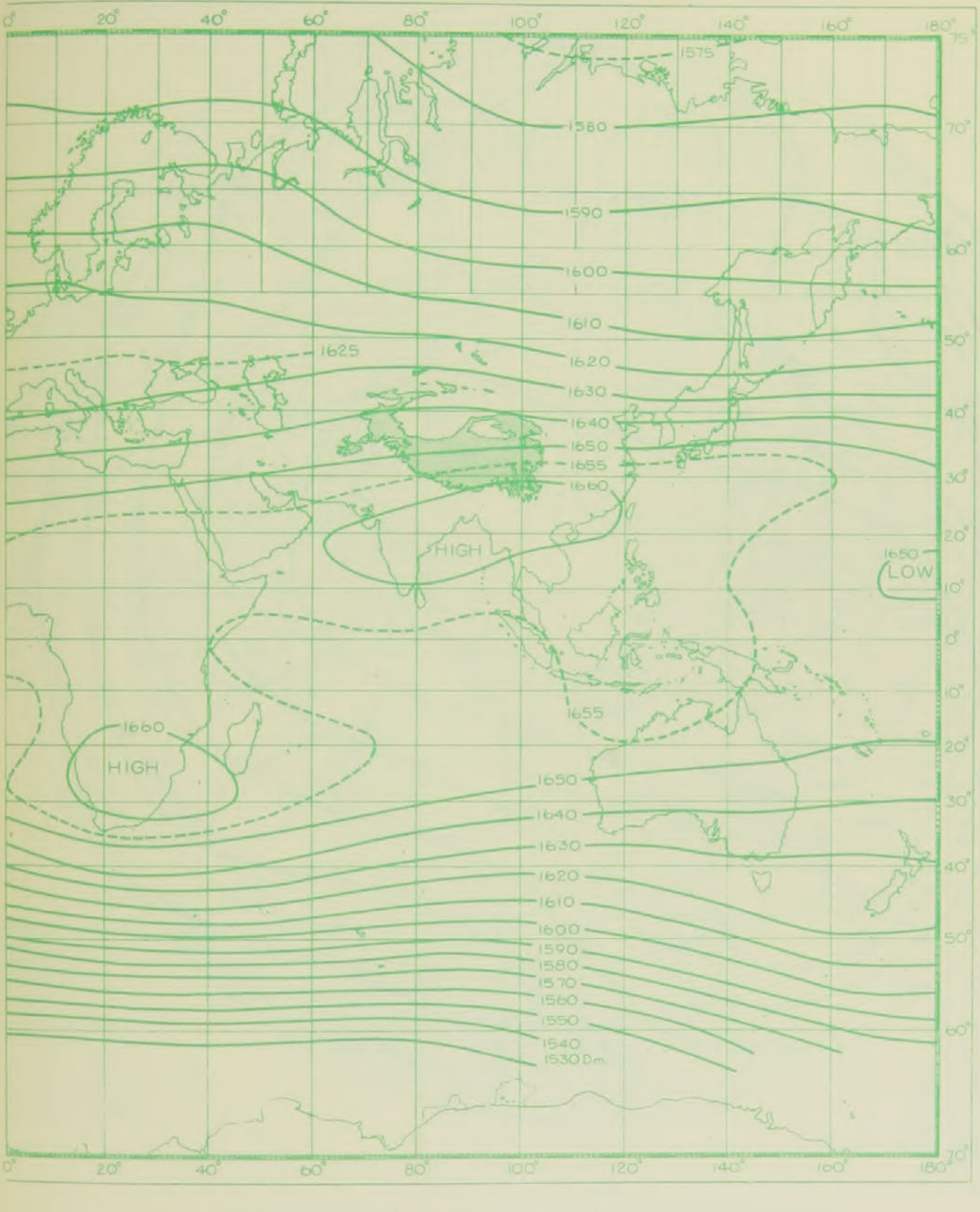


FIGURE 43—CONTINUED

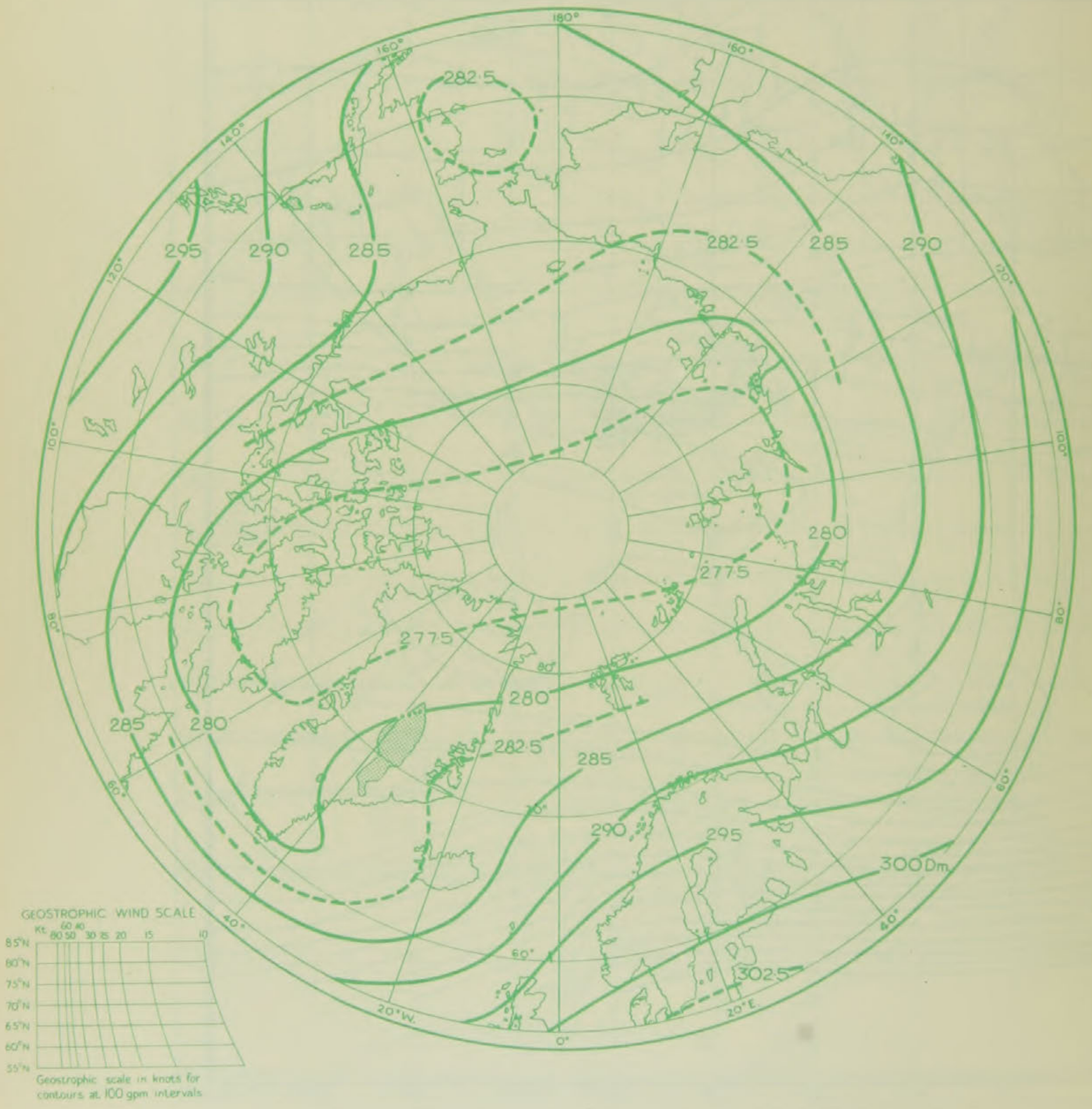


FIGURE 44—AVERAGE 700-MB. CONTOURS, OCTOBER 1949–53
I.C.A.O. height = 9,882 ft. = 3,012 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

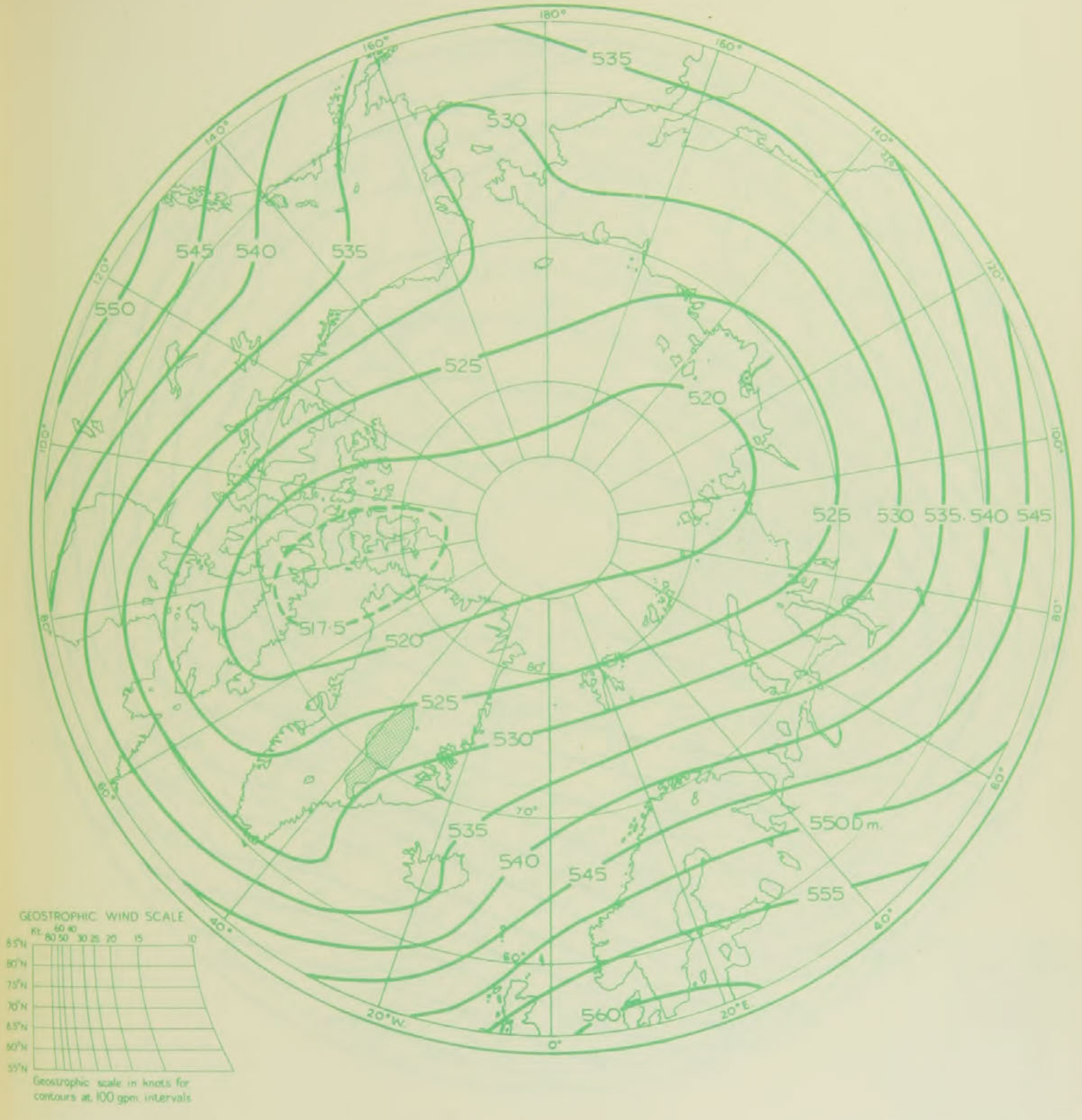


FIGURE 45—AVERAGE 500-MB. CONTOURS, OCTOBER 1949–53
I.C.A.O. height = 18,289 ft. = 5,574 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

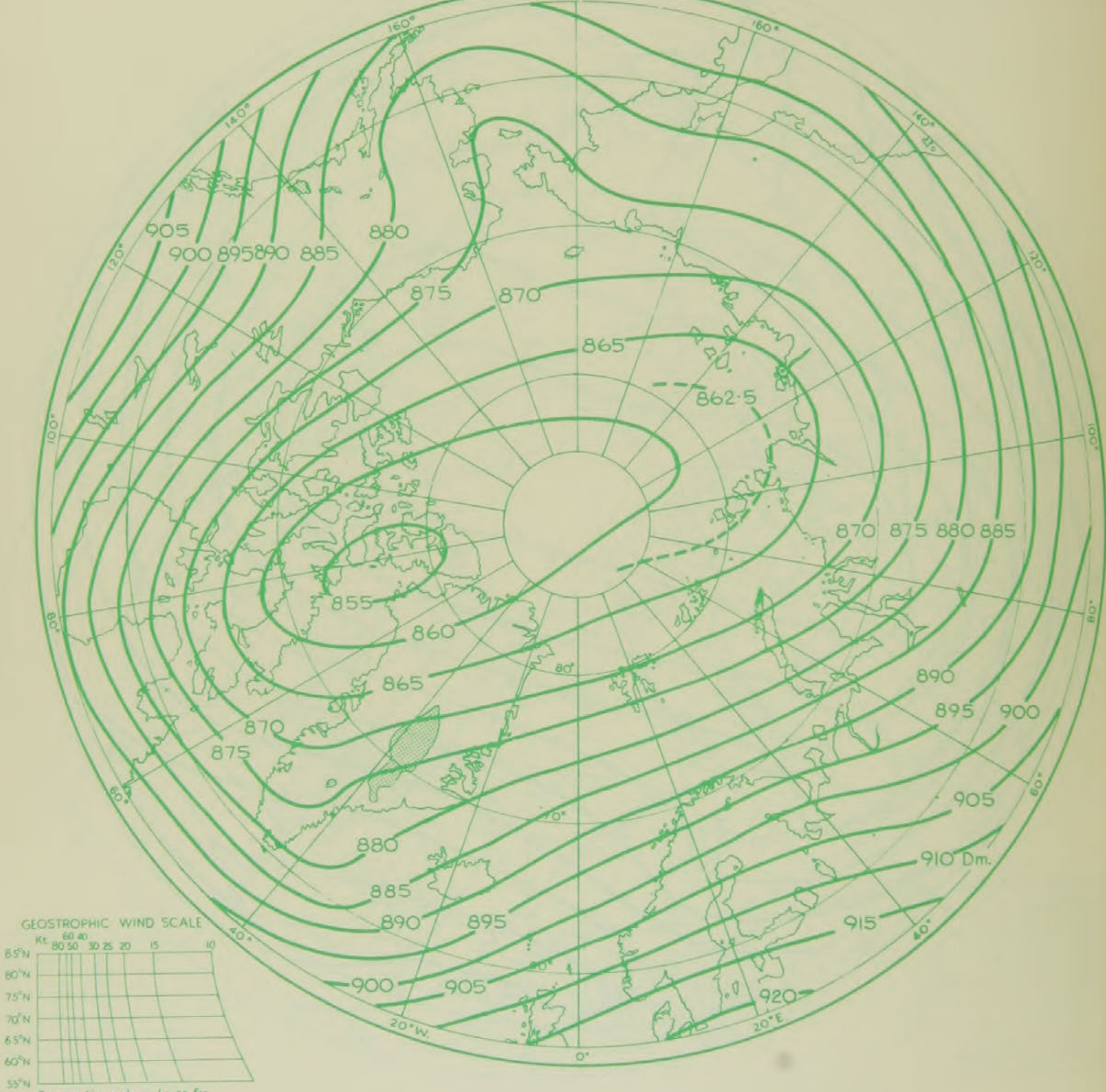


FIGURE 46—AVERAGE 300-MB. CONTOURS, OCTOBER 1949–53
I.C.A.O. height = 30,065 ft. = 9,164 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

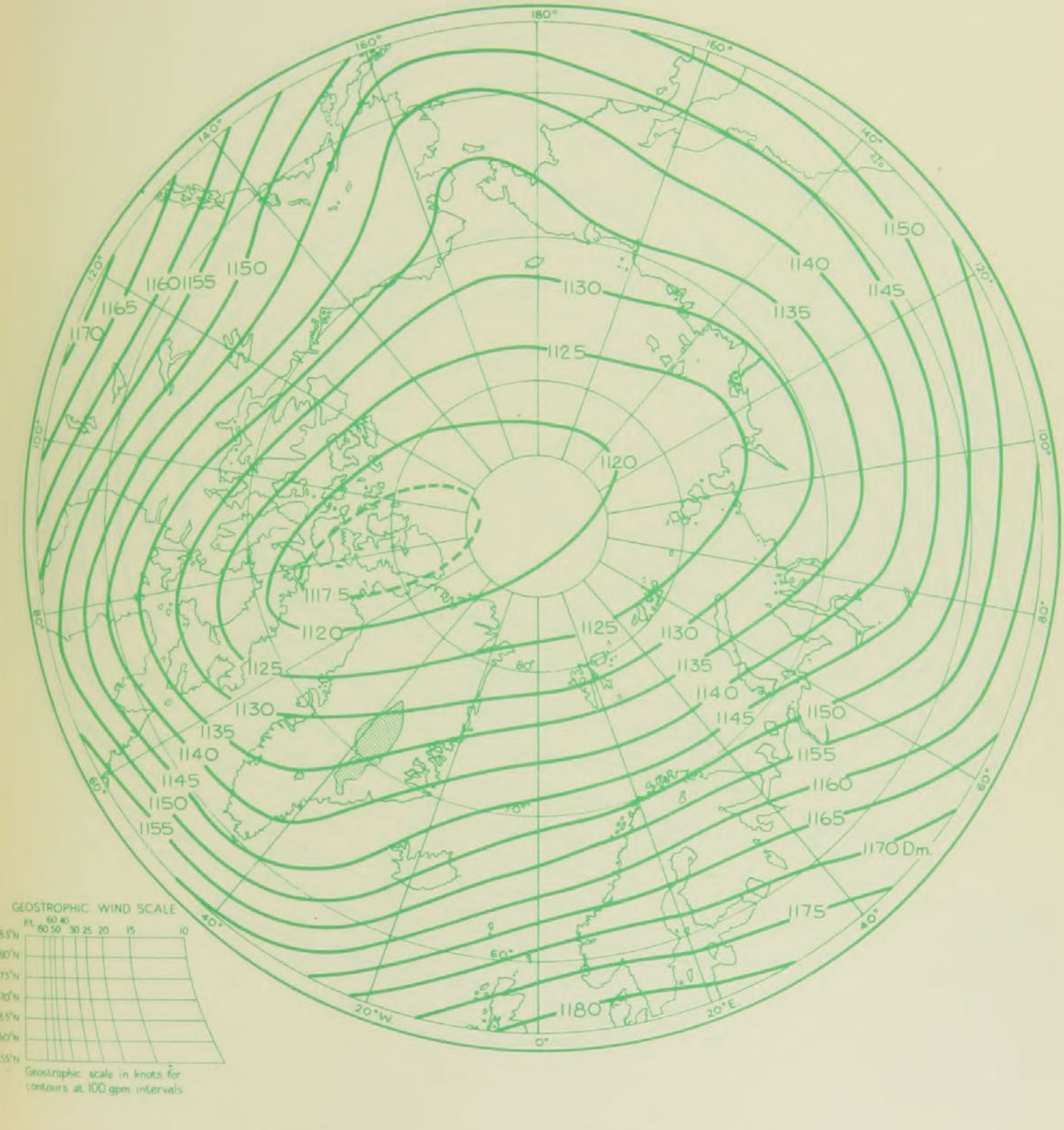


FIGURE 47—AVERAGE 200-MB. CONTOURS, OCTOBER 1949–53
I.C.A.O. height = 38,662 ft. = 11,784 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

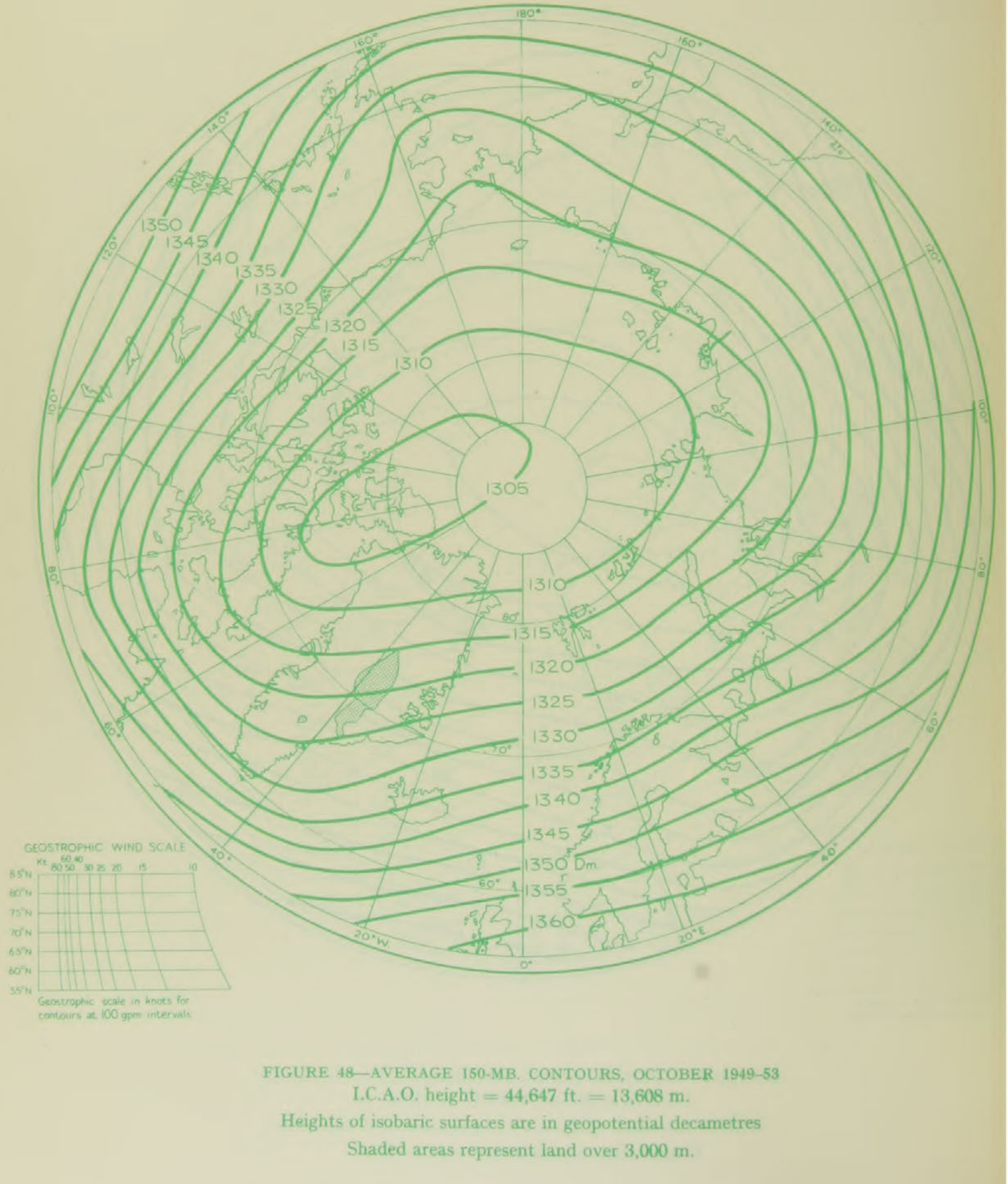


FIGURE 48—AVERAGE 150-MB. CONTOURS, OCTOBER 1949–53
I.C.A.O. height = 44,647 ft. = 13,608 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

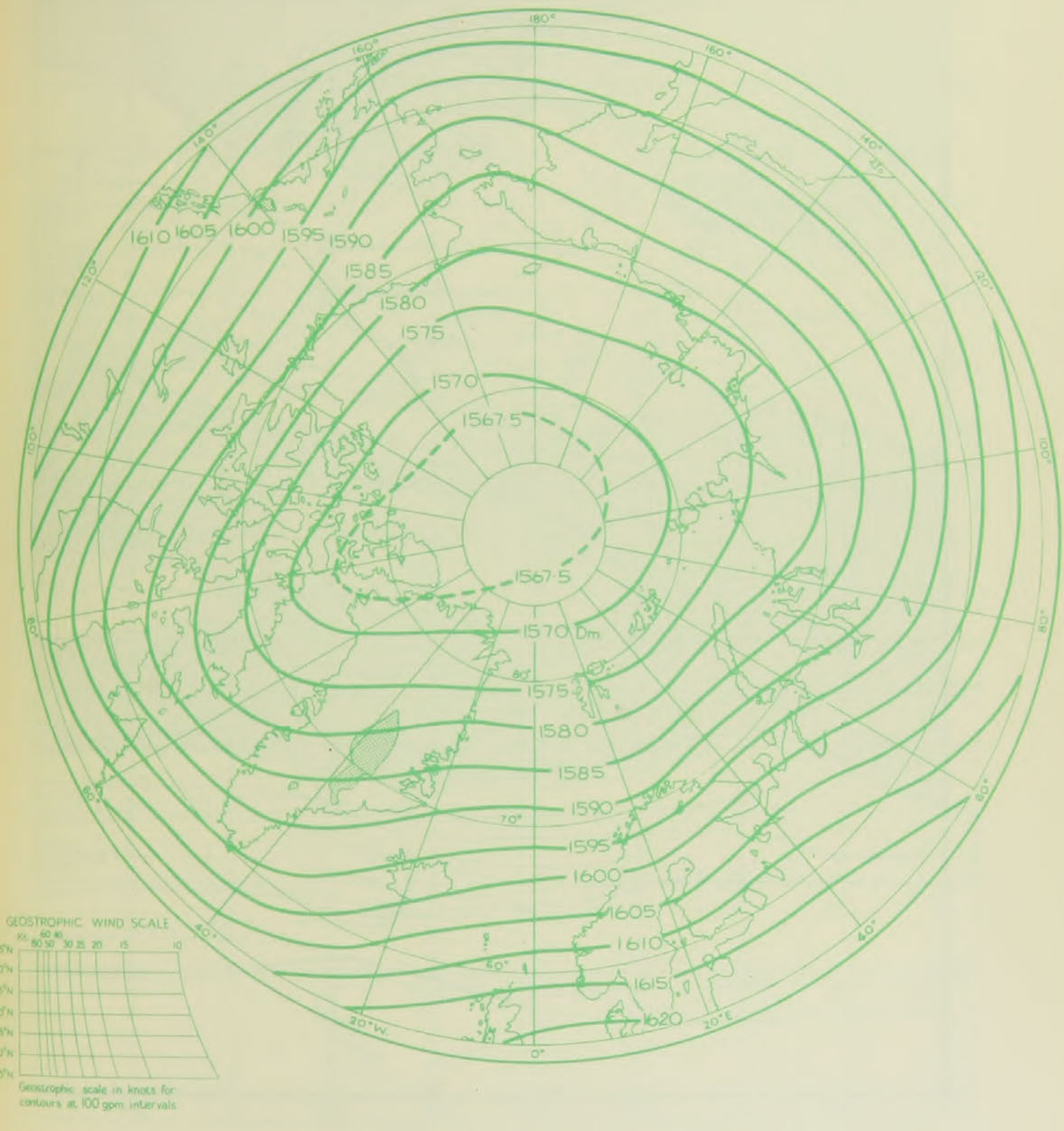


FIGURE 49—AVERAGE 100-MB. CONTOURS, OCTOBER 1949–53
I.C.A.O. height = 53,083 ft. = 16,180 m.
Heights of isobaric surfaces are in geopotential decametres
Shaded areas represent land over 3,000 m.

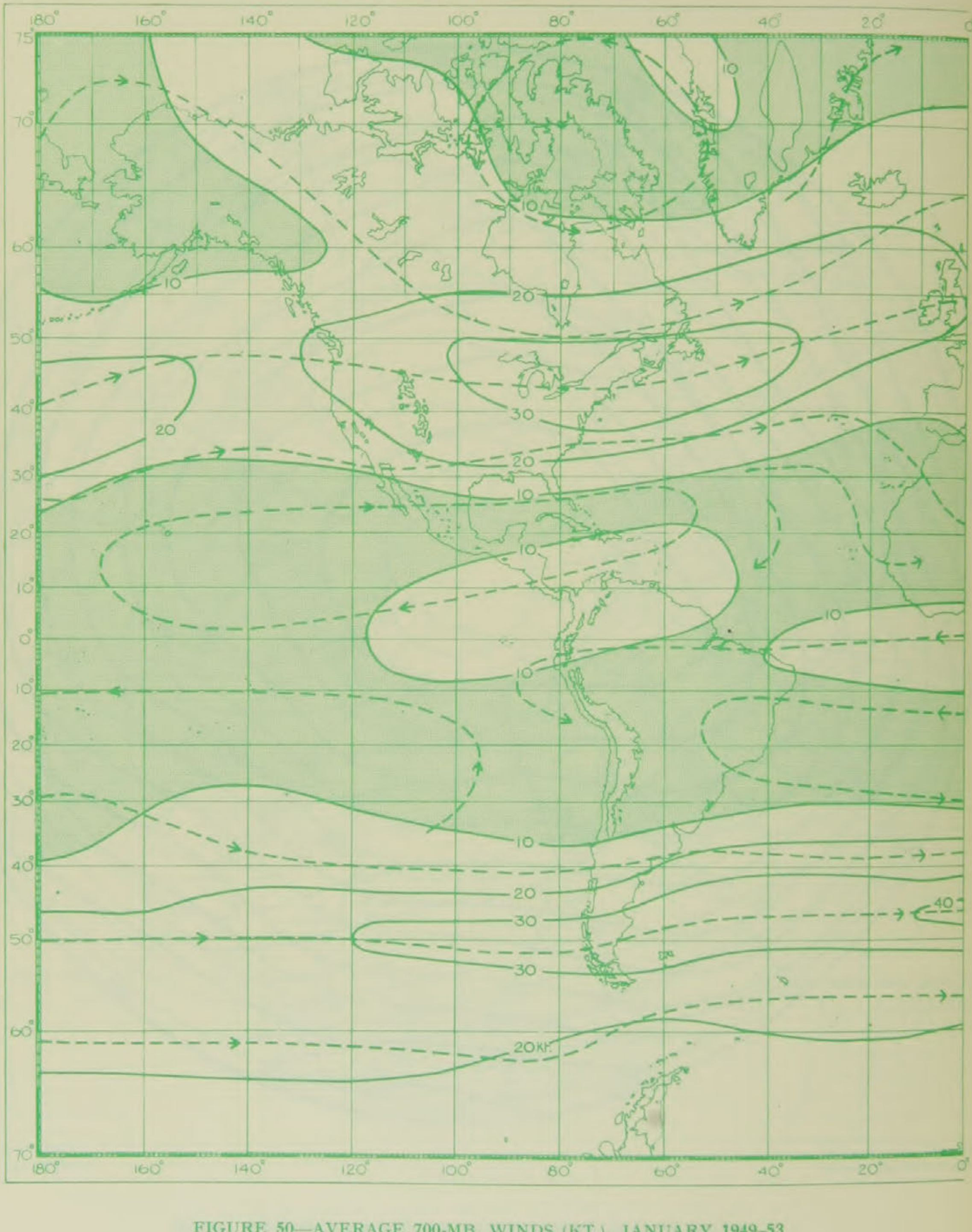


FIGURE 50—AVERAGE 700-MB. WINDS (KT.), JANUARY 1949–53
I.C.A.O. height = 9,882 ft. = 3,012 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

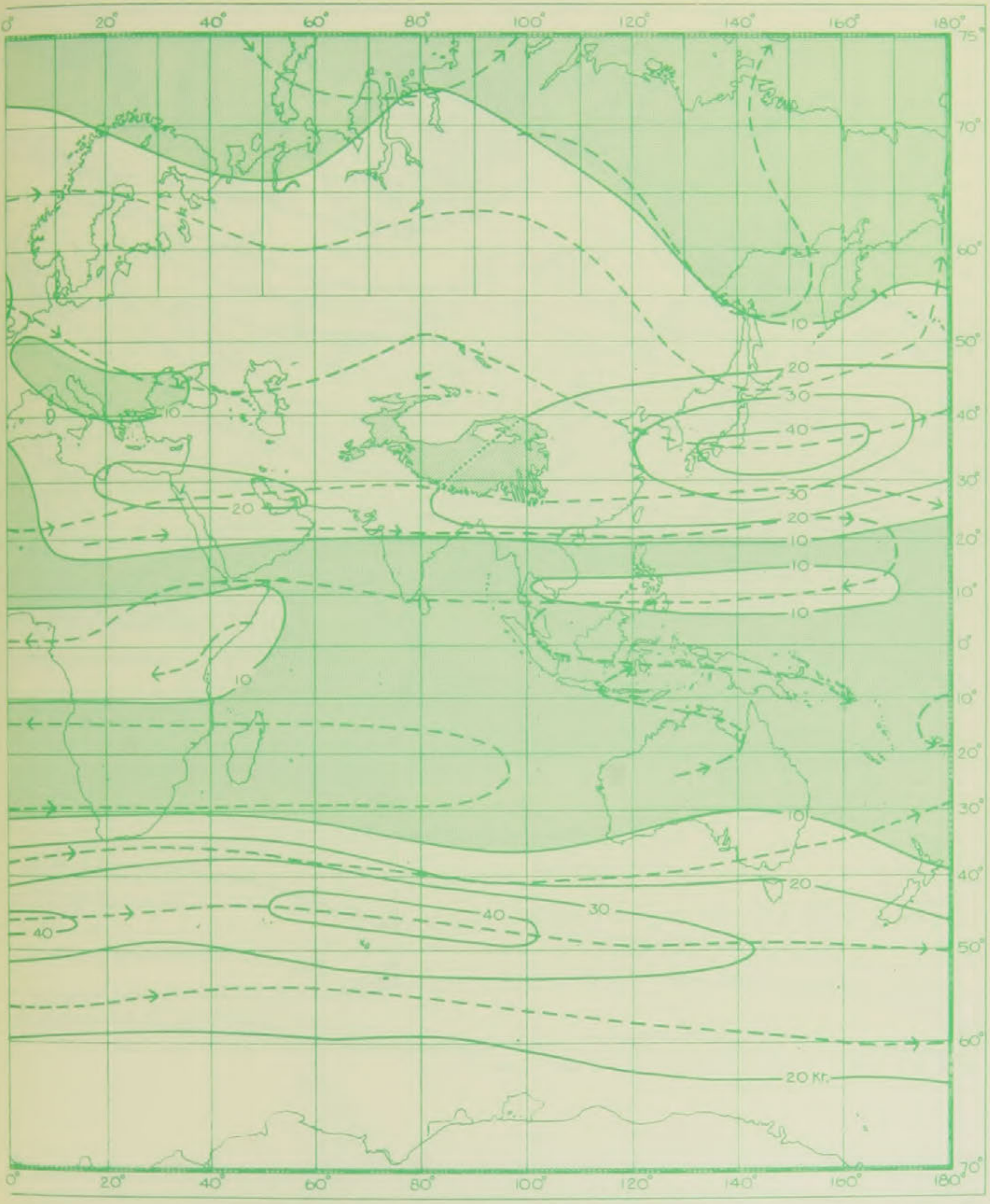


FIGURE 50—CONTINUED

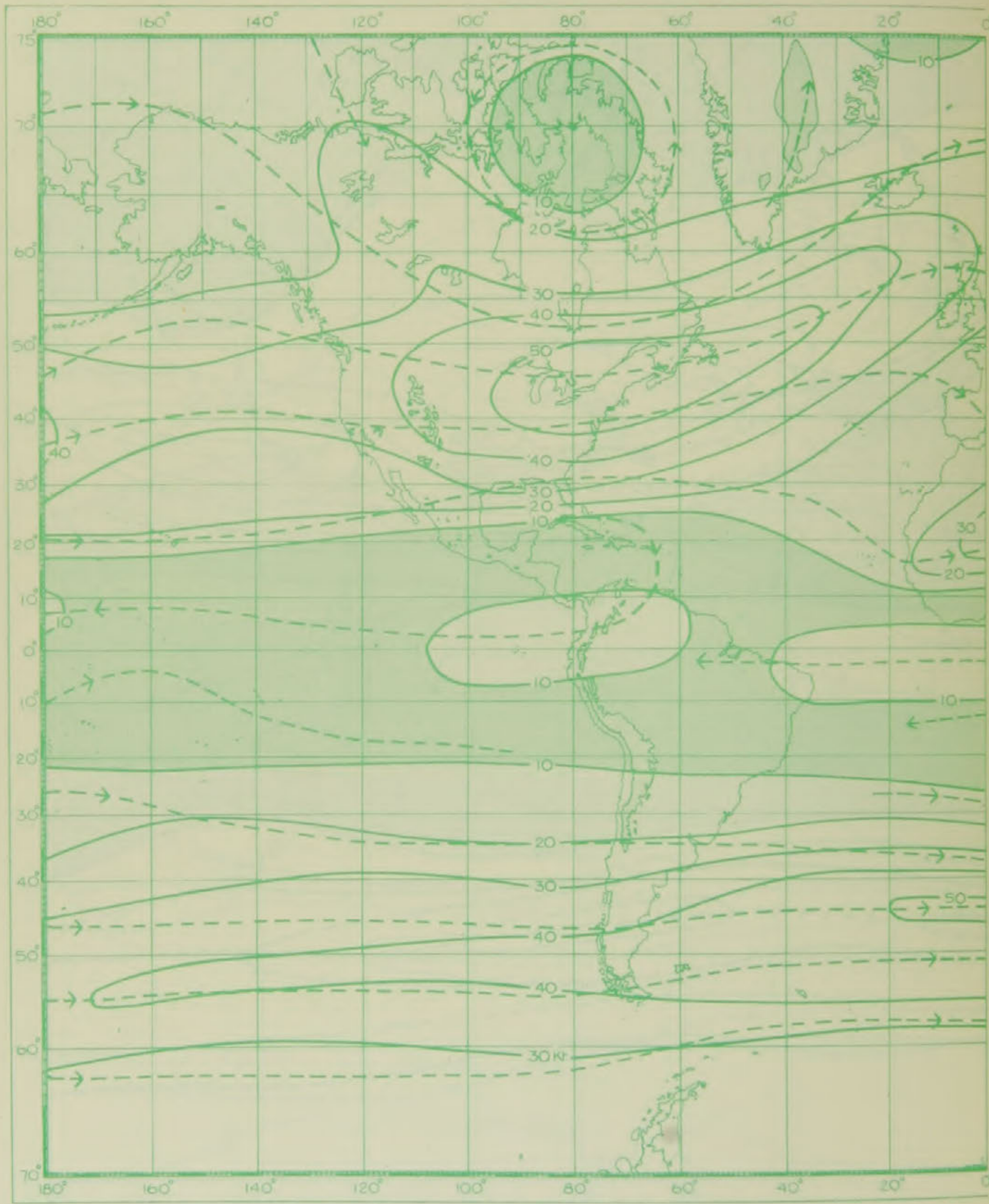


FIGURE 51—AVERAGE 500-MB. WINDS (KT.), JANUARY 1949-53
I.C.A.O. height = 18,289 ft. = 5,574 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

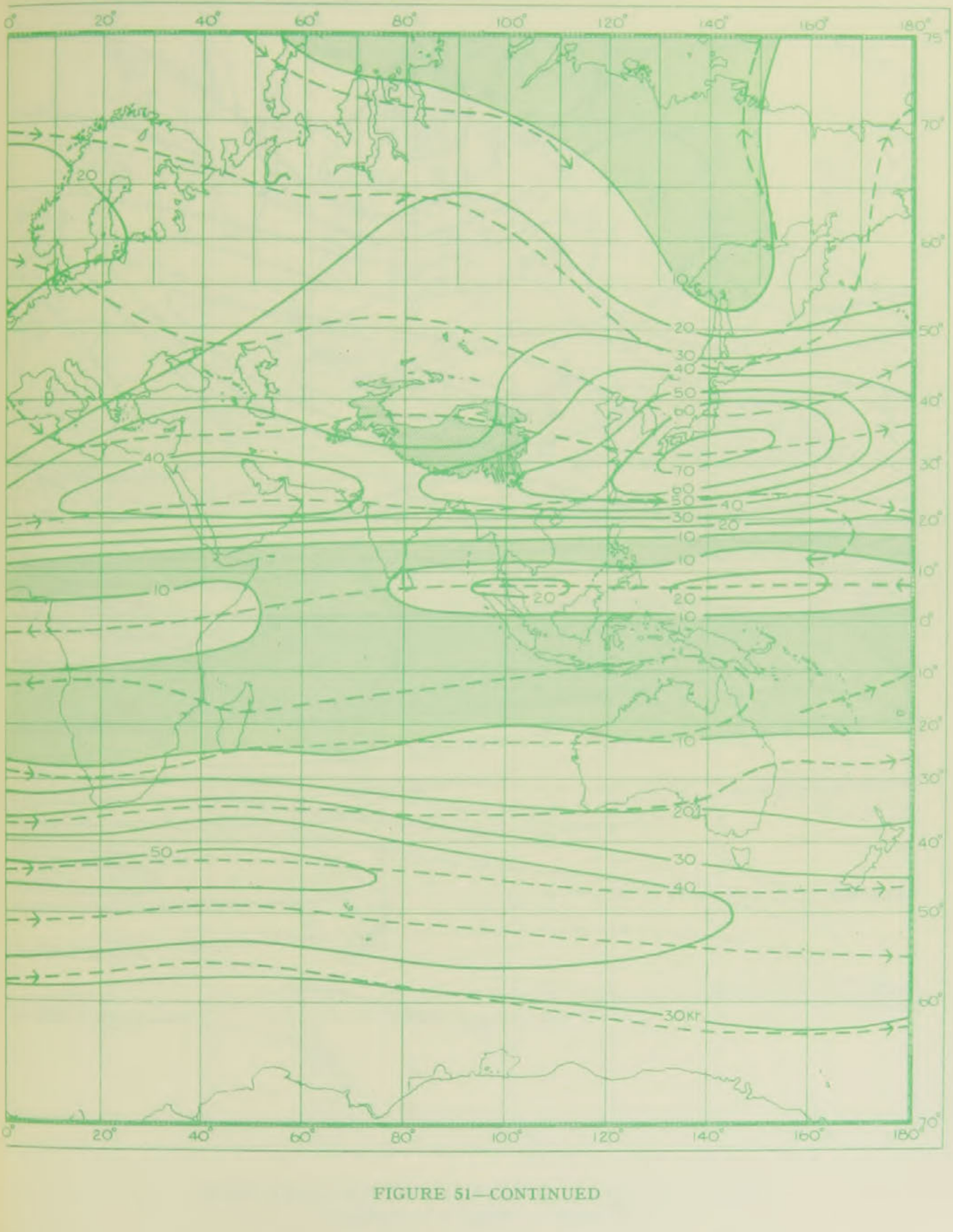


FIGURE 51—CONTINUED

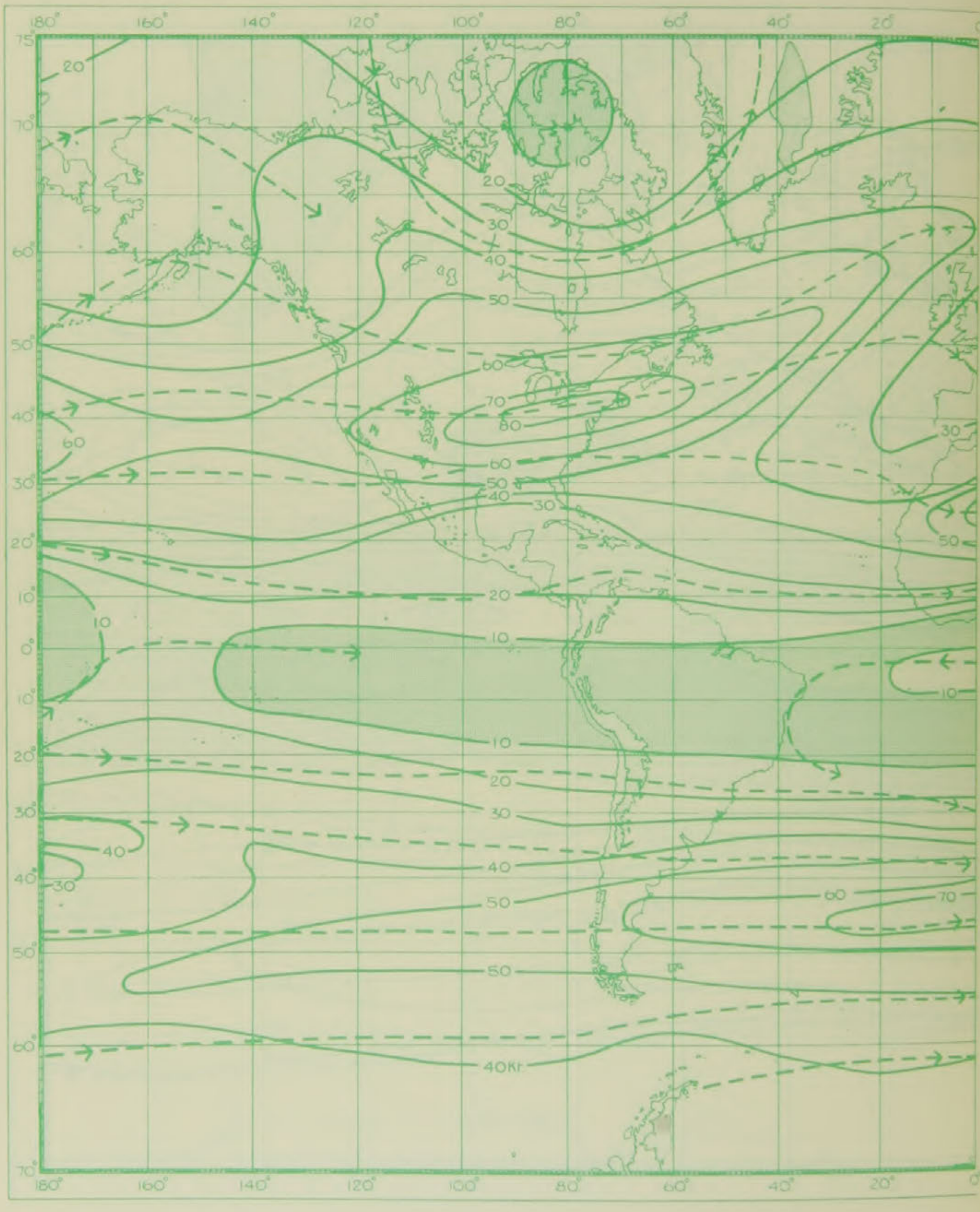


FIGURE 52—AVERAGE 300-MB. WINDS (KT.), JANUARY 1949–53
I.C.A.O. height = 30,065 ft. = 9,164 m.

Isotachs are shown by continuous lines and streamlines by broken lines

Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

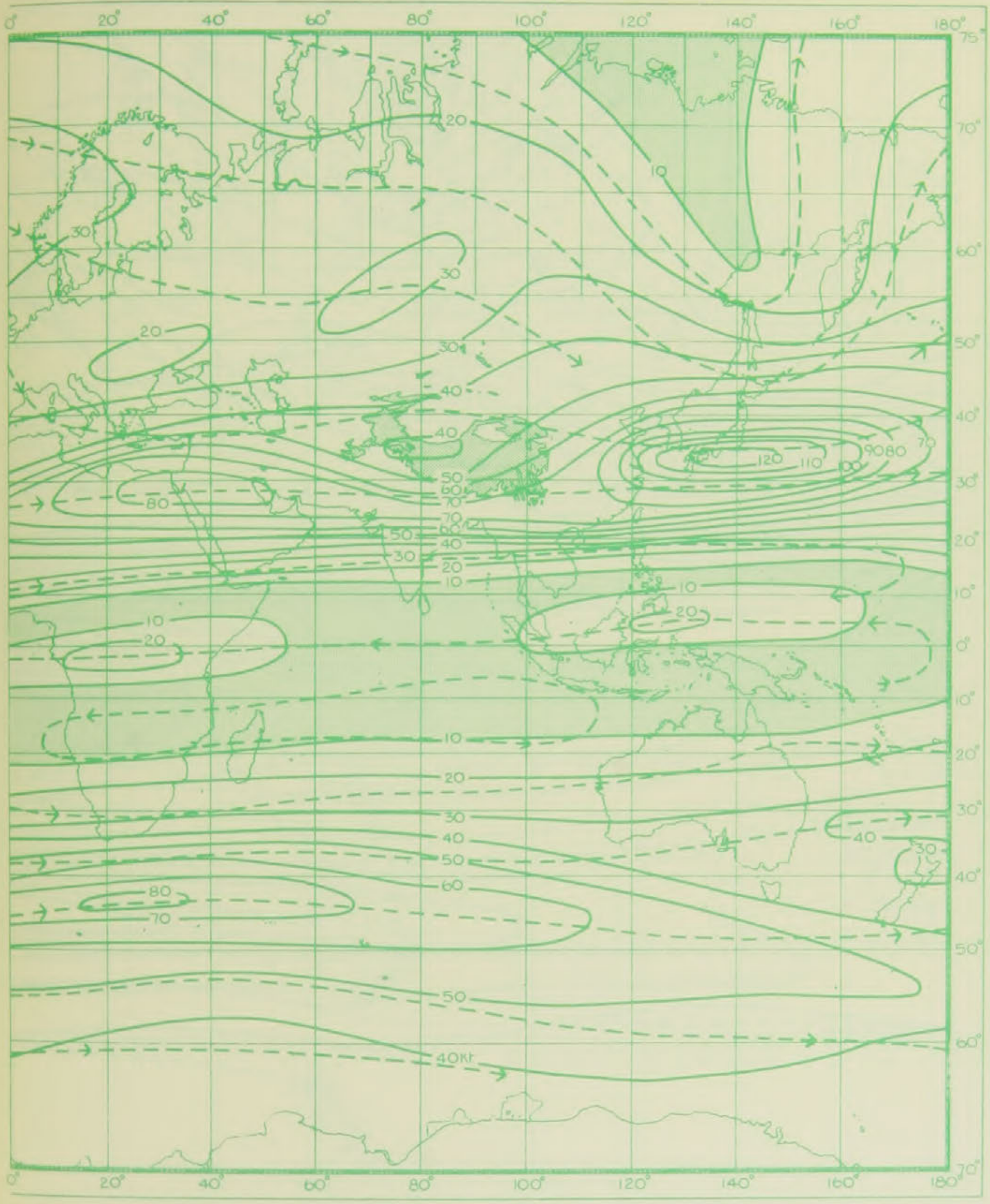


FIGURE 52—CONTINUED

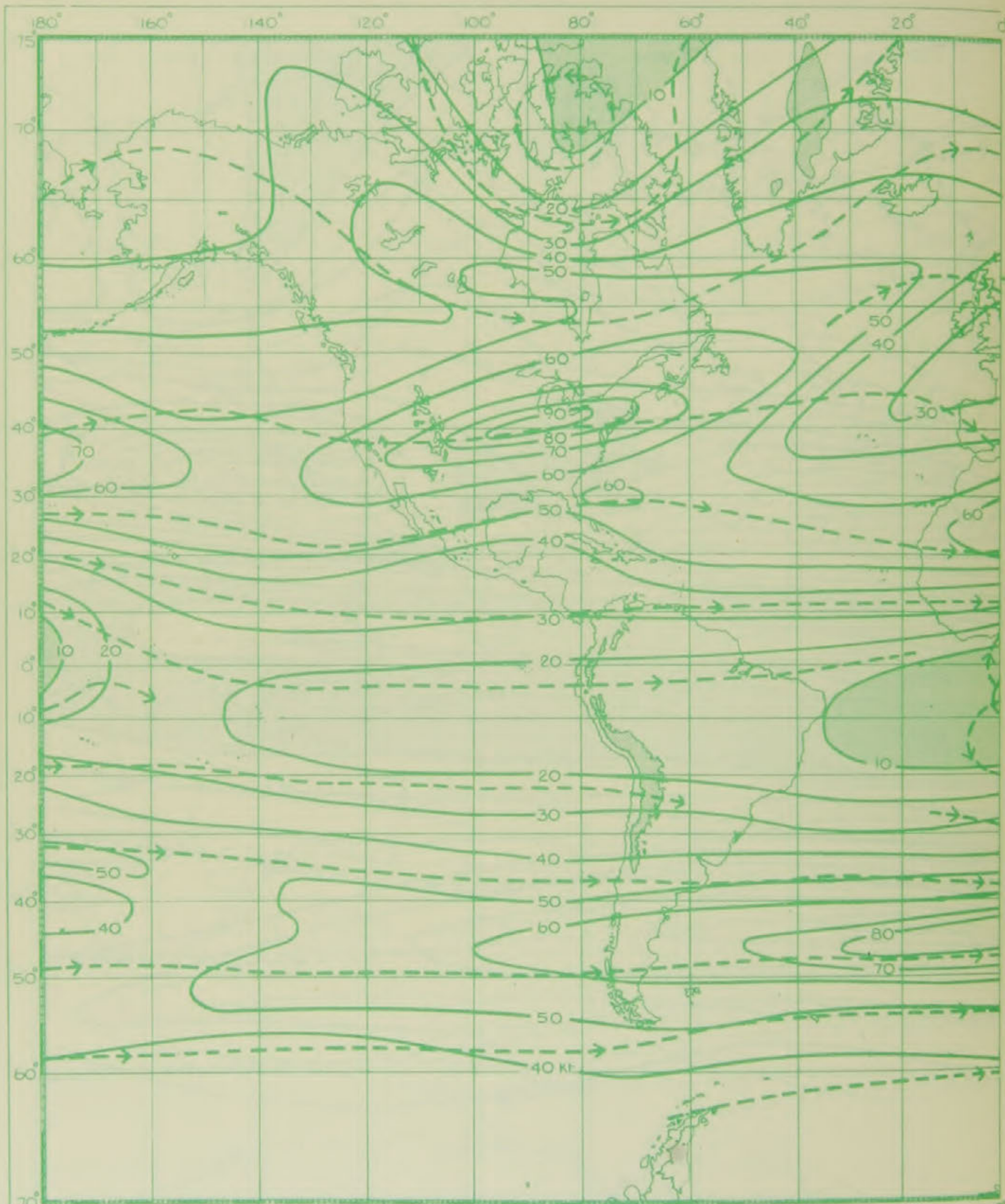
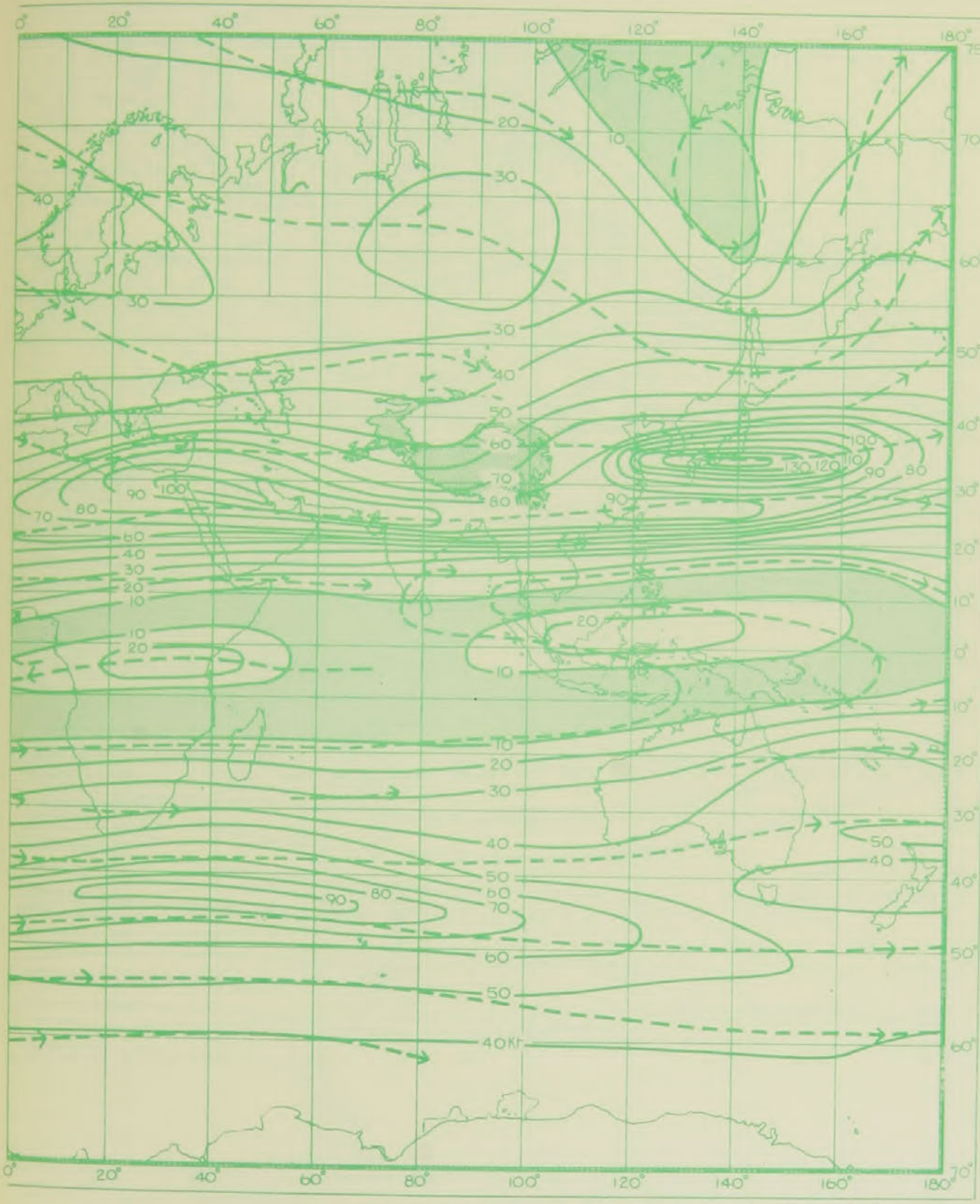


FIGURE 53—AVERAGE 200-MB. WINDS (KT.), JANUARY 1949–53

I.C.A.O. height = 38,662 ft. = 11,784 m.

Isotachs are shown by continuous lines and streamlines by broken lines

Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading



F

FIGURE 53—CONTINUED

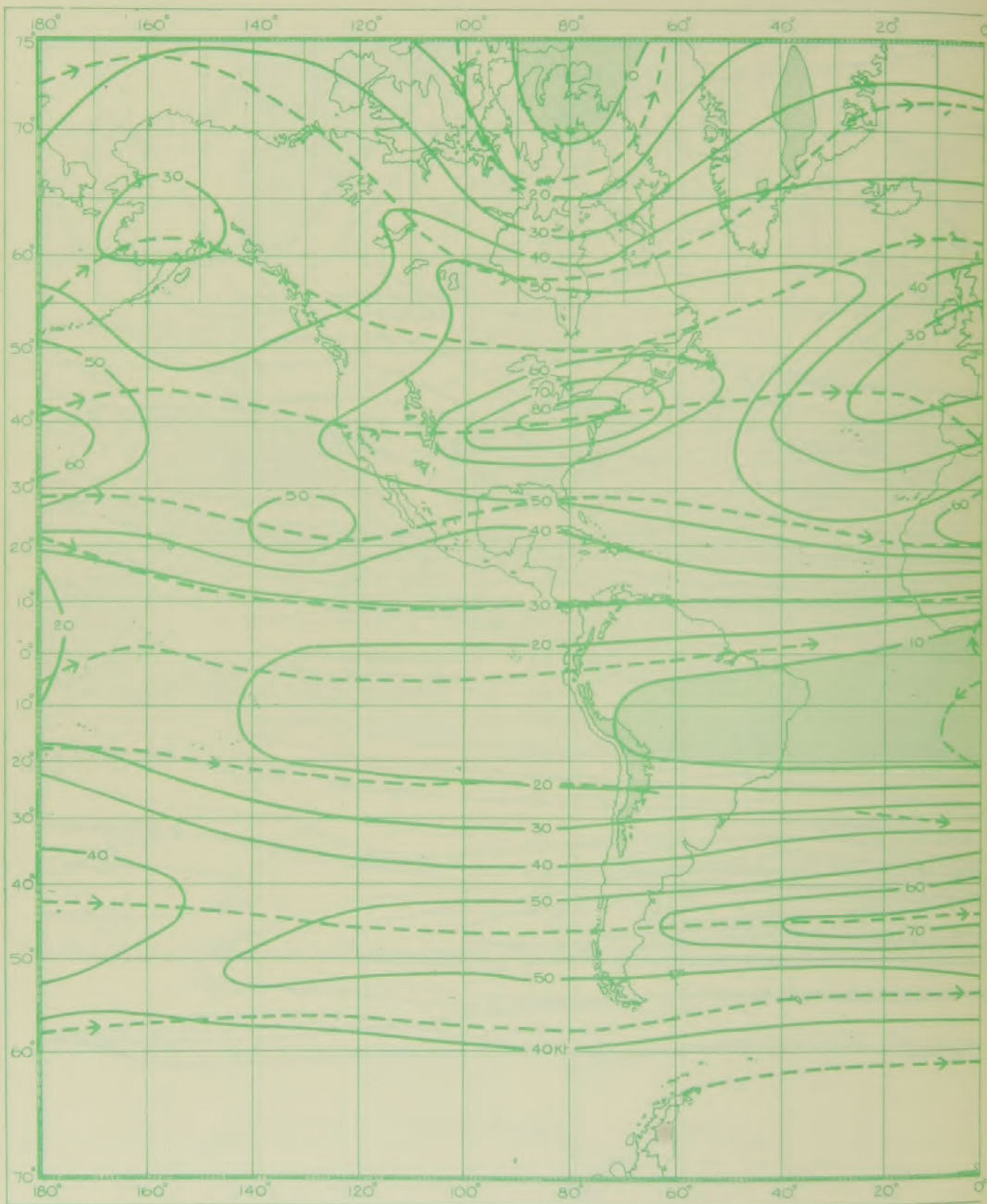


FIGURE 54—AVERAGE 150-MB. WINDS (KT.), JANUARY 1949–53
I.C.A.O. height = 44,647 ft. = 13,608 m.

Isotachs are shown by continuous lines and streamlines by broken lines

Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

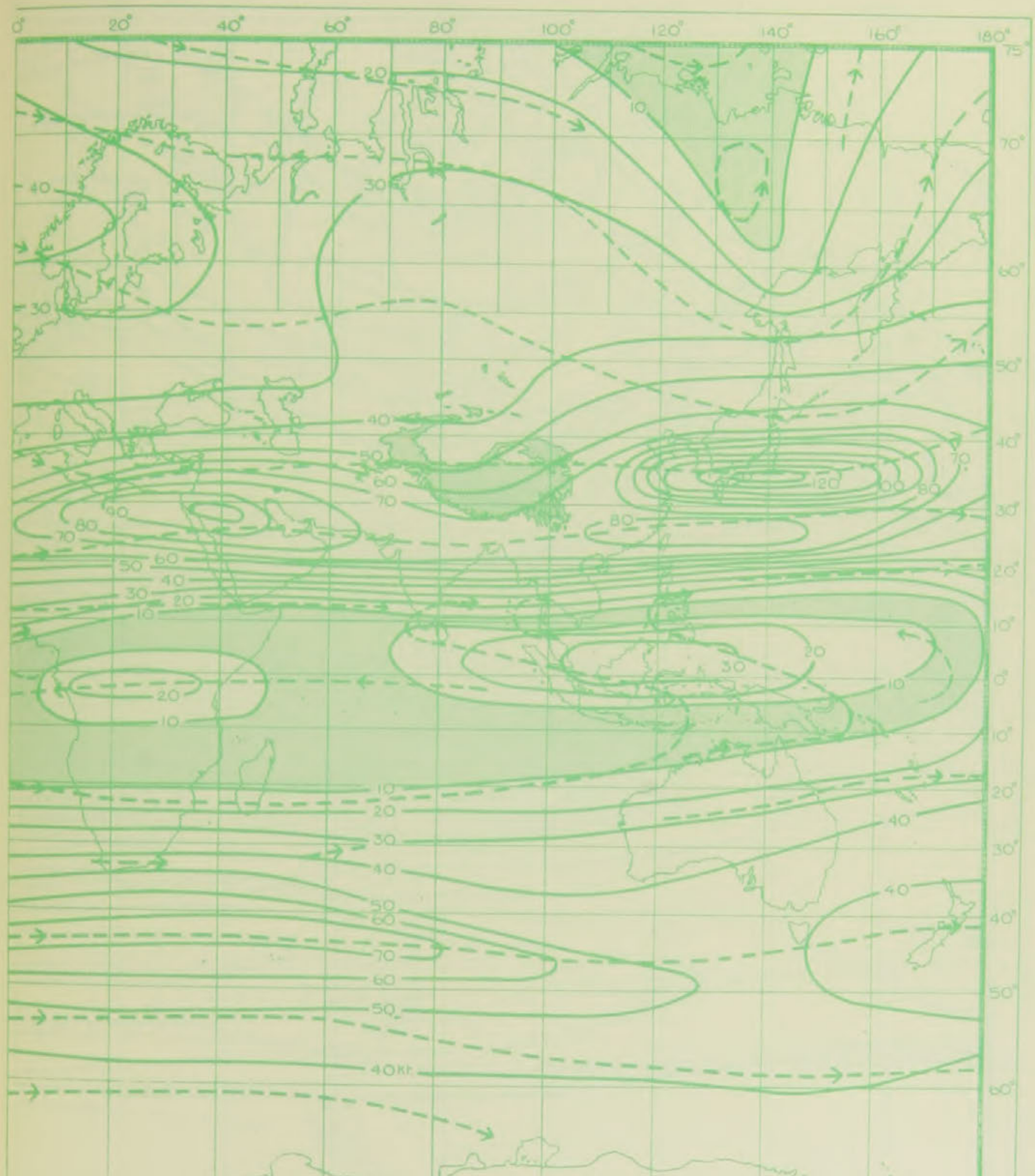


FIGURE 54—CONTINUED

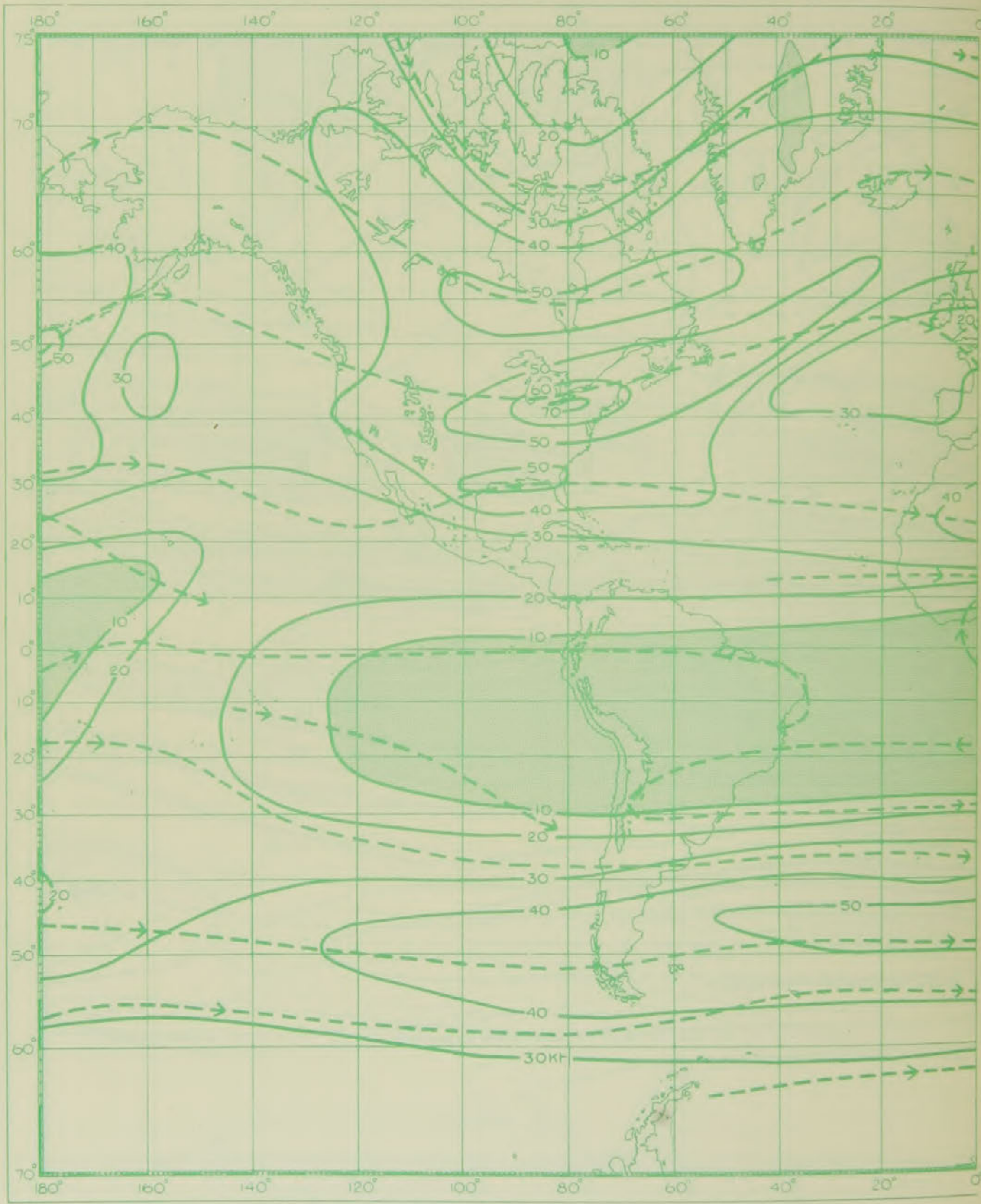


FIGURE 55—AVERAGE 100-MB. WINDS (KT.), JANUARY 1949–53
I.C.A.O. height = 53,083 ft. = 16,180 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

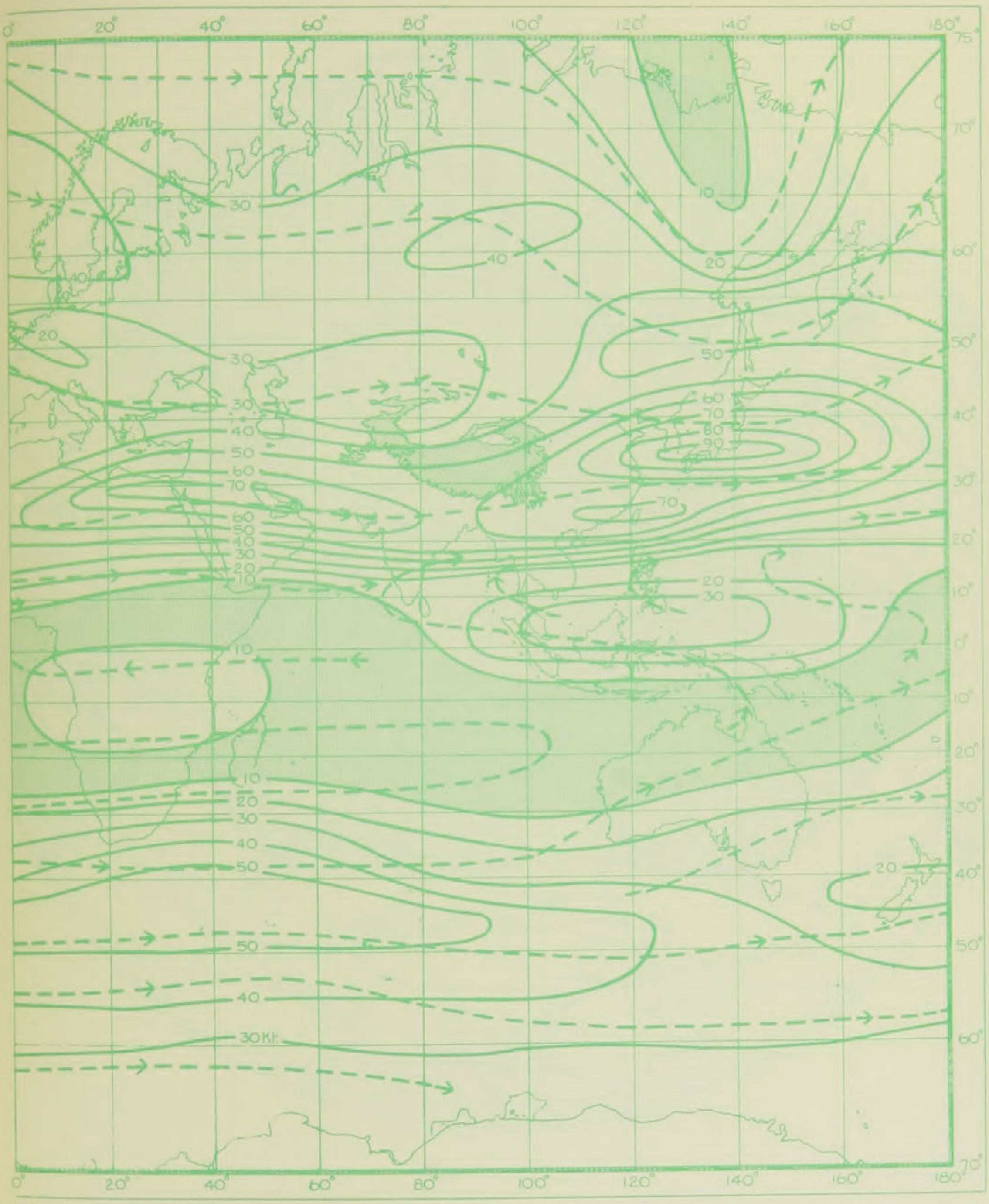


FIGURE 55—CONTINUED

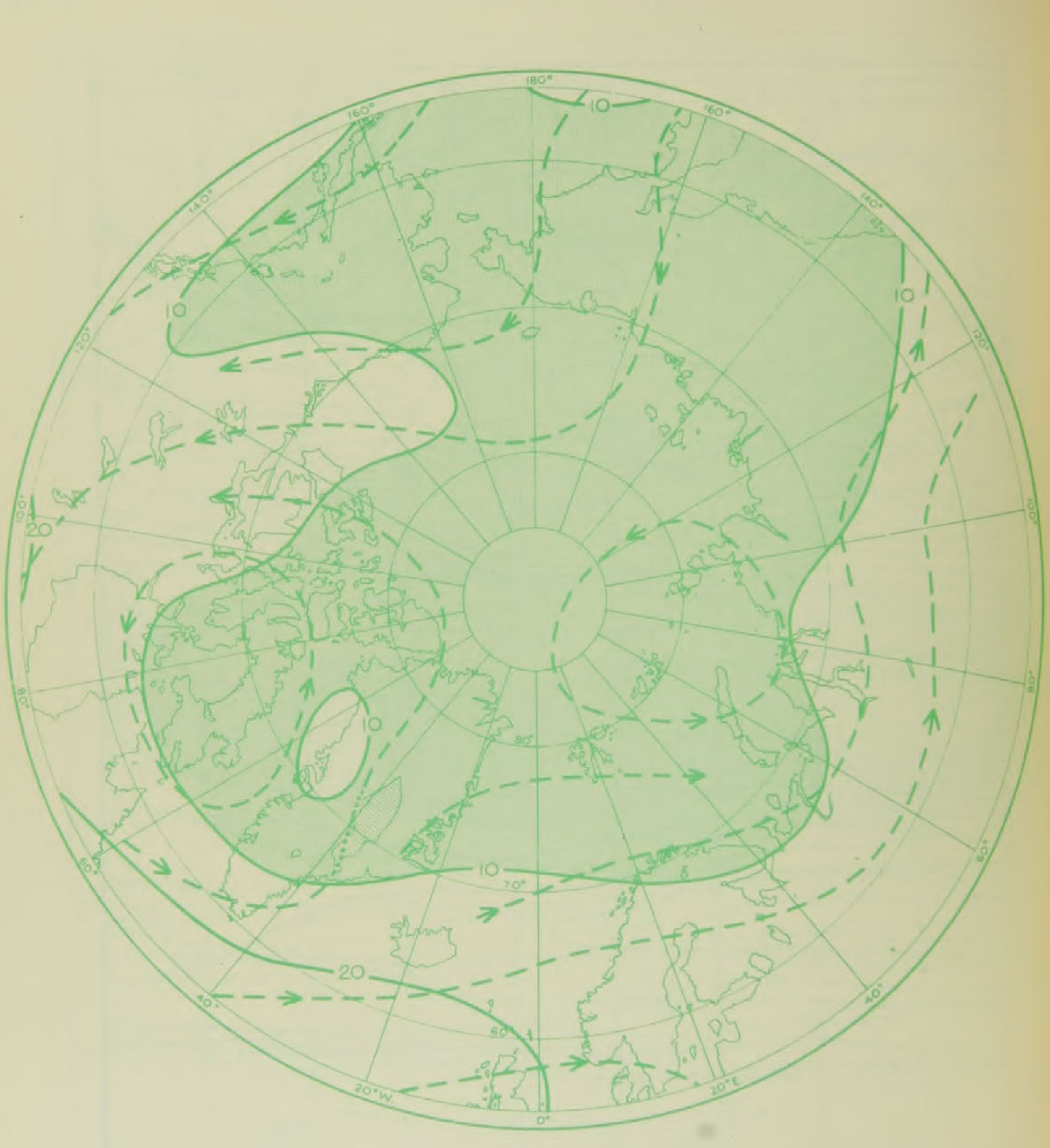


FIGURE 56—AVERAGE 700-MB. WINDS (KT.), JANUARY 1949–53
I.C.A.O. height = 9,882 ft. = 3,012 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with speed wind less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

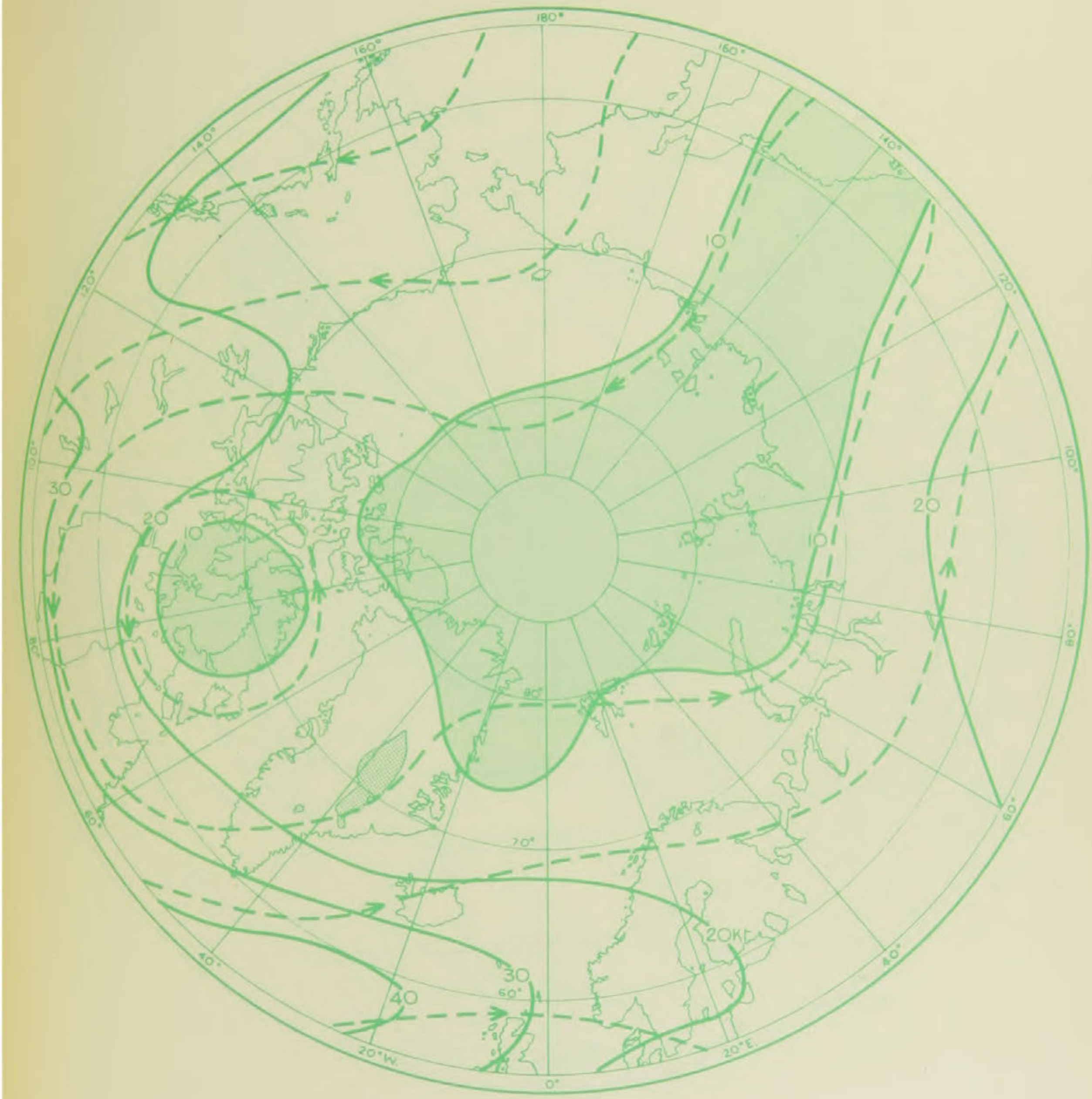


FIGURE 57—AVERAGE 500-MB. WINDS (KT.), JANUARY 1949–53
I.C.A.O. height = 18,289 ft. = 5,574 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

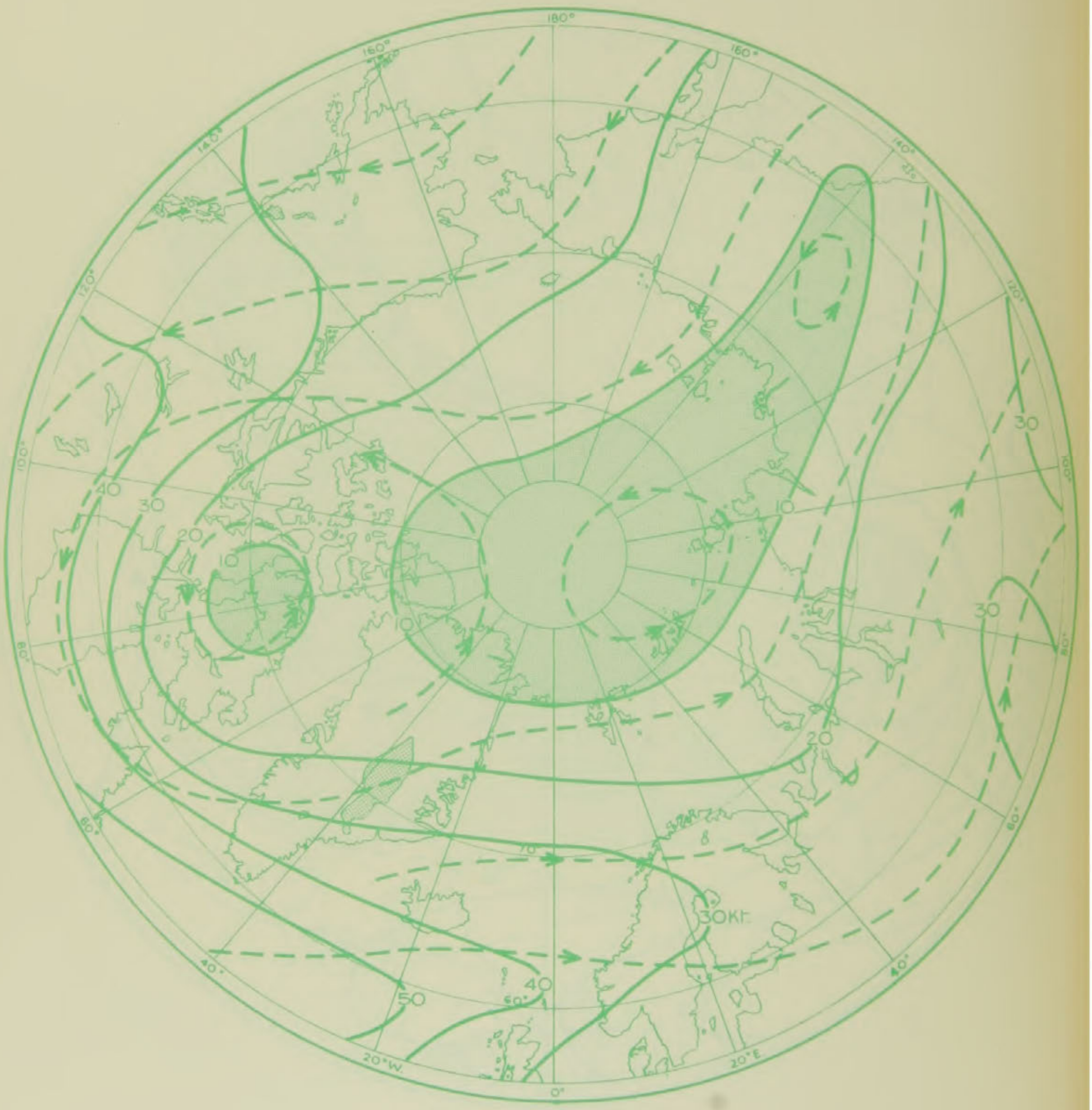


FIGURE 58—AVERAGE 300-MB. WINDS (KT.), JANUARY 1949–53
I.C.A.O. height = 30,065 ft. = 9,164 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

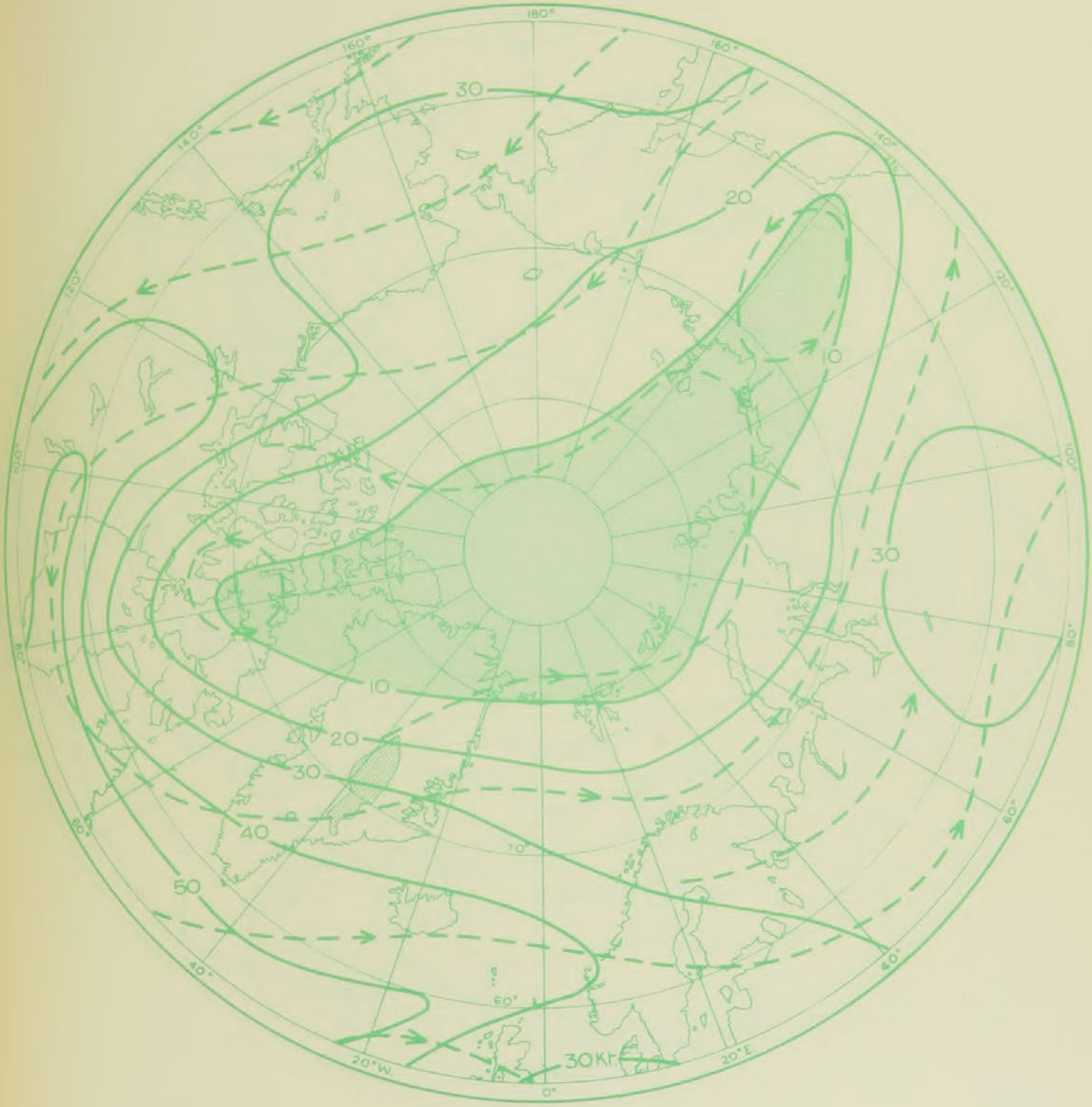


FIGURE 59—AVERAGE 200-MB. WINDS (KT.), JANUARY 1949–53
I.C.A.O. height = 38,662 ft. = 11,784 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

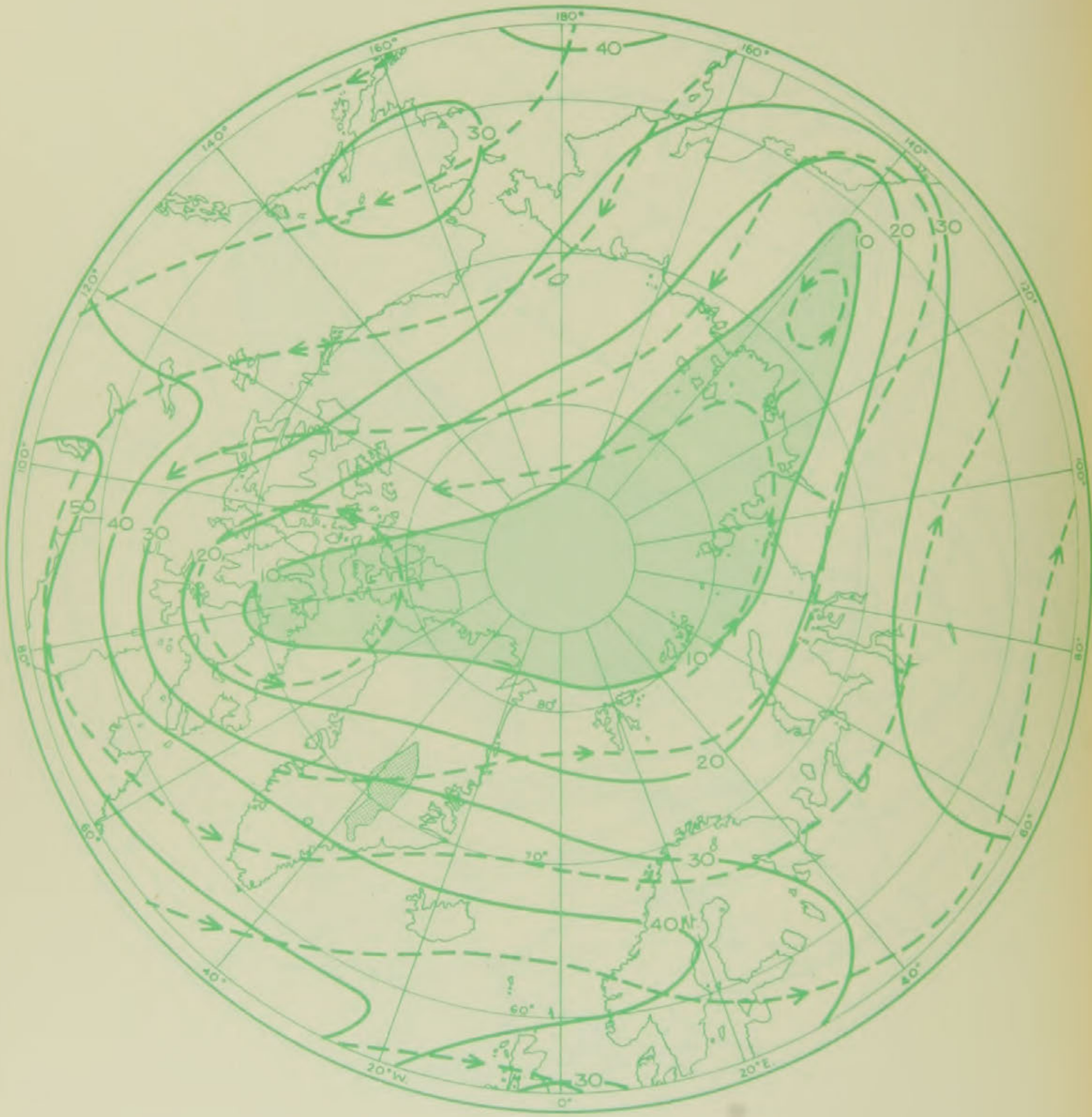


FIGURE 60—AVERAGE 150-MB. WINDS (KT.), JANUARY 1949–53
I.C.A.O. height = 44,647 ft. = 13,608 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

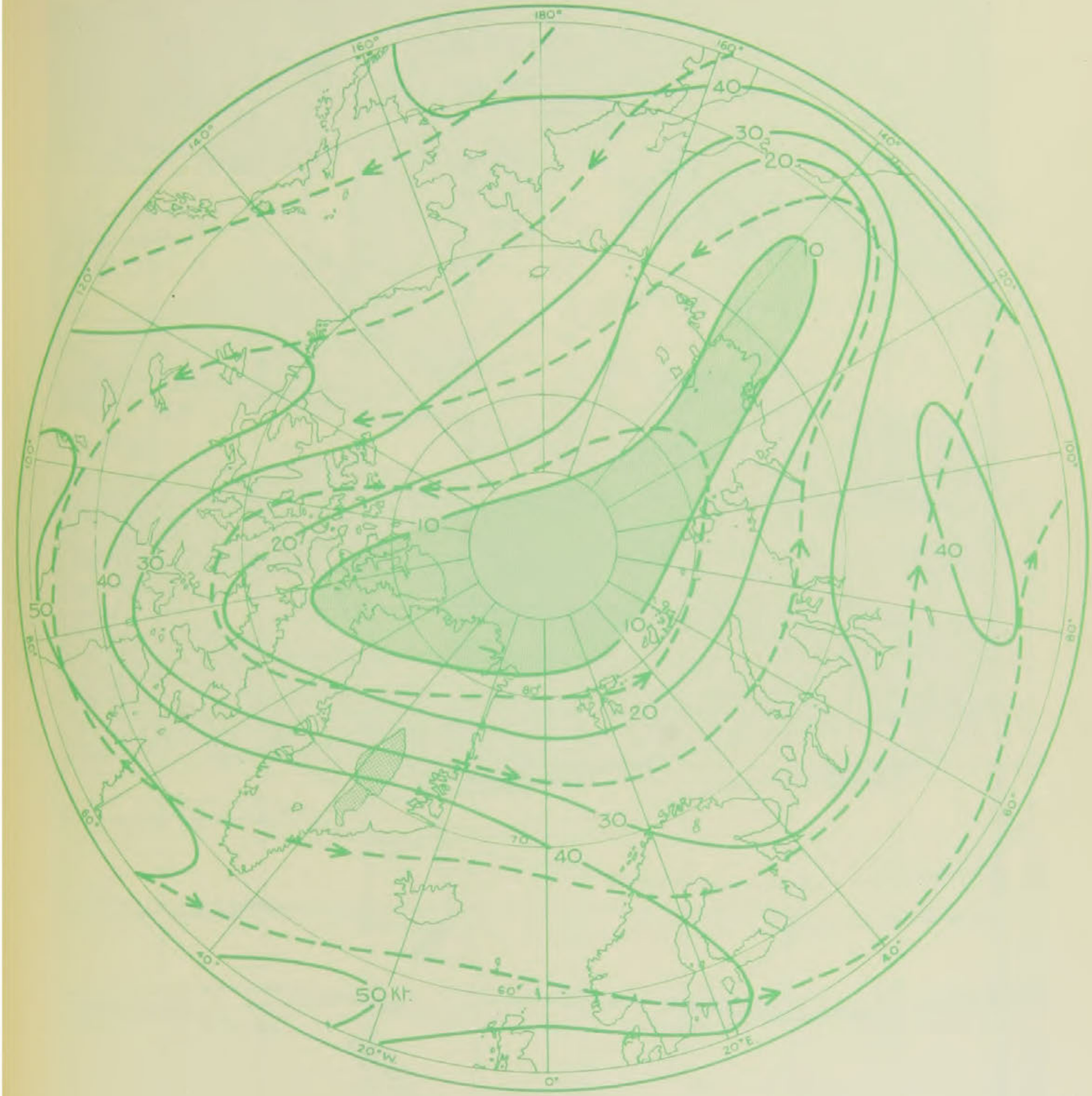


FIGURE 61—AVERAGE 100-MB. WINDS (KT.), JANUARY 1949–53
I.C.A.O. height = 53,083 ft. = 16,180 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt are lightly shaded; land over 3,000 m. is represented by heavier shading

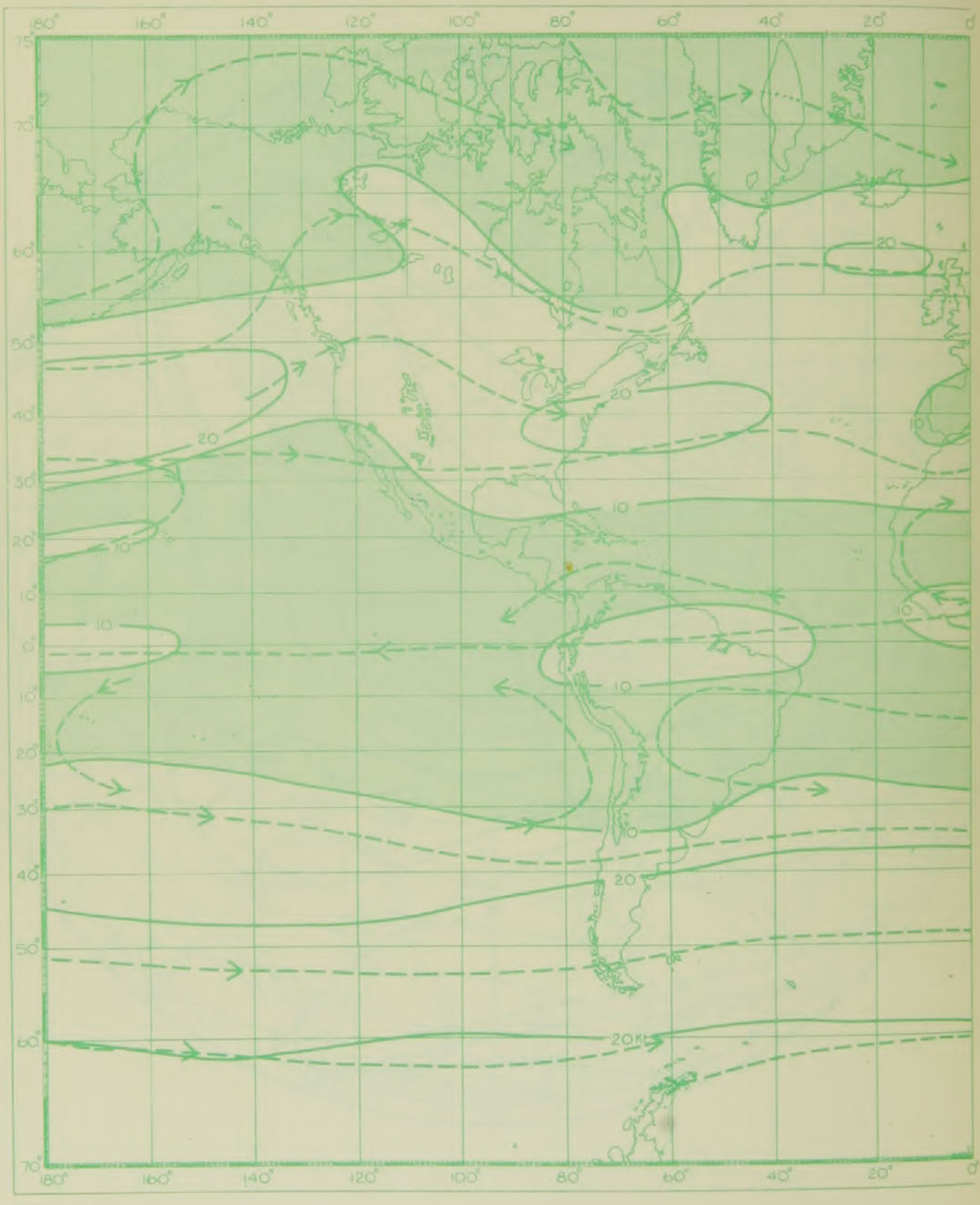


FIGURE 62—AVERAGE 700-MB. WINDS (KT.), APRIL 1949–53

I.C.A.O. height = 9,882 ft. = 3,012 m.

Isotachs are shown by continuous lines and streamlines by broken lines

Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

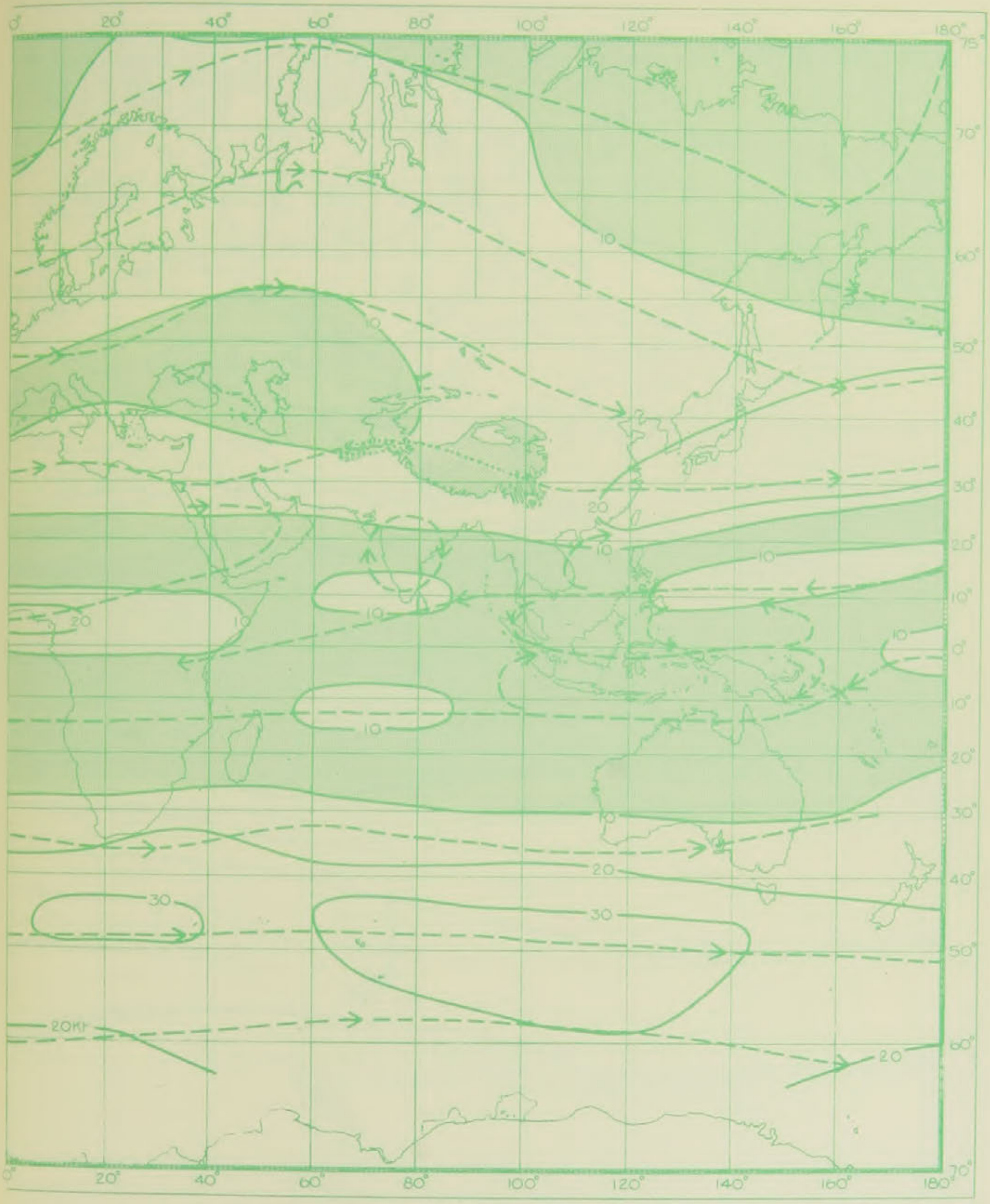


FIGURE 62—CONTINUED

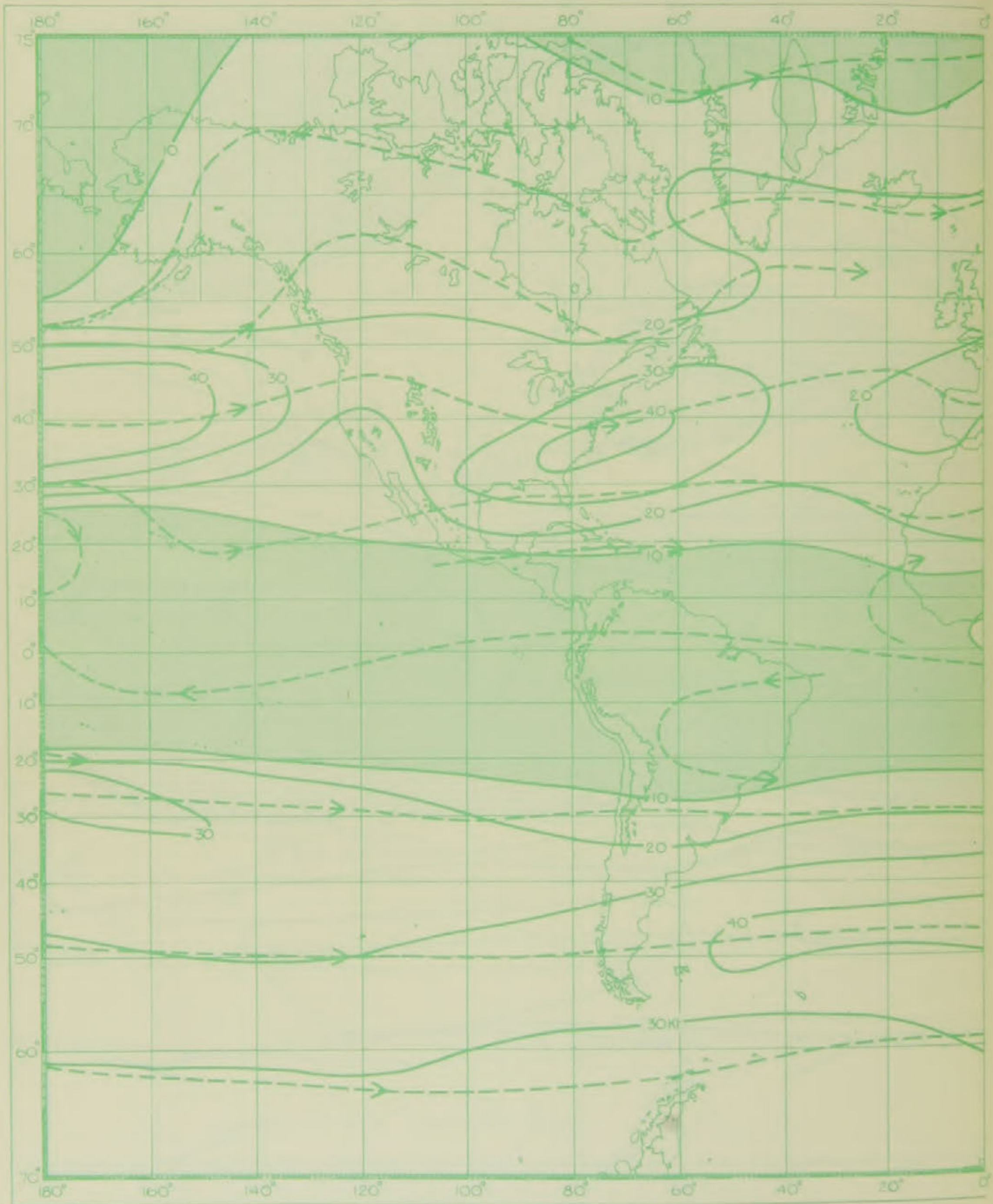


FIGURE 63—AVERAGE 500-MB. WINDS (KT.), APRIL 1949–53
I.C.A.O. height = 18,289 ft. = 5,574 m.

Isotachs are shown by continuous lines and streamlines by broken lines

Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

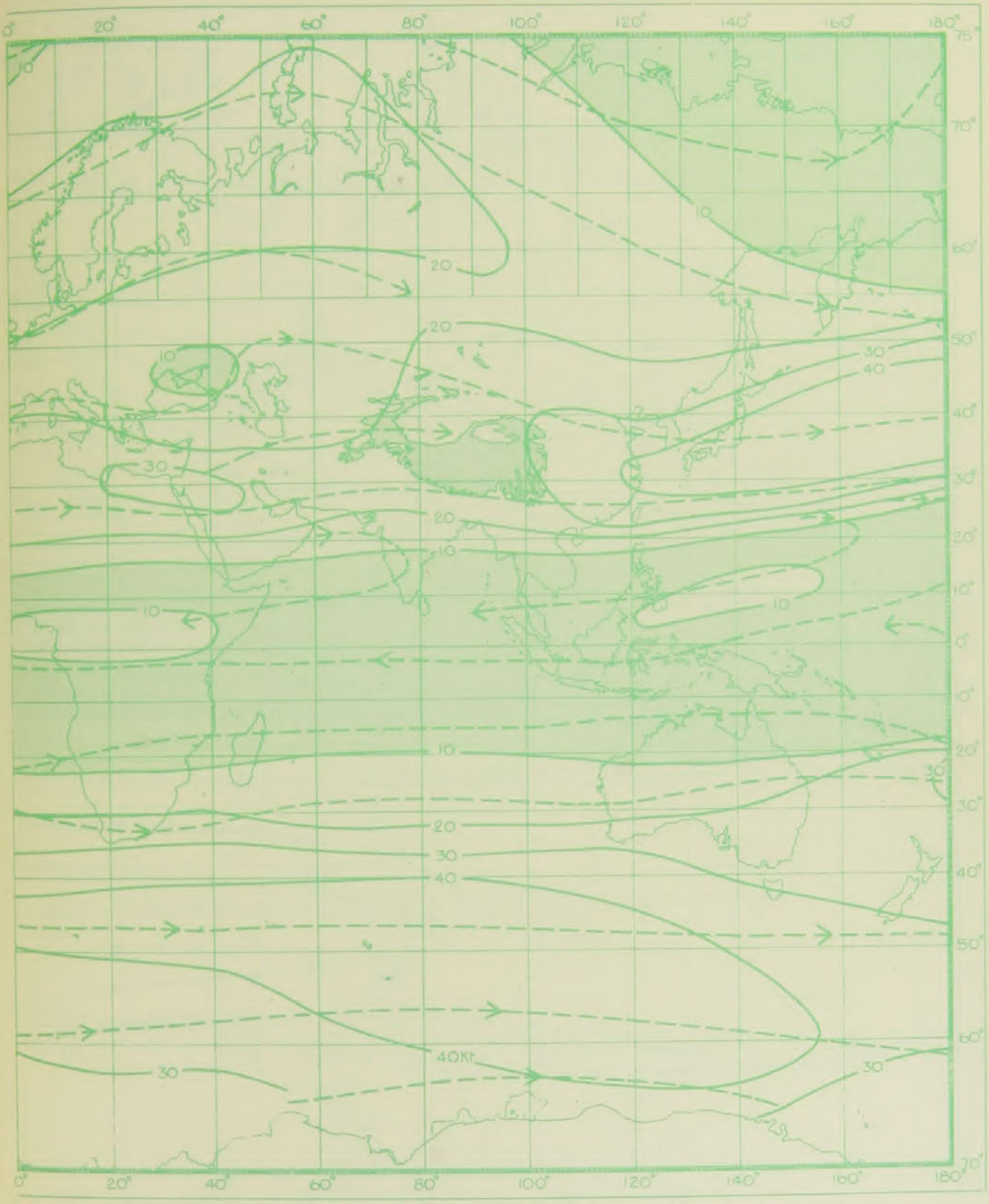


FIGURE 63—CONTINUED

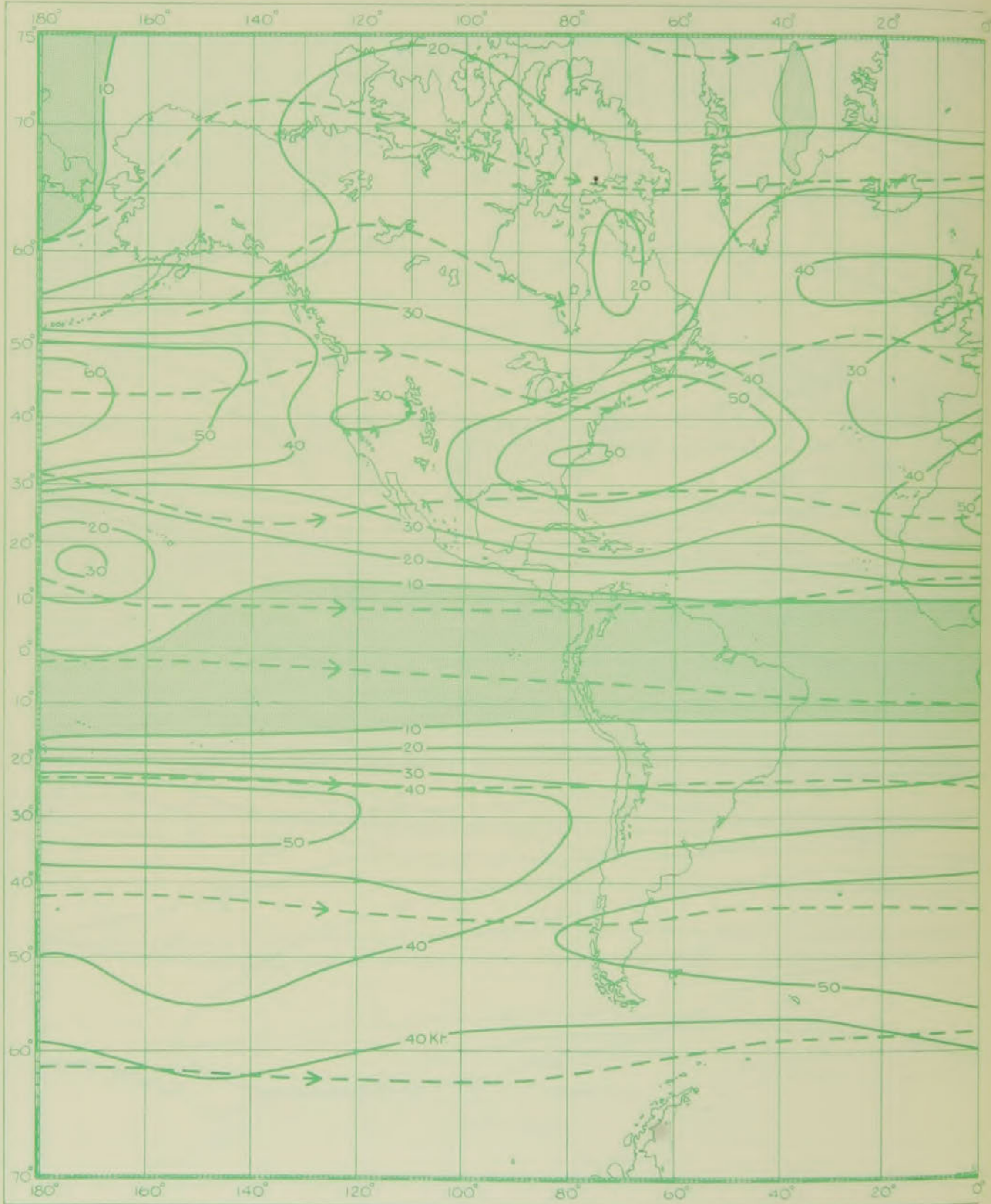


FIGURE 64—AVERAGE 300-MB WINDS (KT.), APRIL 1949–53
I.C.A.O. height = 30,065 ft. = 9,164 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

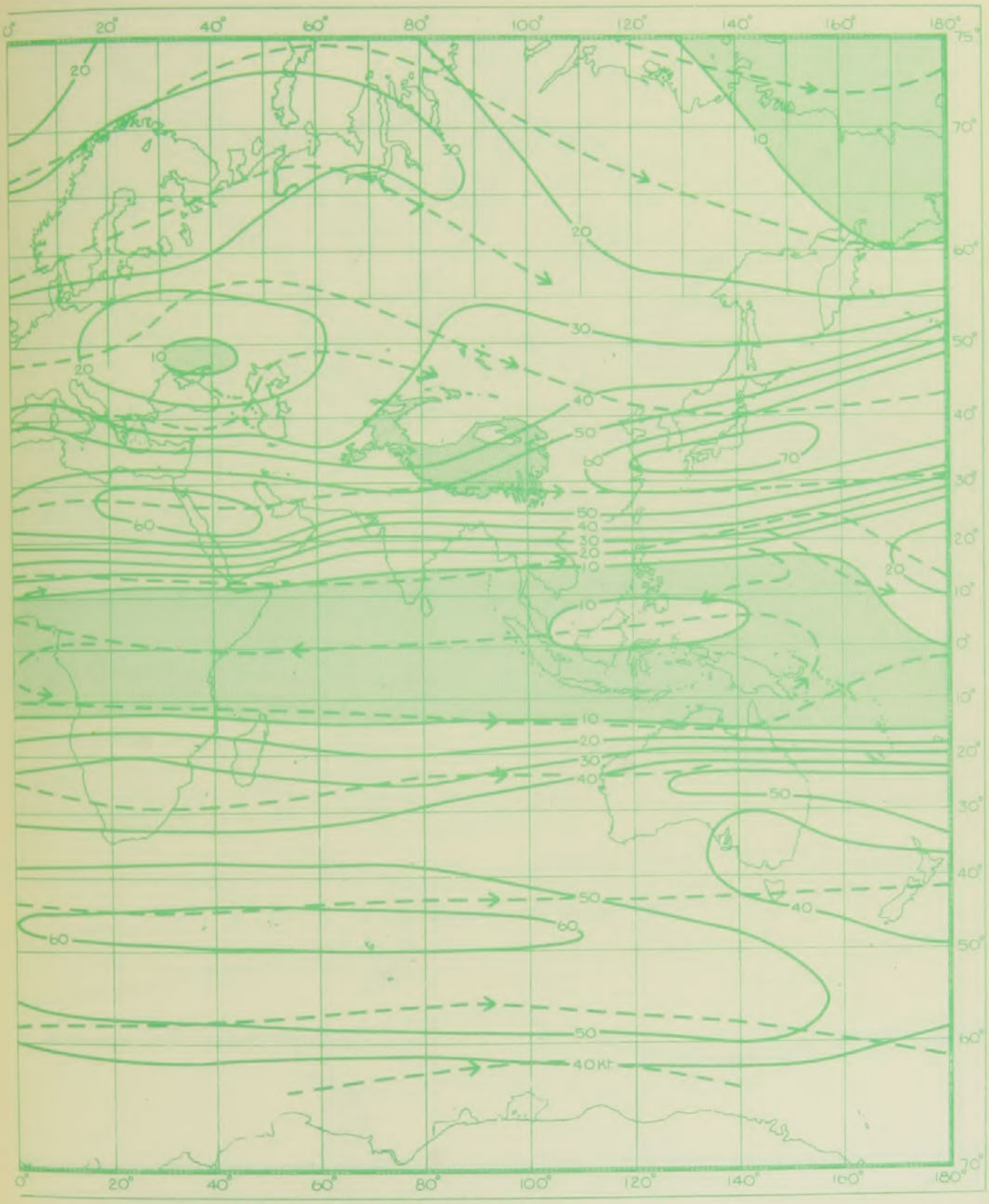


FIGURE 64—CONTINUED

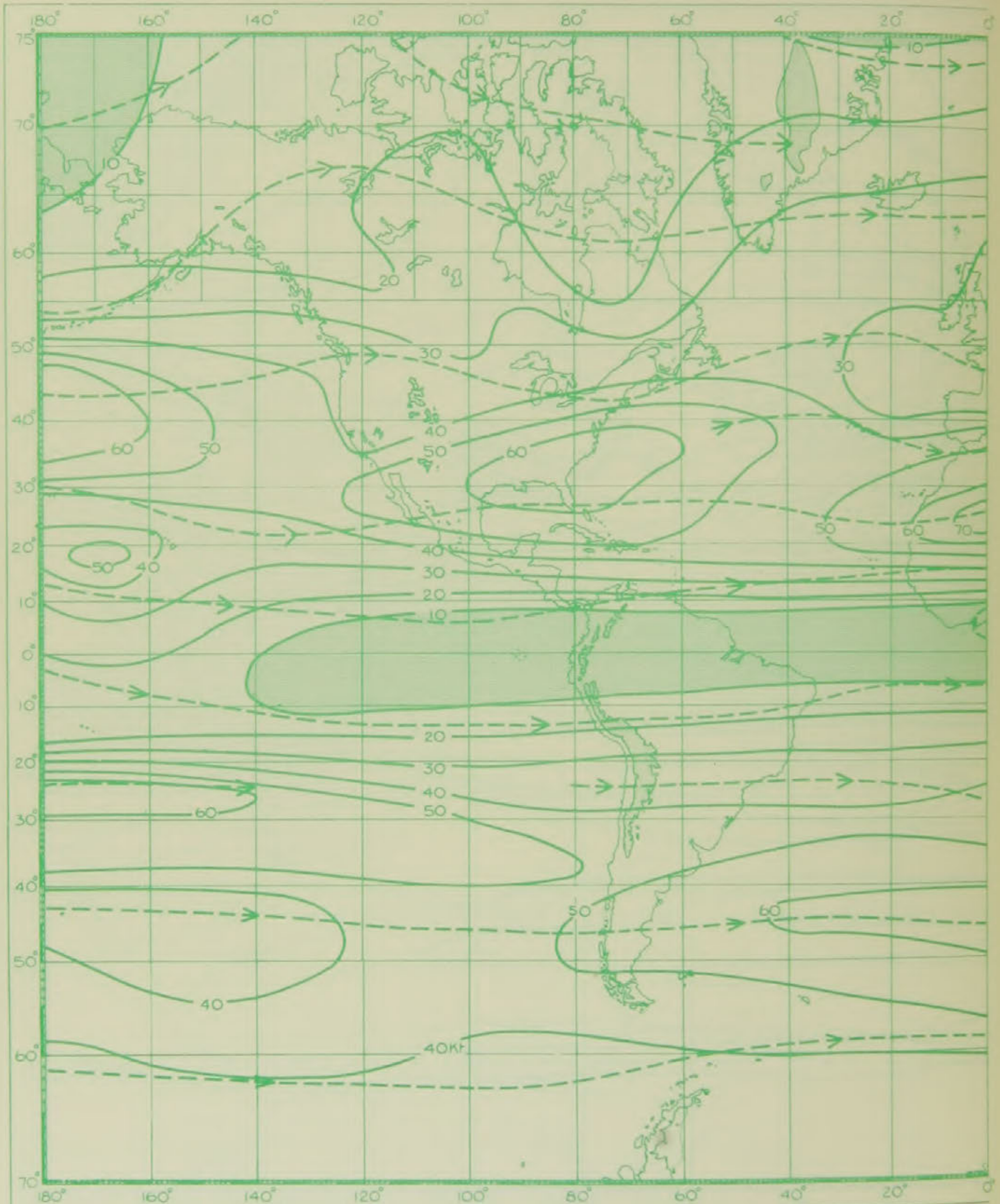


FIGURE 65—AVERAGE 200-MB. WINDS (KT.), APRIL 1949–53
I.C.A.O. height = 38,662 ft. = 11,784 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

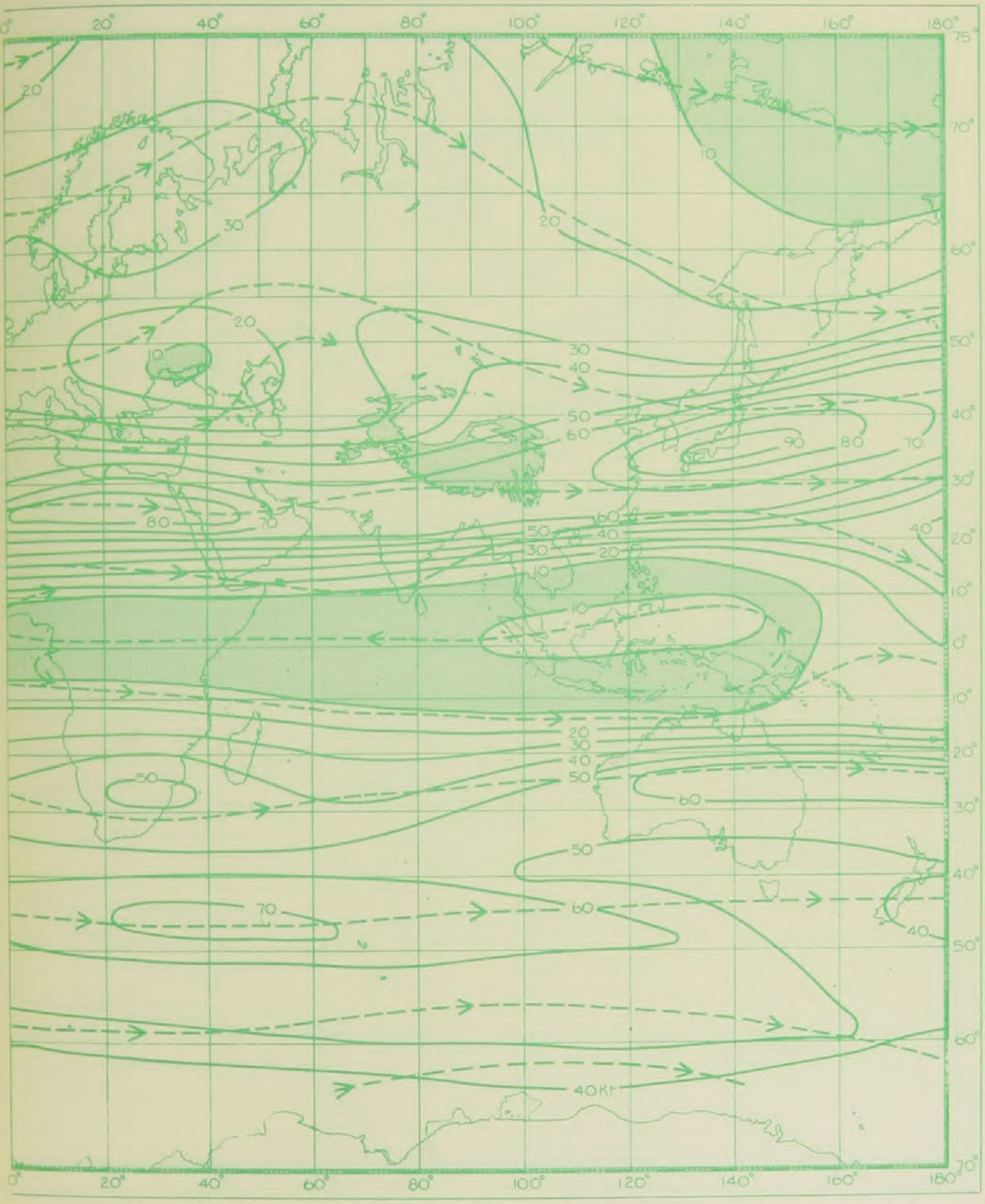


FIGURE 65—CONTINUED

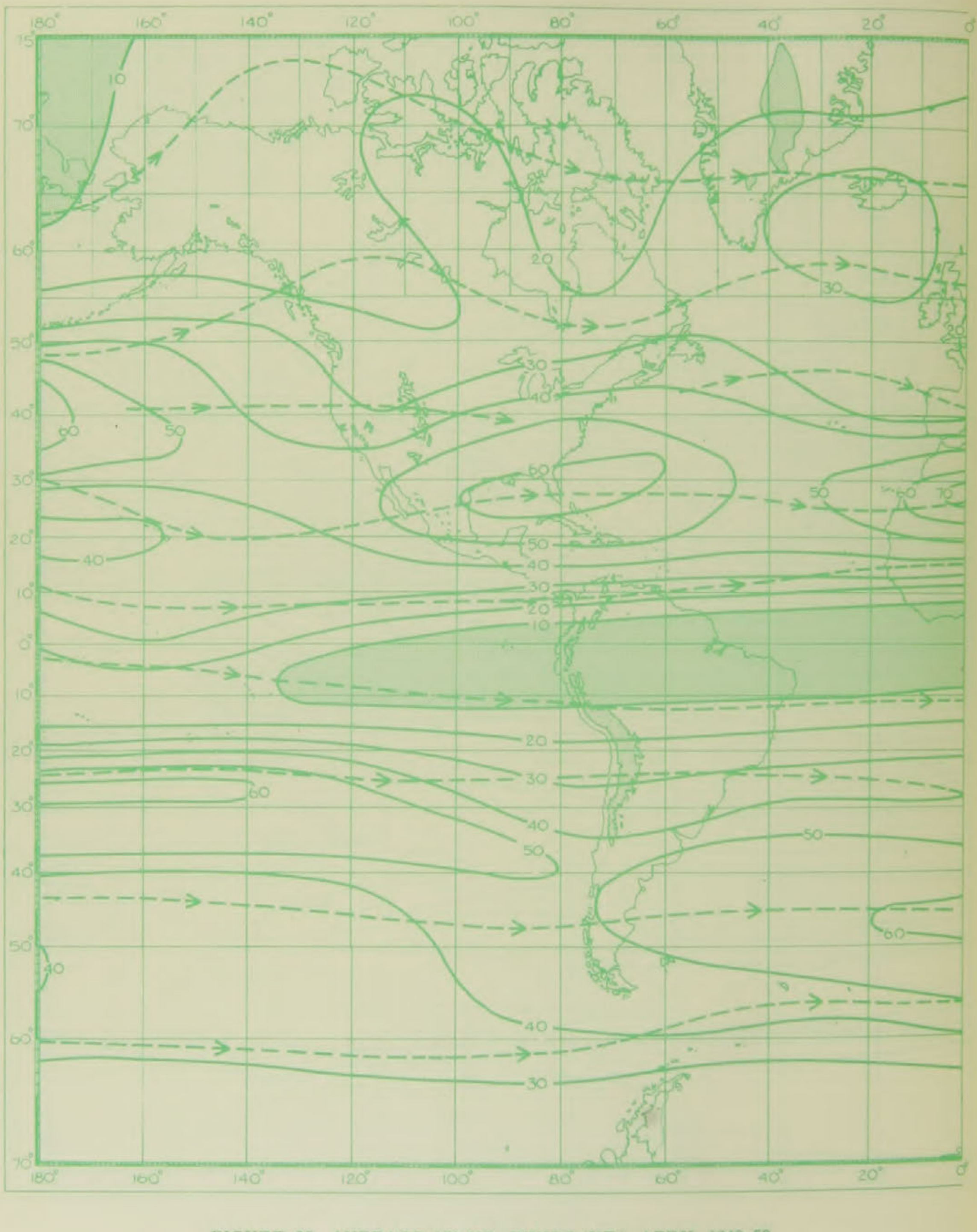


FIGURE 66—AVERAGE 150-MB. WINDS (KT.), APRIL 1949–53

I.C.A.O. height = 44,647 ft. = 13,608 m.

Isotachs are shown by continuous lines and streamlines by broken lines

Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

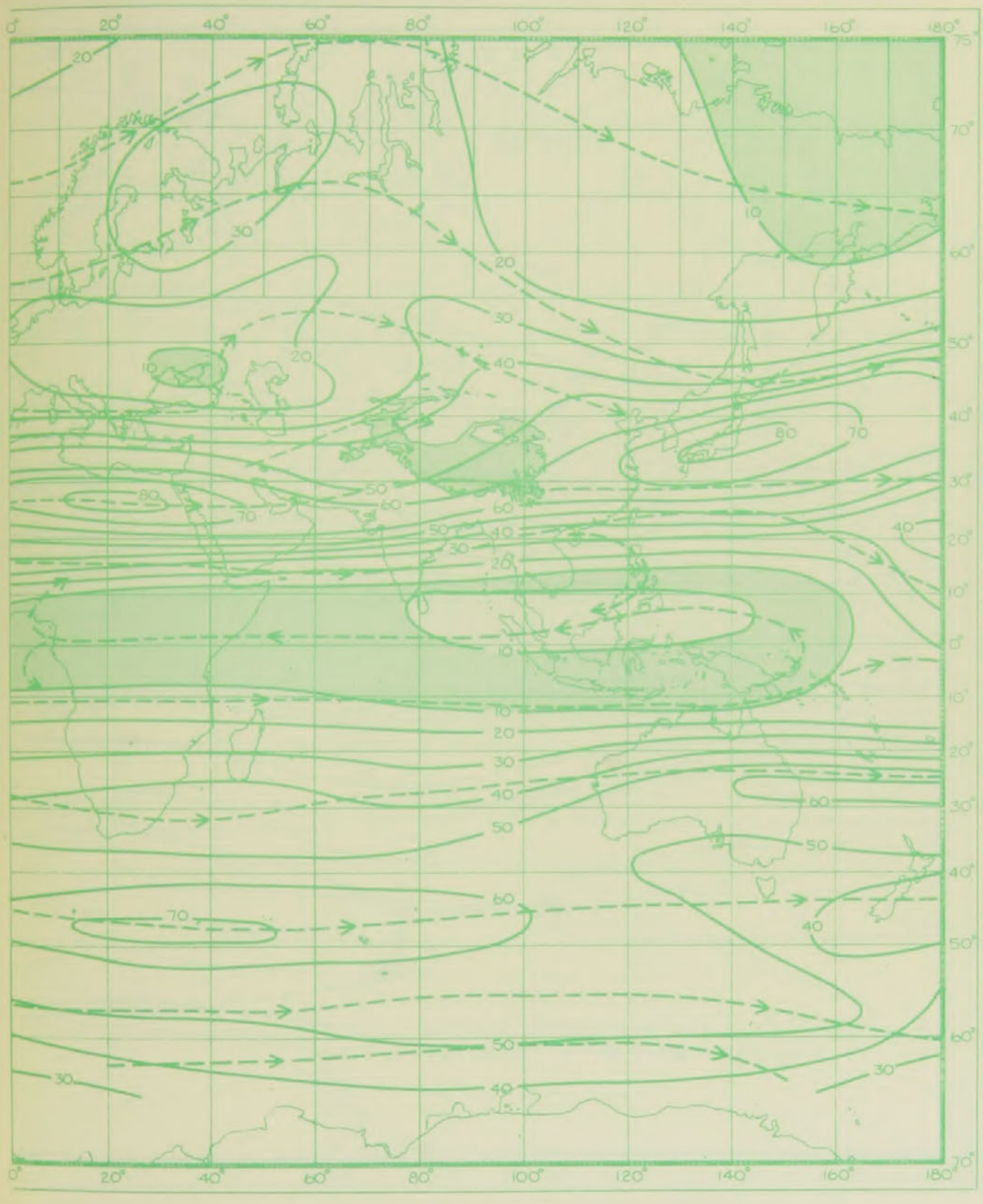


FIGURE 66—CONTINUED

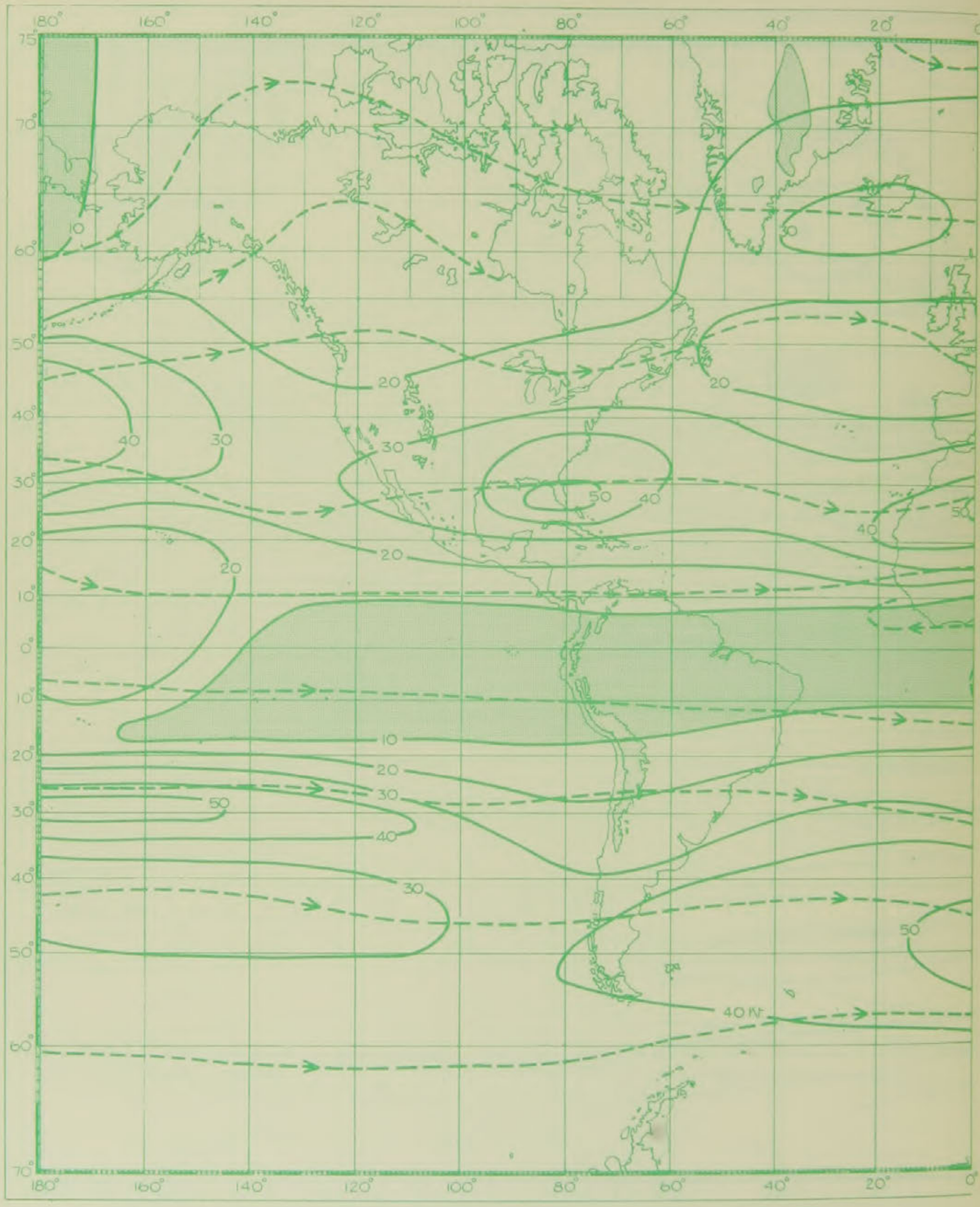


FIGURE 67—AVERAGE 100-MB. WINDS (KT.), APRIL 1949–53
I.C.A.O. height = 53,083 ft. = 16,180 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

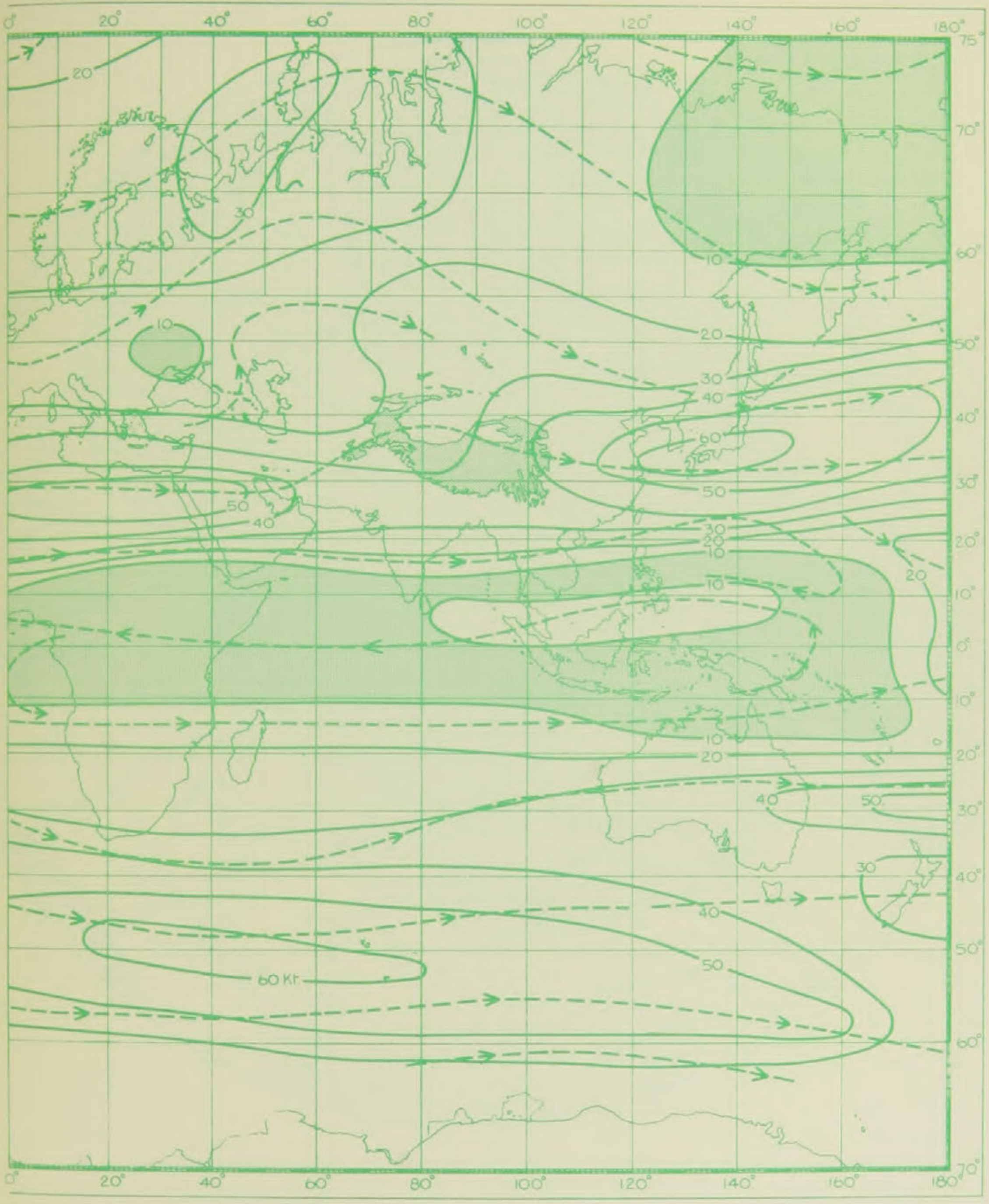


FIGURE 67—CONTINUED

FIGURE 68—AVERAGE 700-MB. WINDS (KT.), APRIL 1949–53
I.C.A.O. height = 9,882 ft. = 3,012 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

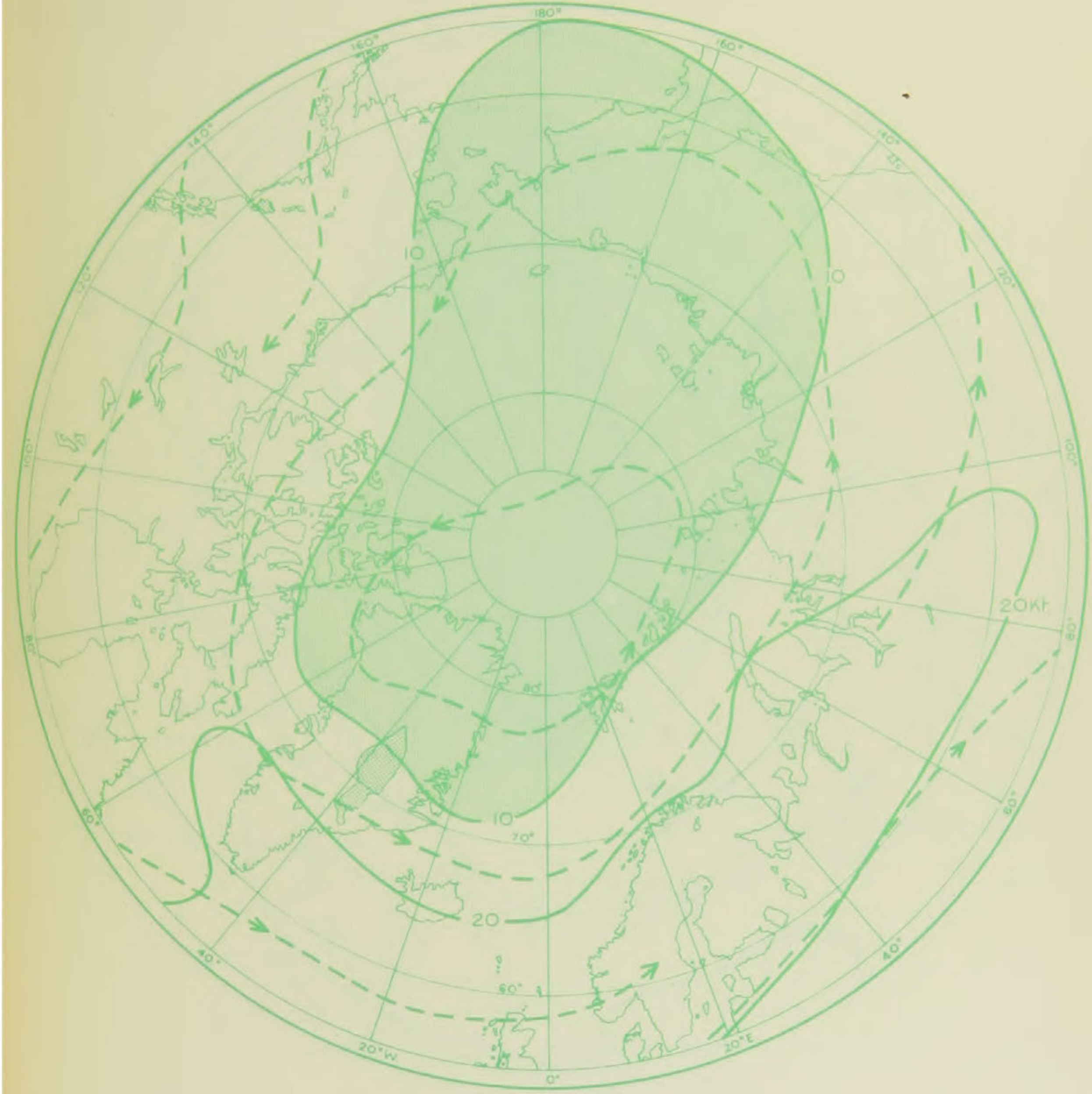


FIGURE 69—AVERAGE 500-MB. WINDS (KT.), APRIL 1949–53
I.C.A.O. height = 18,289 ft. = 5,574 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

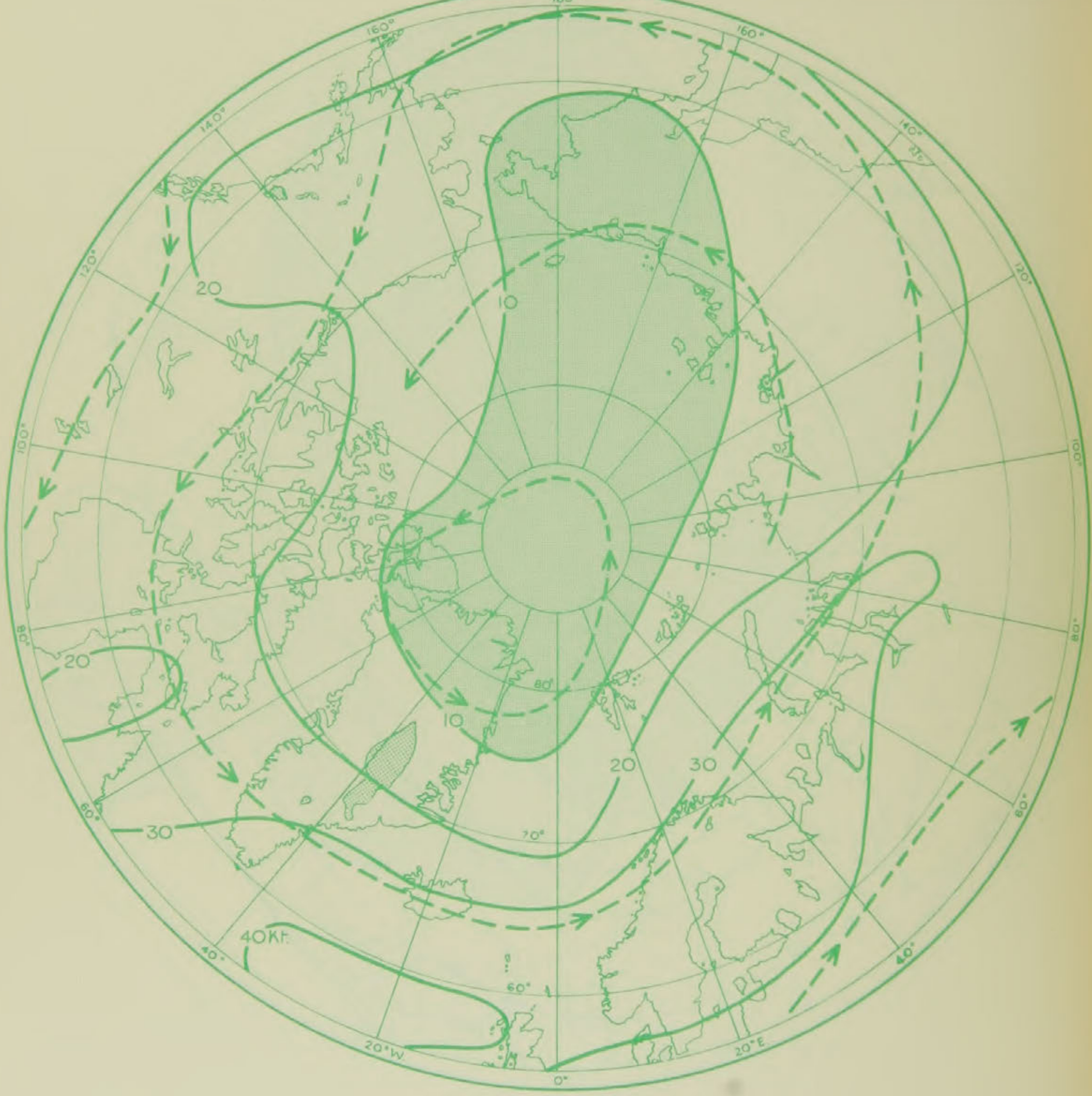


FIGURE 70—AVERAGE 300-MB. WINDS (KT.), APRIL 1949–53
I.C.A.O. height = 30,065 ft. = 9,164 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

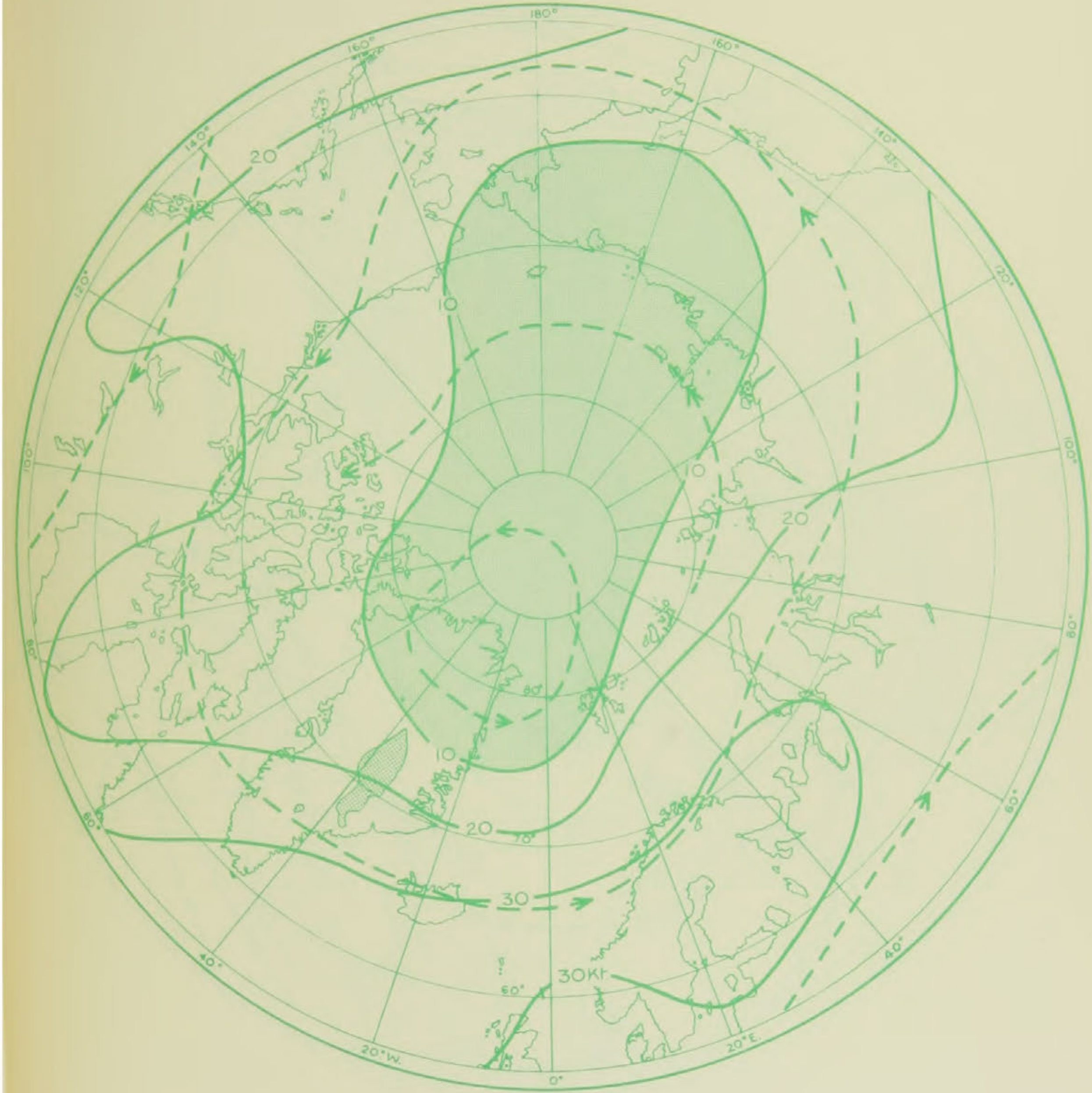


FIGURE 71—AVERAGE 200-MB. WINDS (KT.), APRIL 1949–53
I.C.A.O. height = 38,662 ft. = 11,784 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

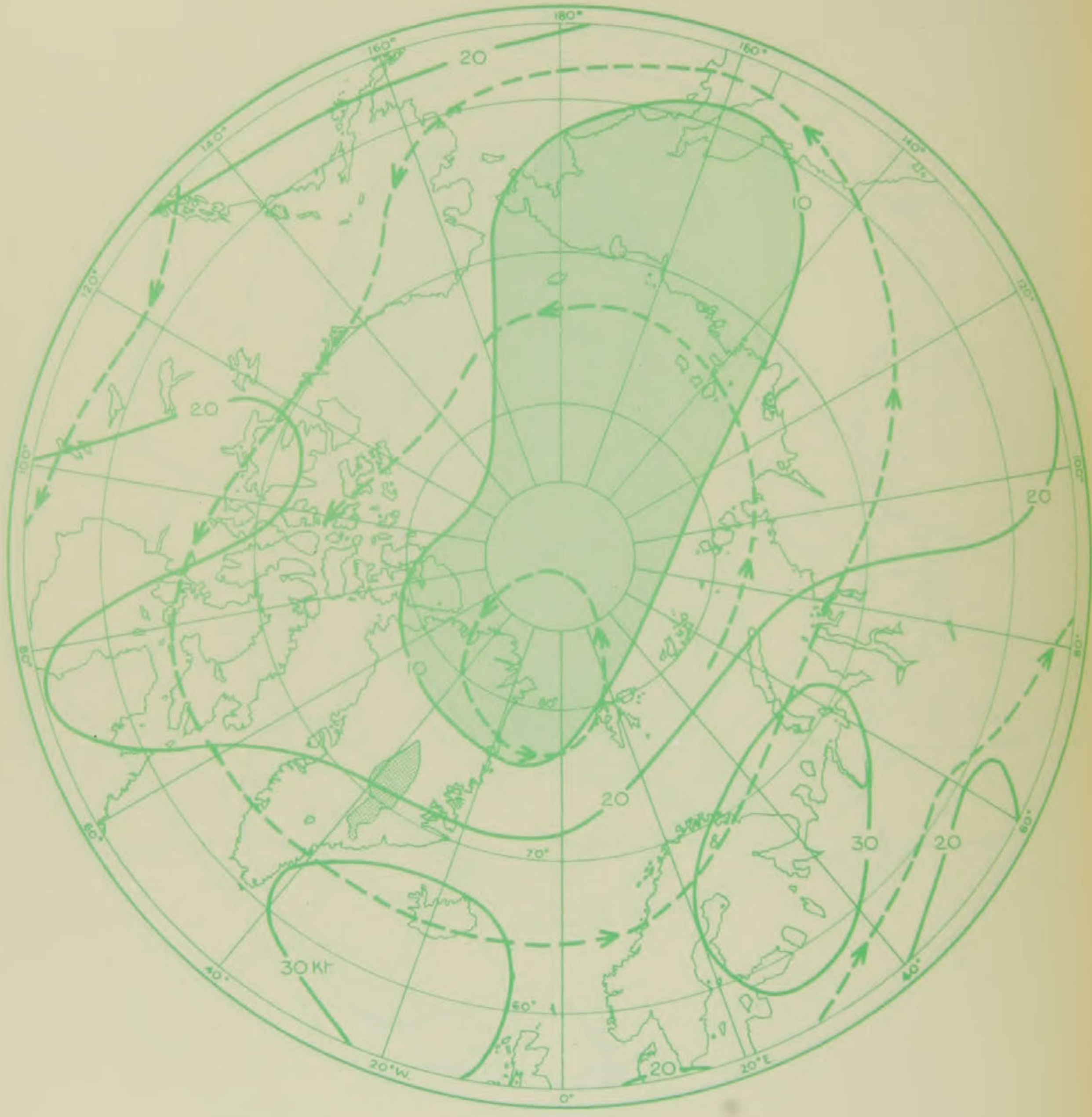


FIGURE 72—AVERAGE 150-MB. WINDS (KT.), APRIL 1949–53
I.C.A.O. height = 44,647 ft. = 13,608 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

FIGURE 73—AVERAGE 100-MB. WINDS (KT.), APRIL 1949–53
I.C.A.O. height = 53,083 ft. = 16,180 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

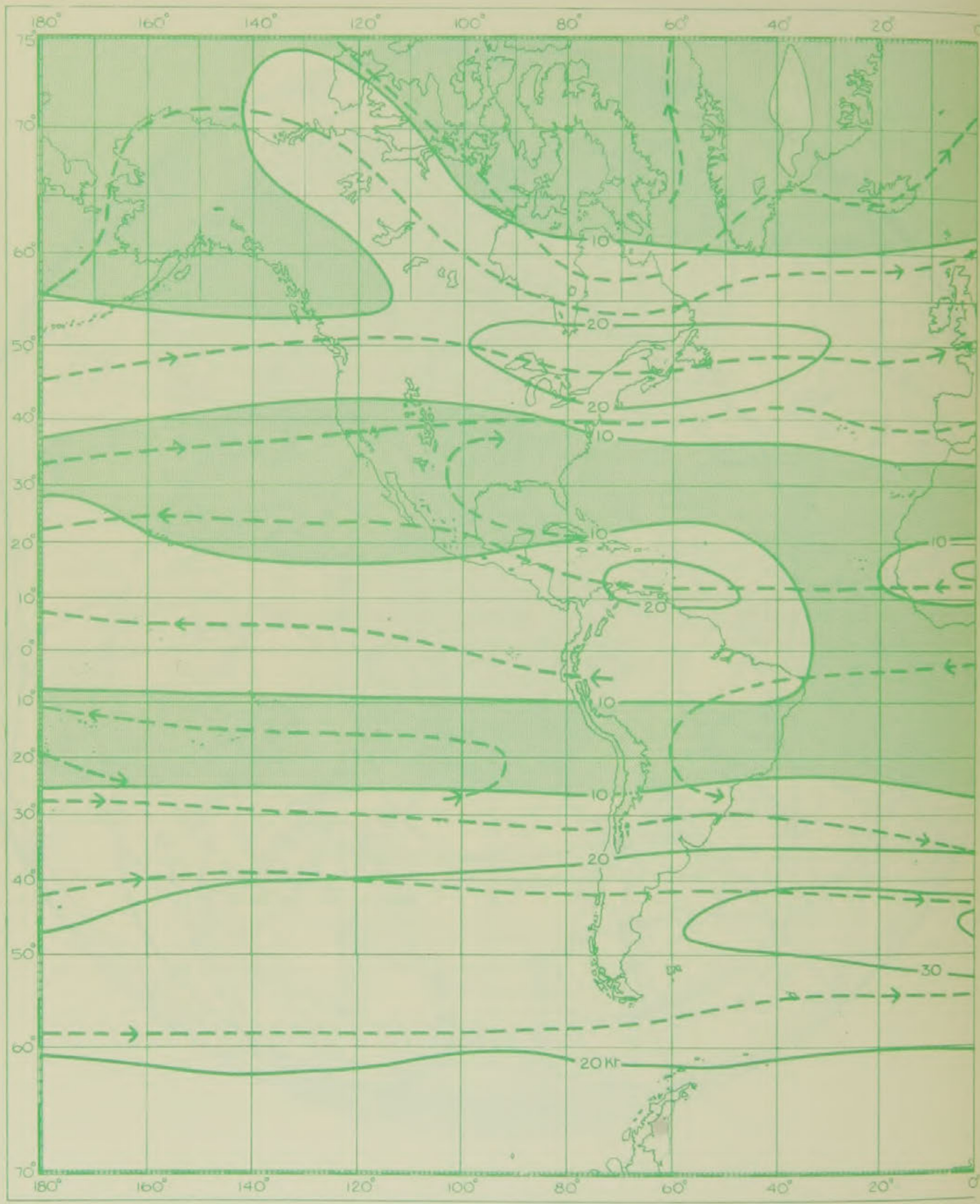


FIGURE 74—AVERAGE 700-MB. WINDS (KT.), JULY 1949–53
I.C.A.O. height = 9,882 ft. = 3,012 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

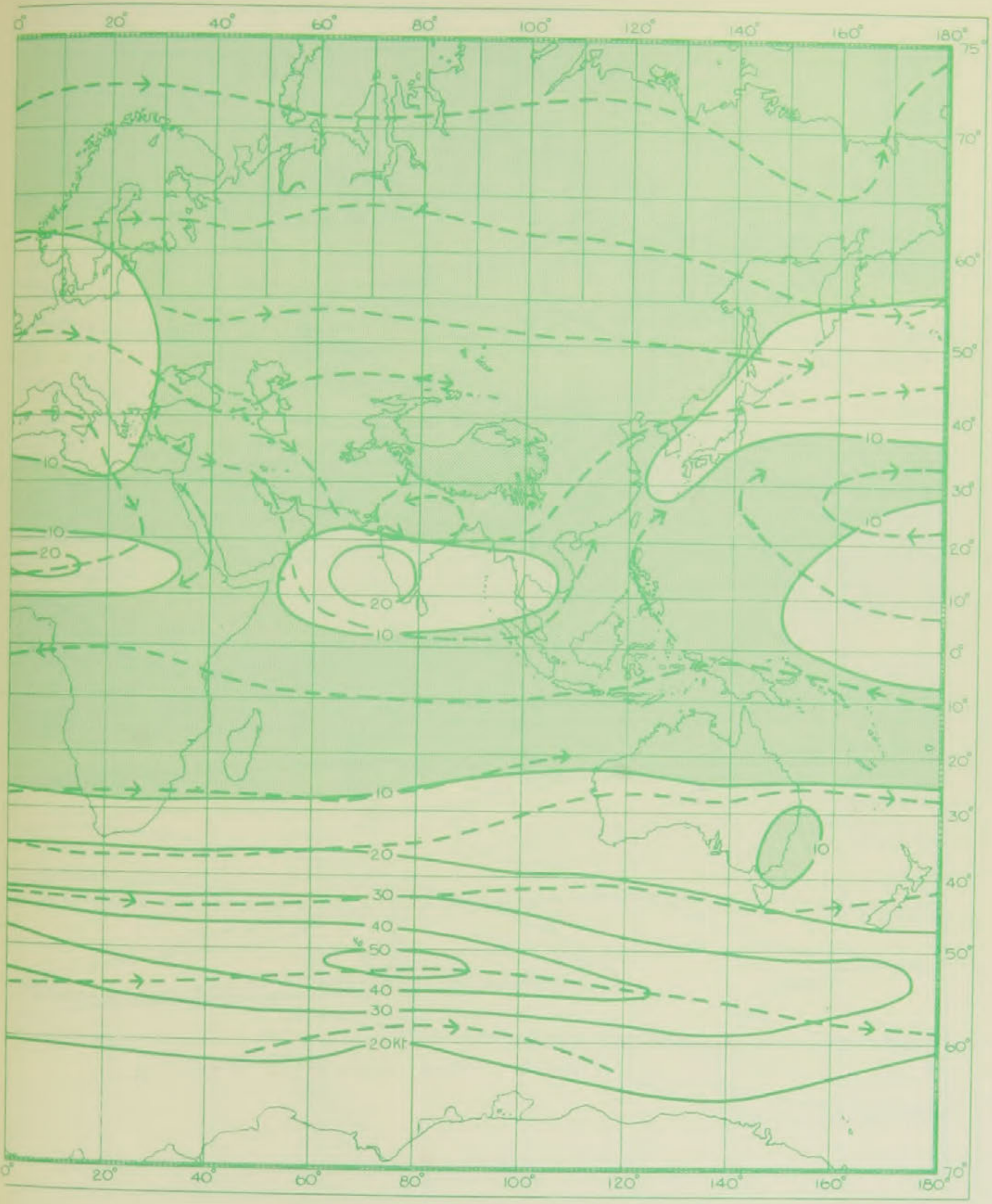


FIGURE 74—CONTINUED

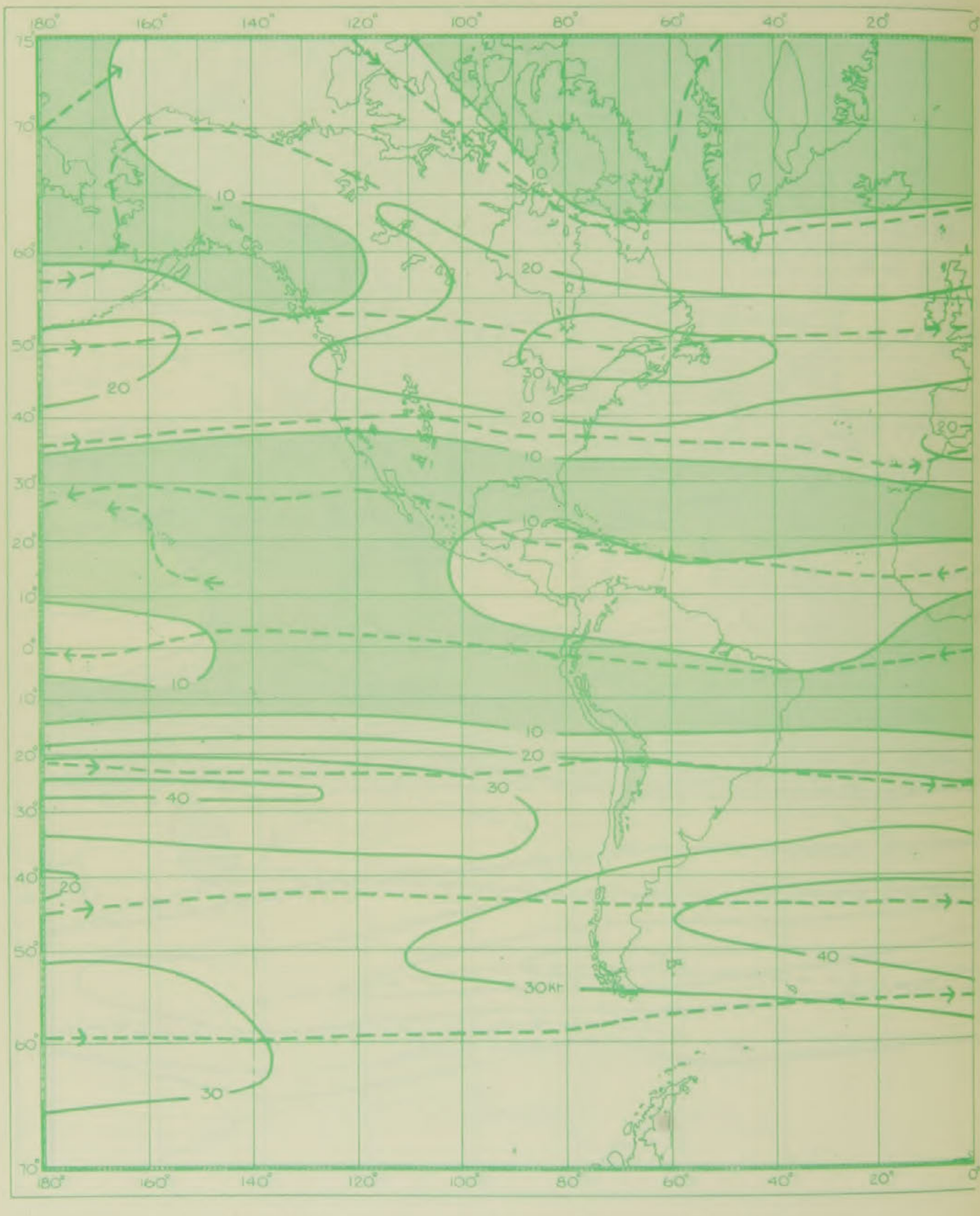


FIGURE 75—AVERAGE 500-MB. WINDS (KT.), JULY 1949–53

I.C.A.O. height = 18,289 ft. = 5,574 m.

Isotachs are shown by continuous lines and streamlines by broken lines

Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

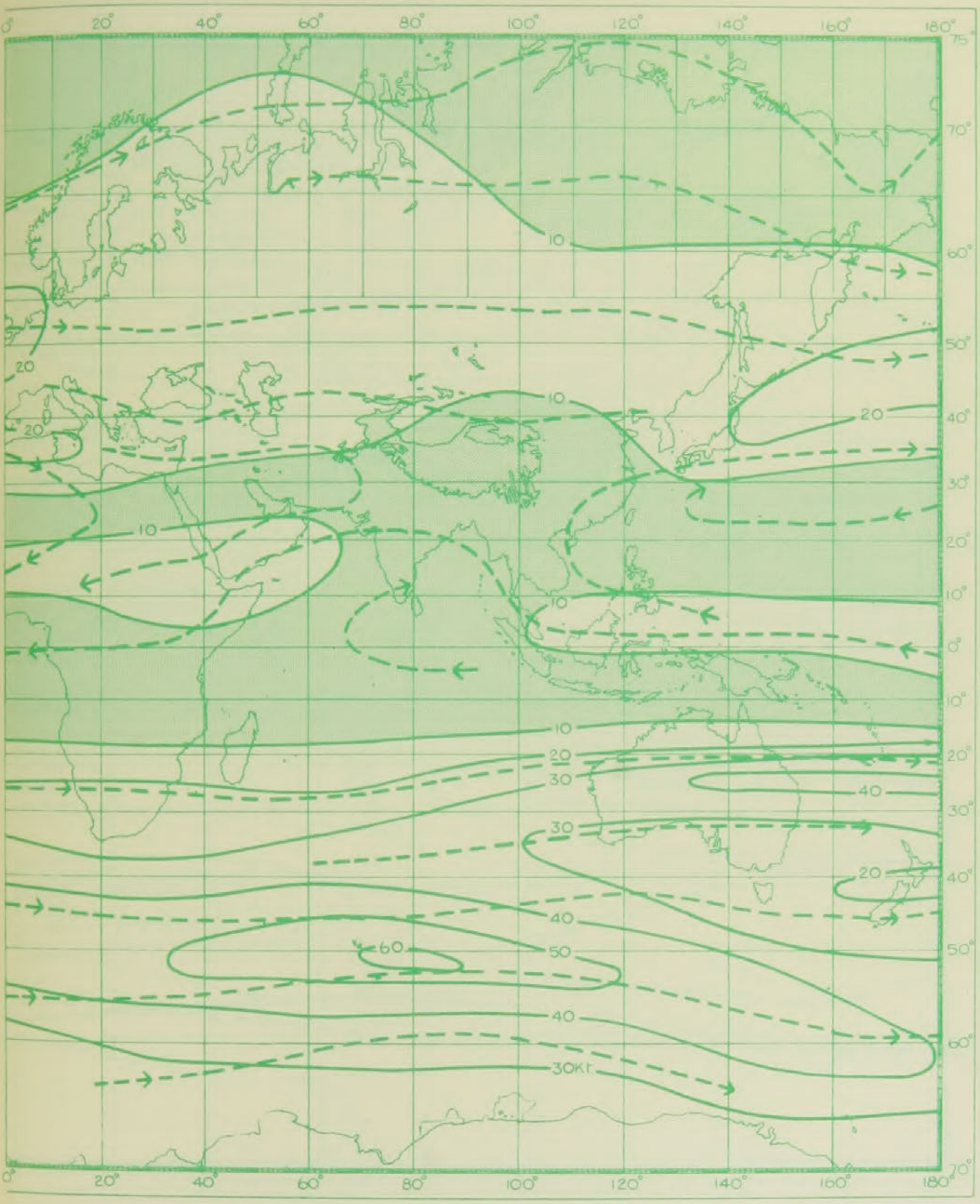


FIGURE 75—CONTINUED

H

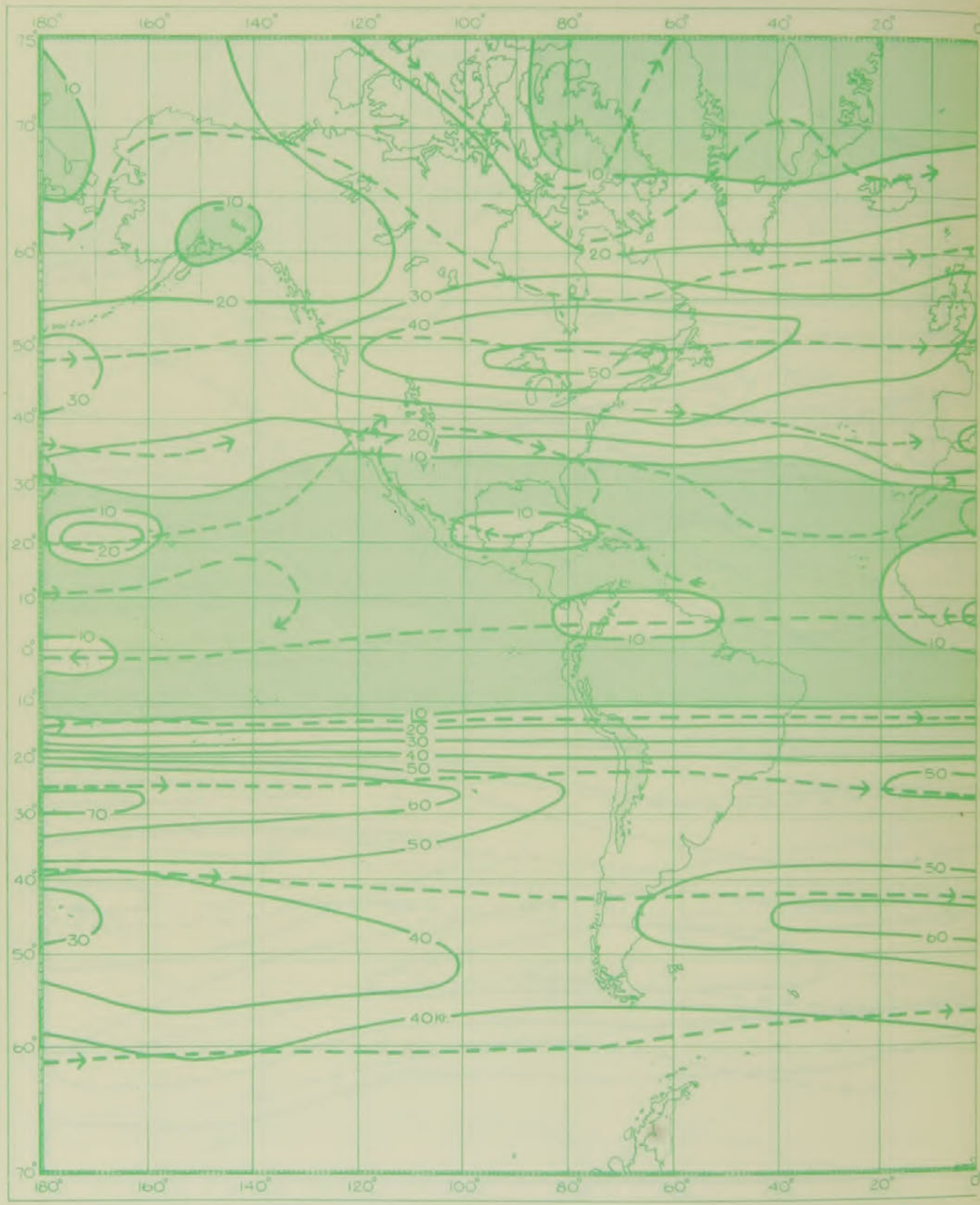


FIGURE 76—AVERAGE 300-MB. WINDS (KT.), JULY 1949–53
I.C.A.O. height = 30,065 ft. = 9,164 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

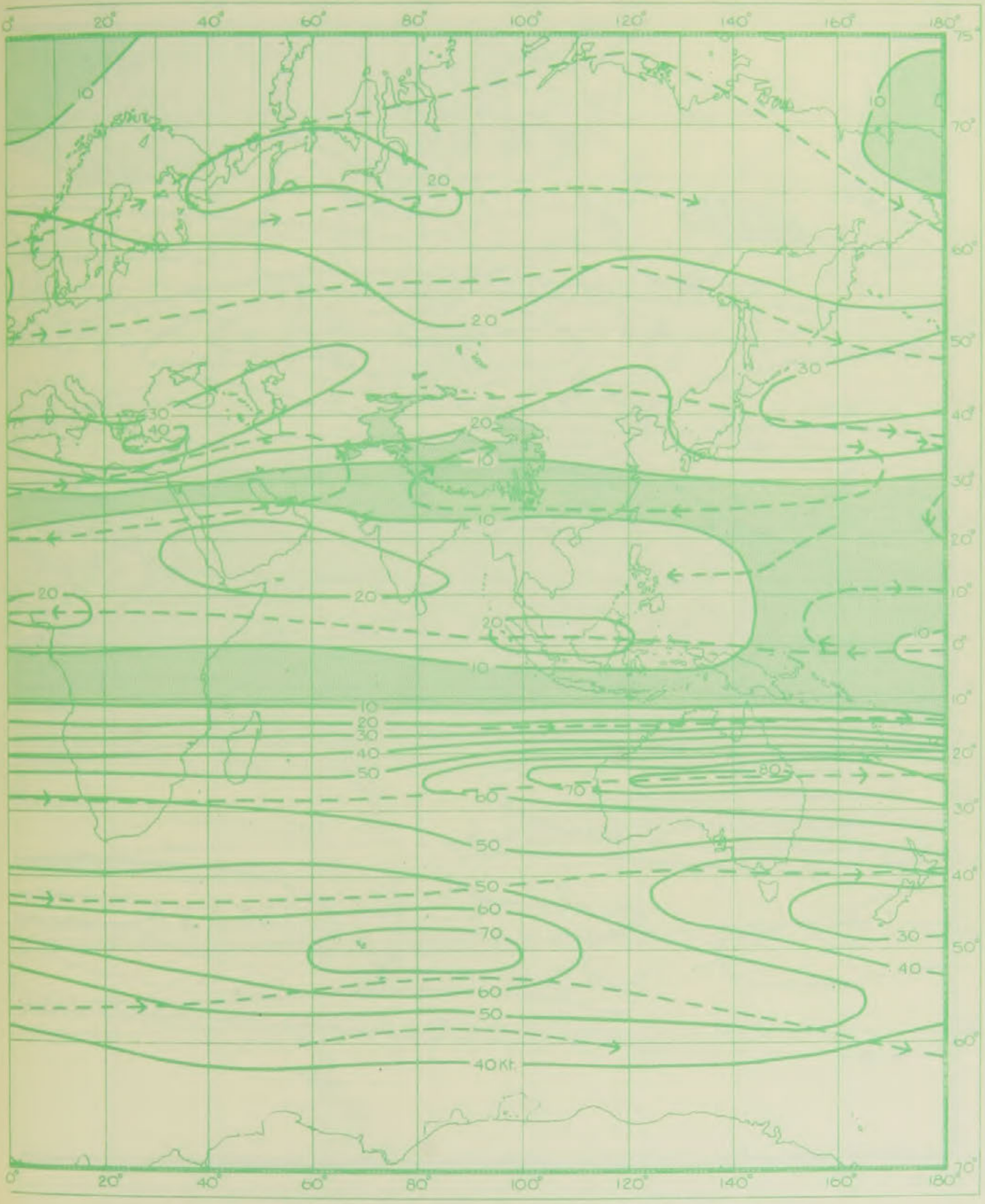


FIGURE 76—CONTINUED

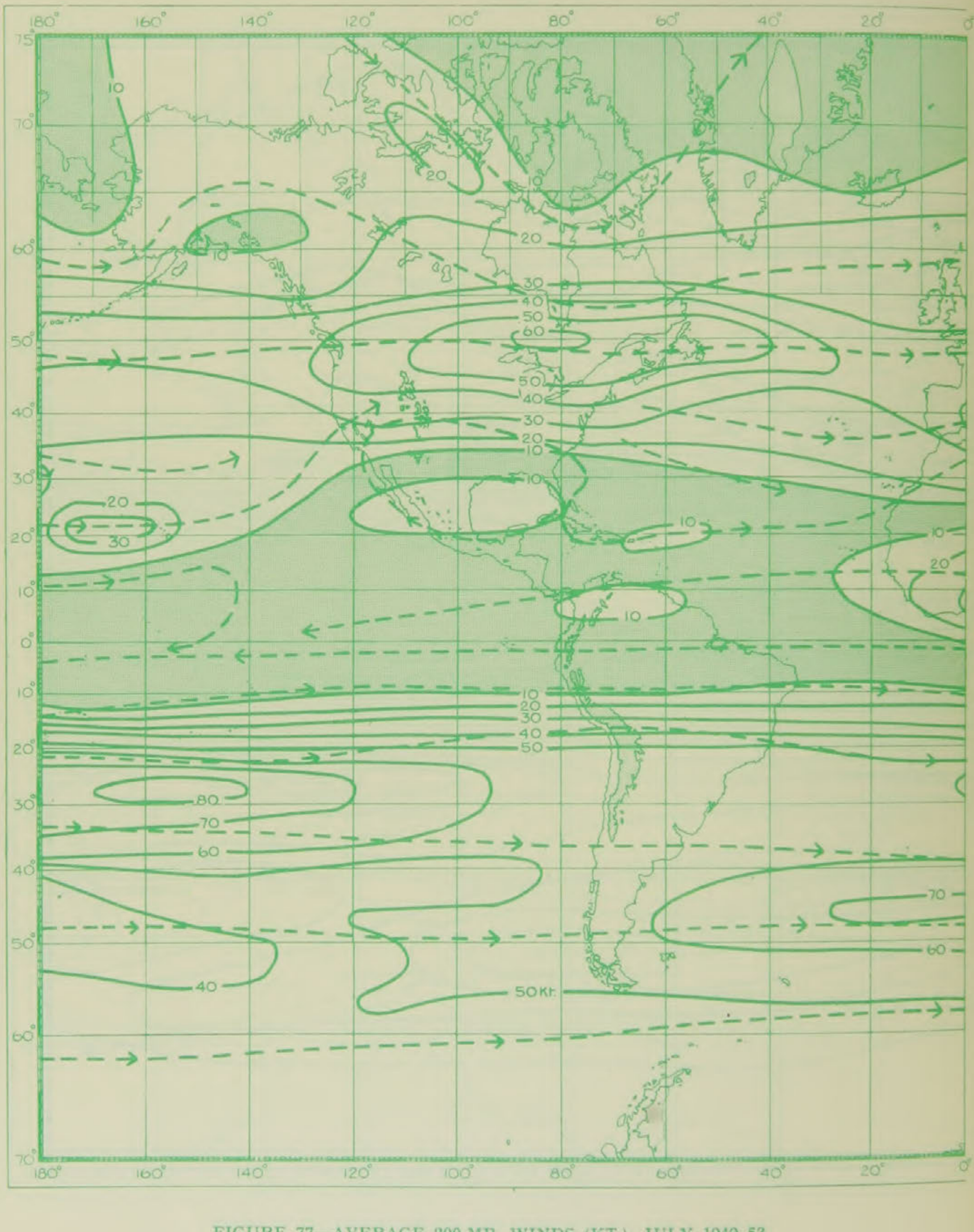


FIGURE 77—AVERAGE 200-MB. WINDS (KT.), JULY 1949–53
I.C.A.O. height = 38,662 ft. = 11,784 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

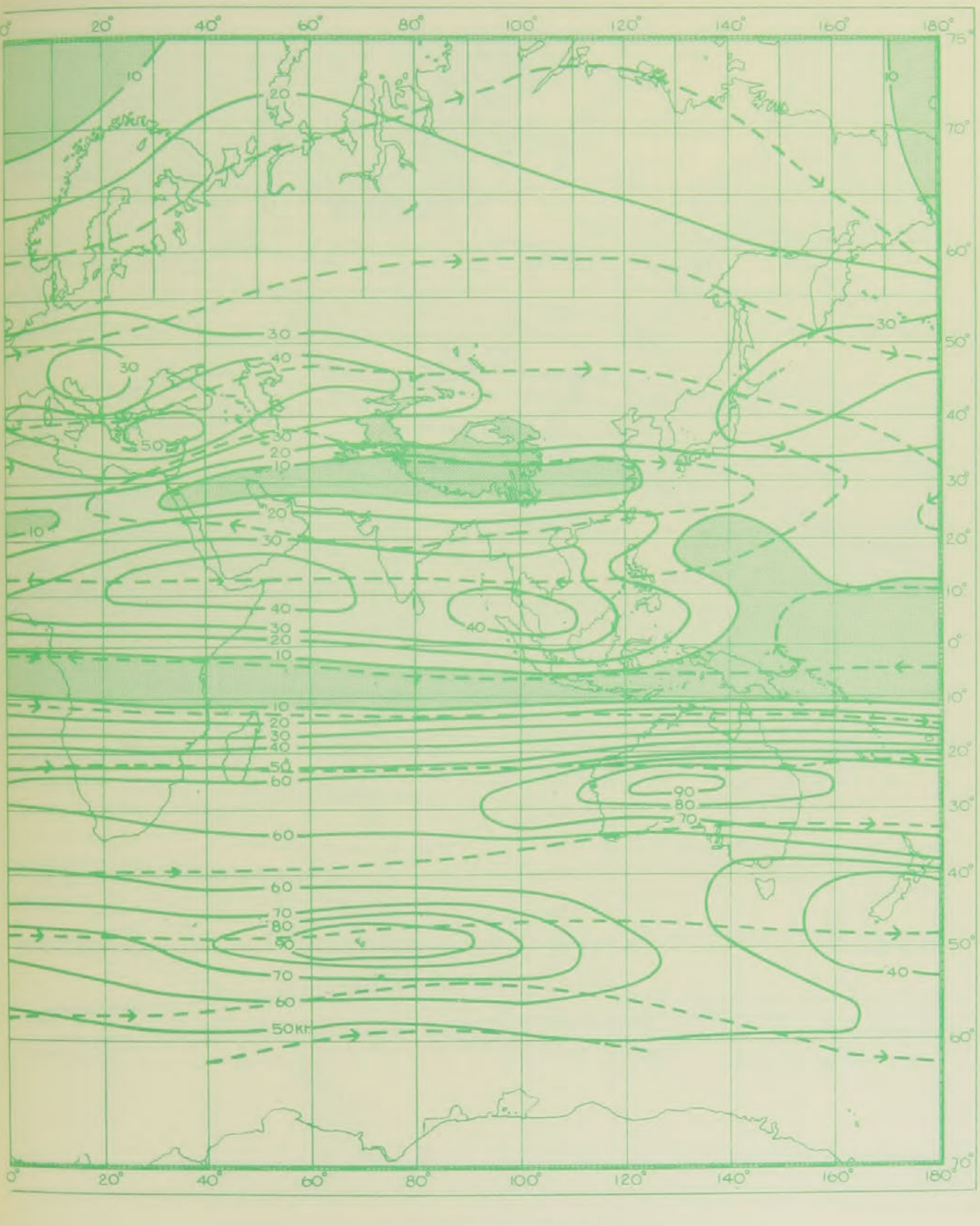


FIGURE 77—CONTINUED

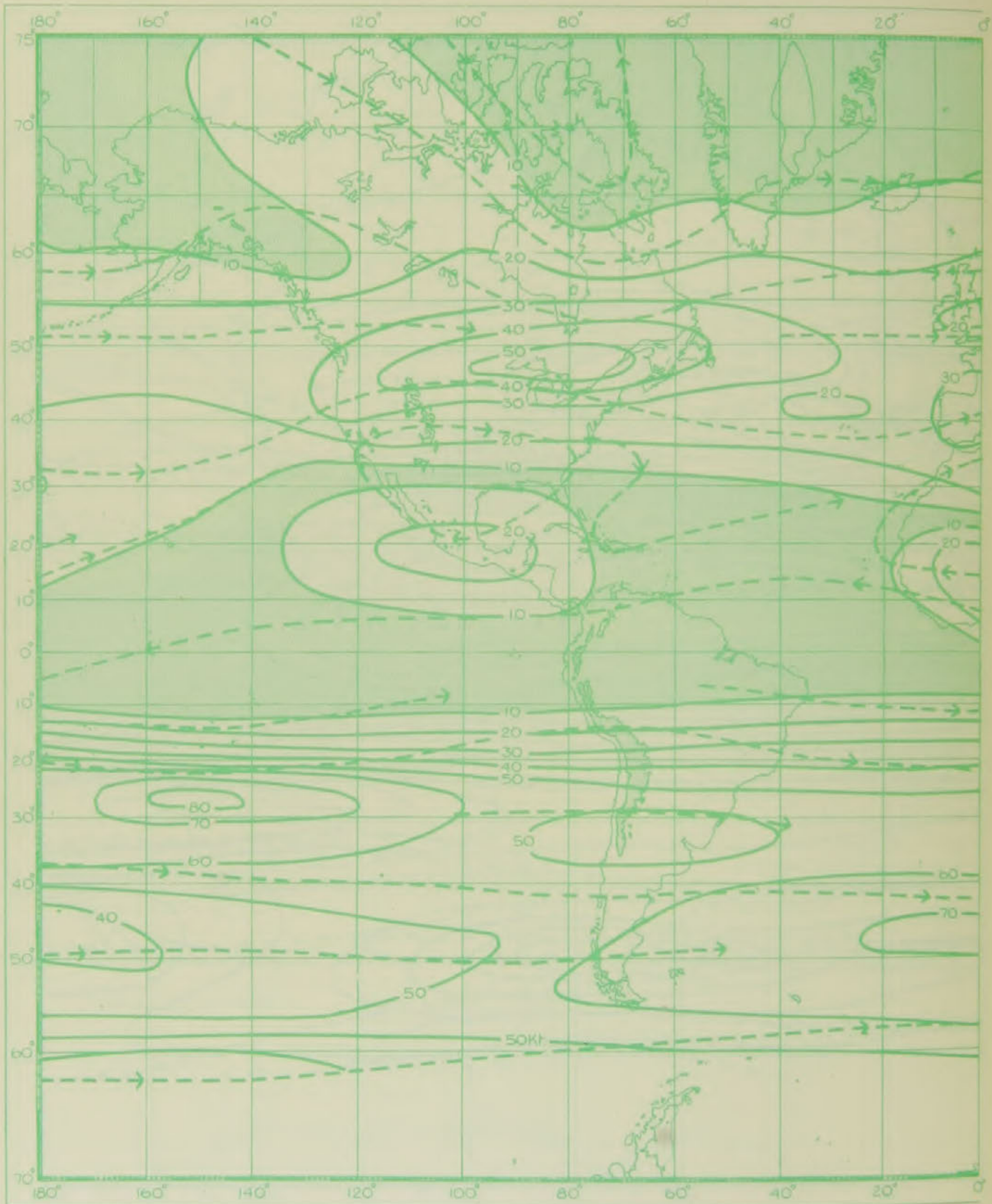


FIGURE 78—AVERAGE 150-MB. WINDS (KT.), JULY 1949–53
I.C.A.O. height = 44,647 ft. = 13,608 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

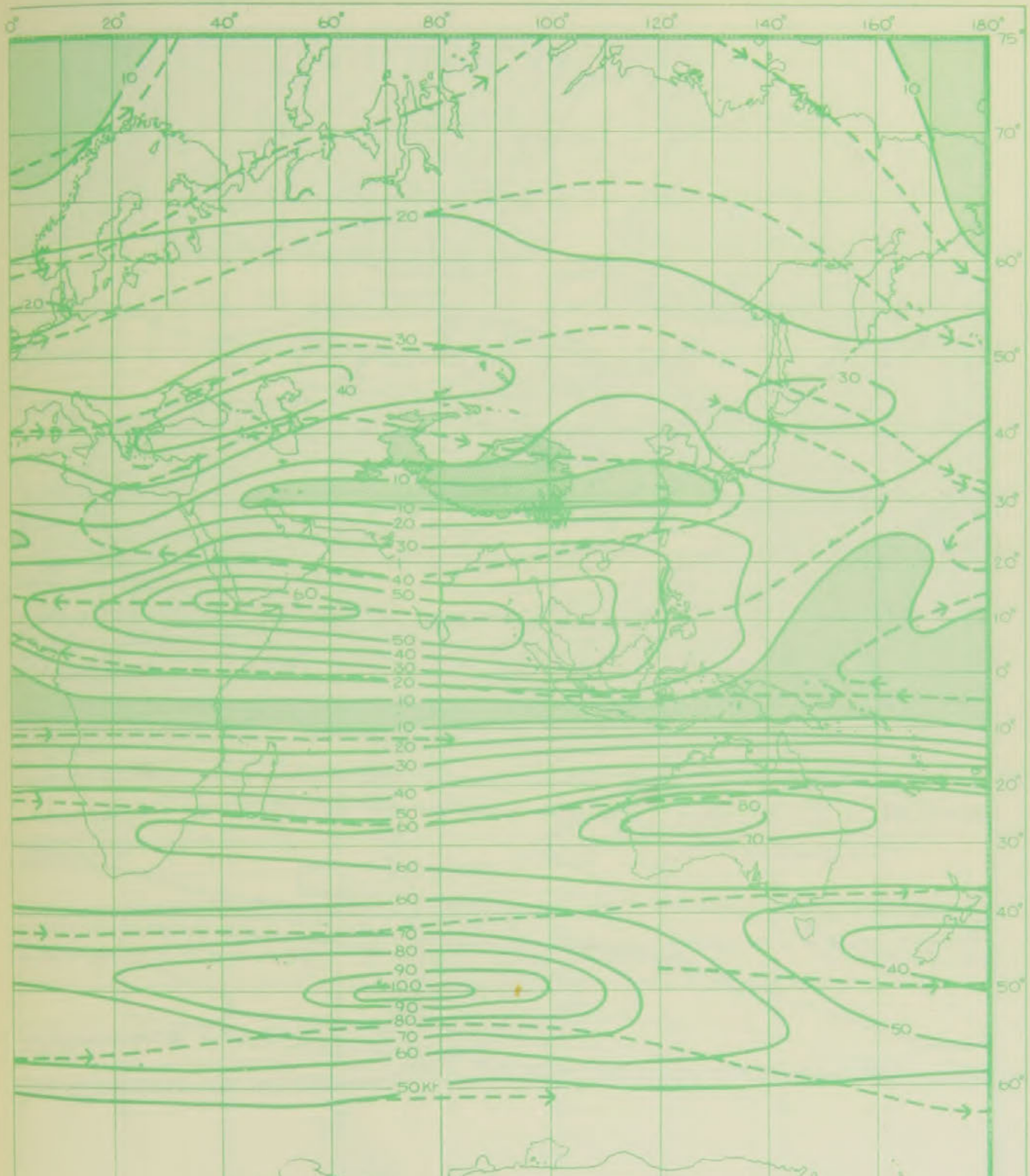


FIGURE 78—CONTINUED

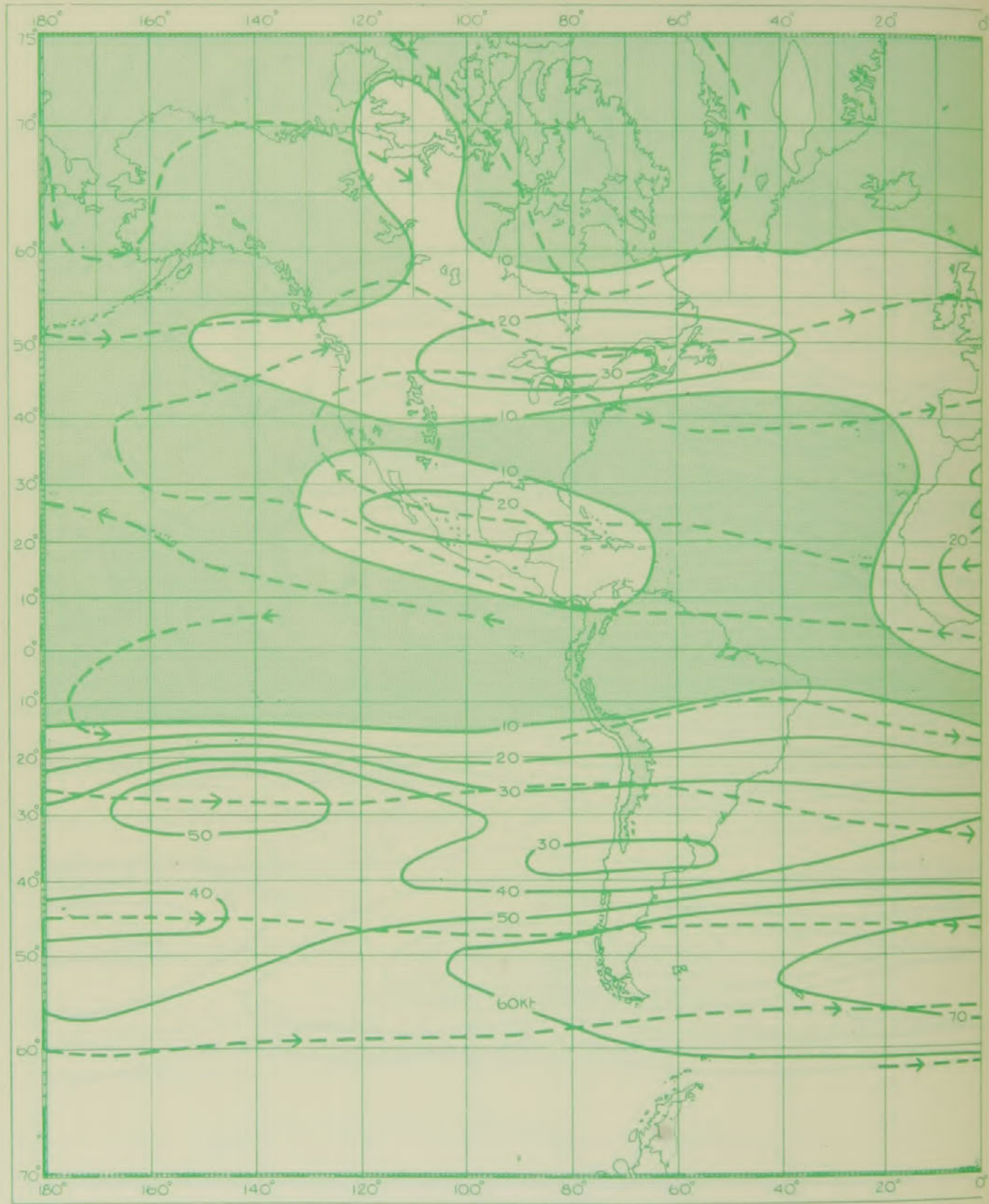


FIGURE 79—AVERAGE 100-MB. WINDS (KT.), JULY 1949–53
I.C.A.O. height = 53,083 ft. = 16,180 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

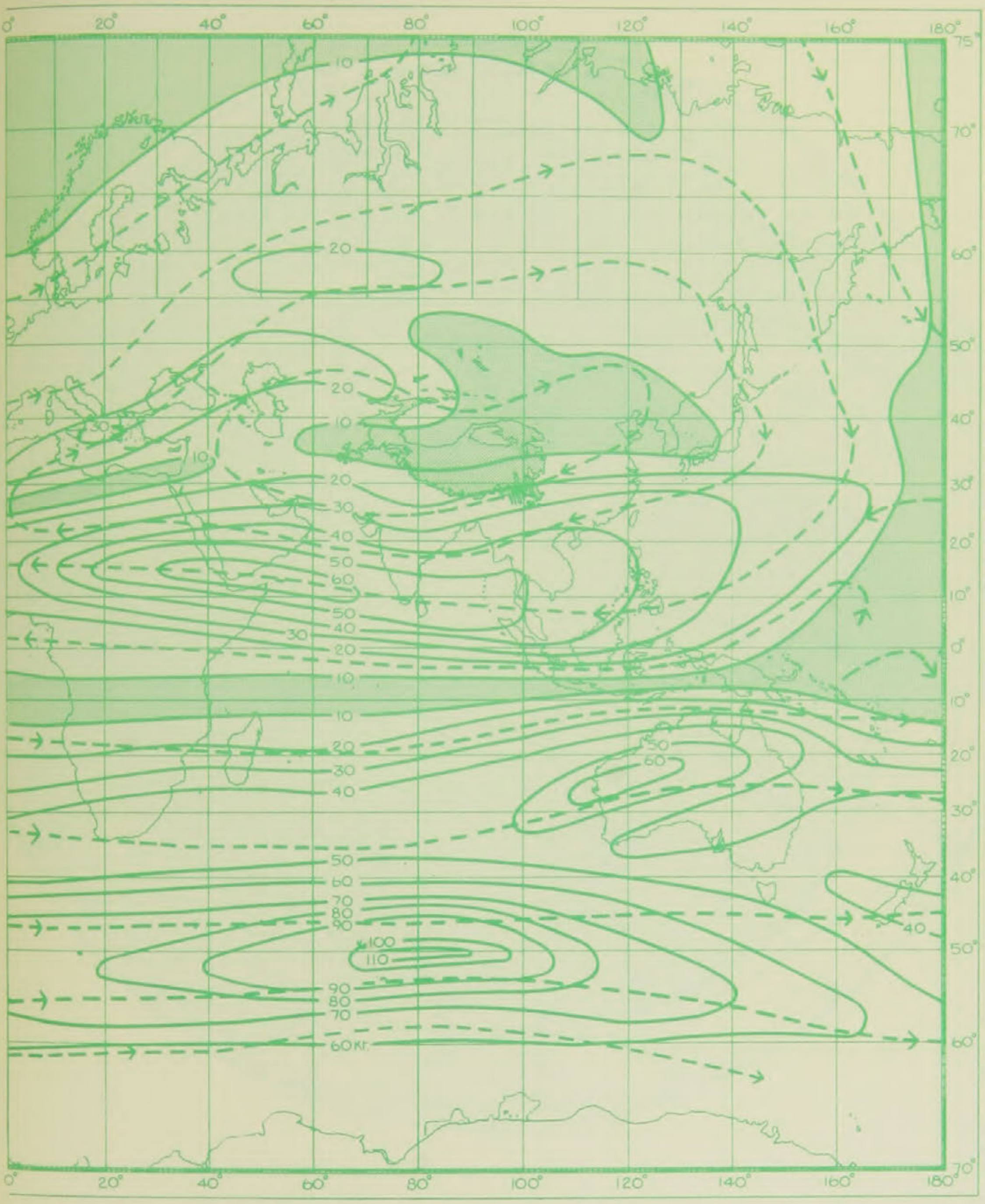


FIGURE 79—CONTINUED

FIGURE 80—AVERAGE 700-MB. WINDS (KT.), JULY 1949-53
I.C.A.O. height = 9,882 ft. = 3,012 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

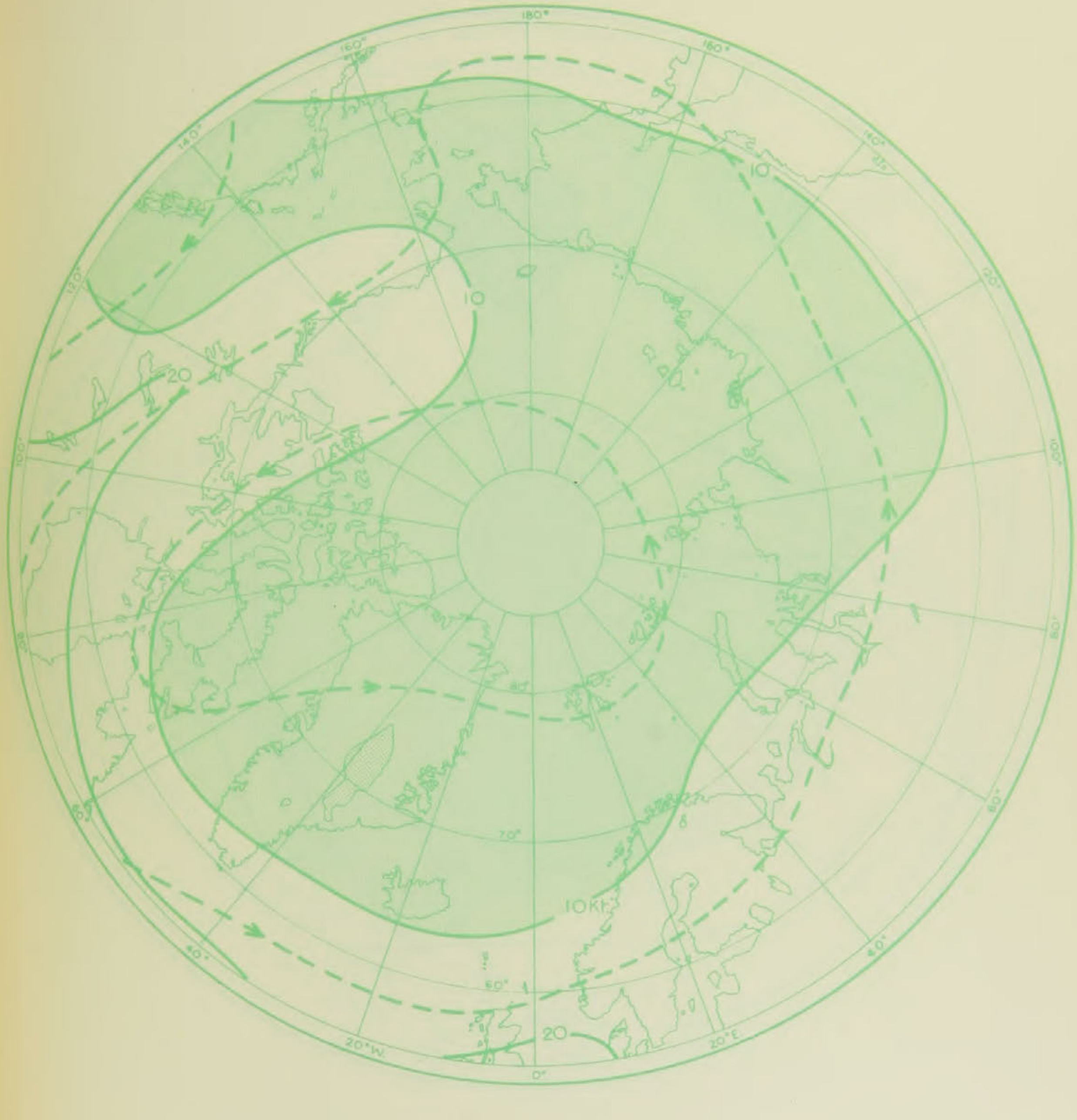


FIGURE 81—AVERAGE 500-MB. WINDS (KT.), JULY 1949–53
I.C.A.O. height = 18,289 ft. = 5,574 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

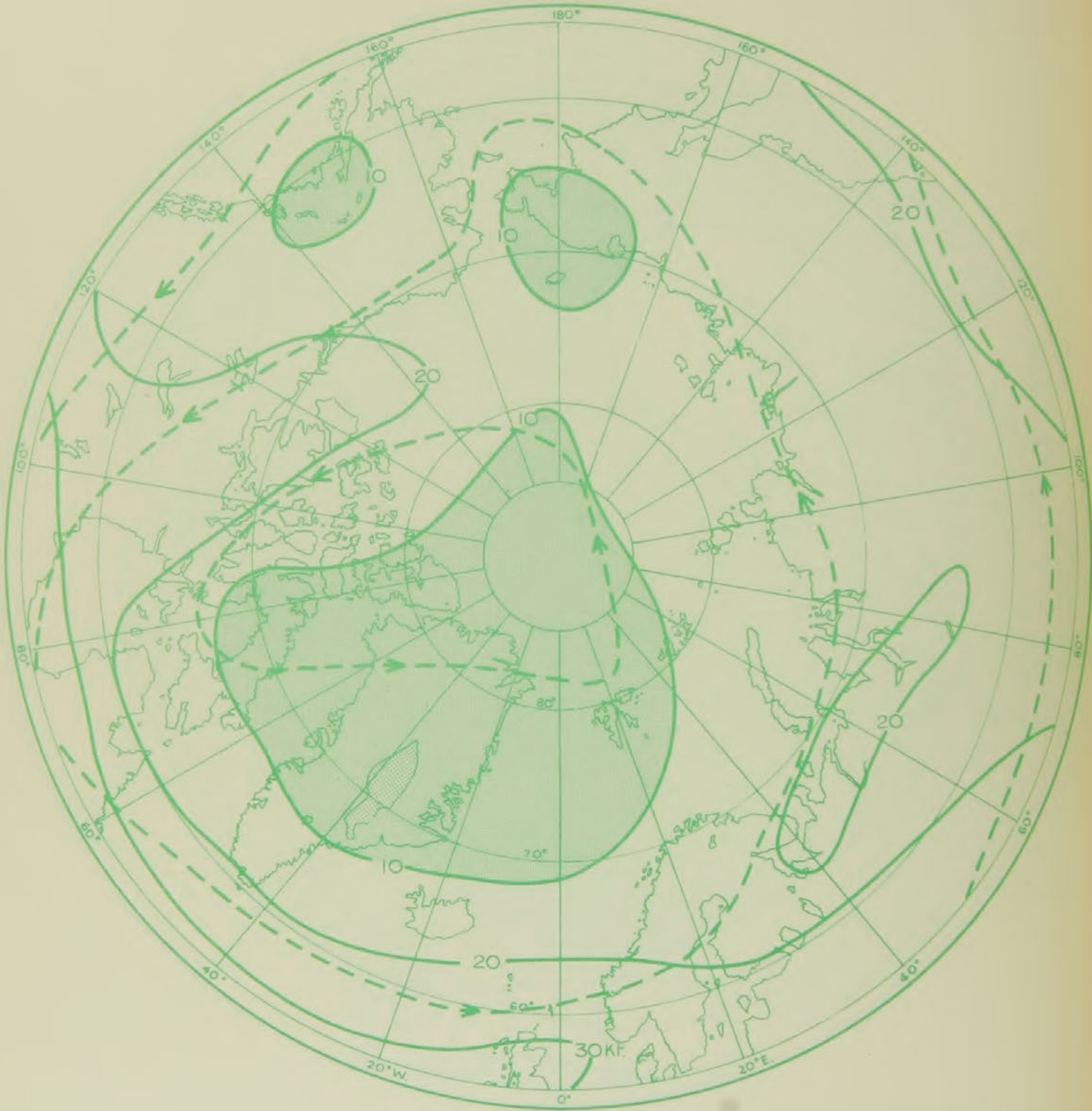


FIGURE 82—AVERAGE 300-MB. WINDS (KT.), JULY 1949–53
I.C.A.O. height = 30,065 ft. = 9,164 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

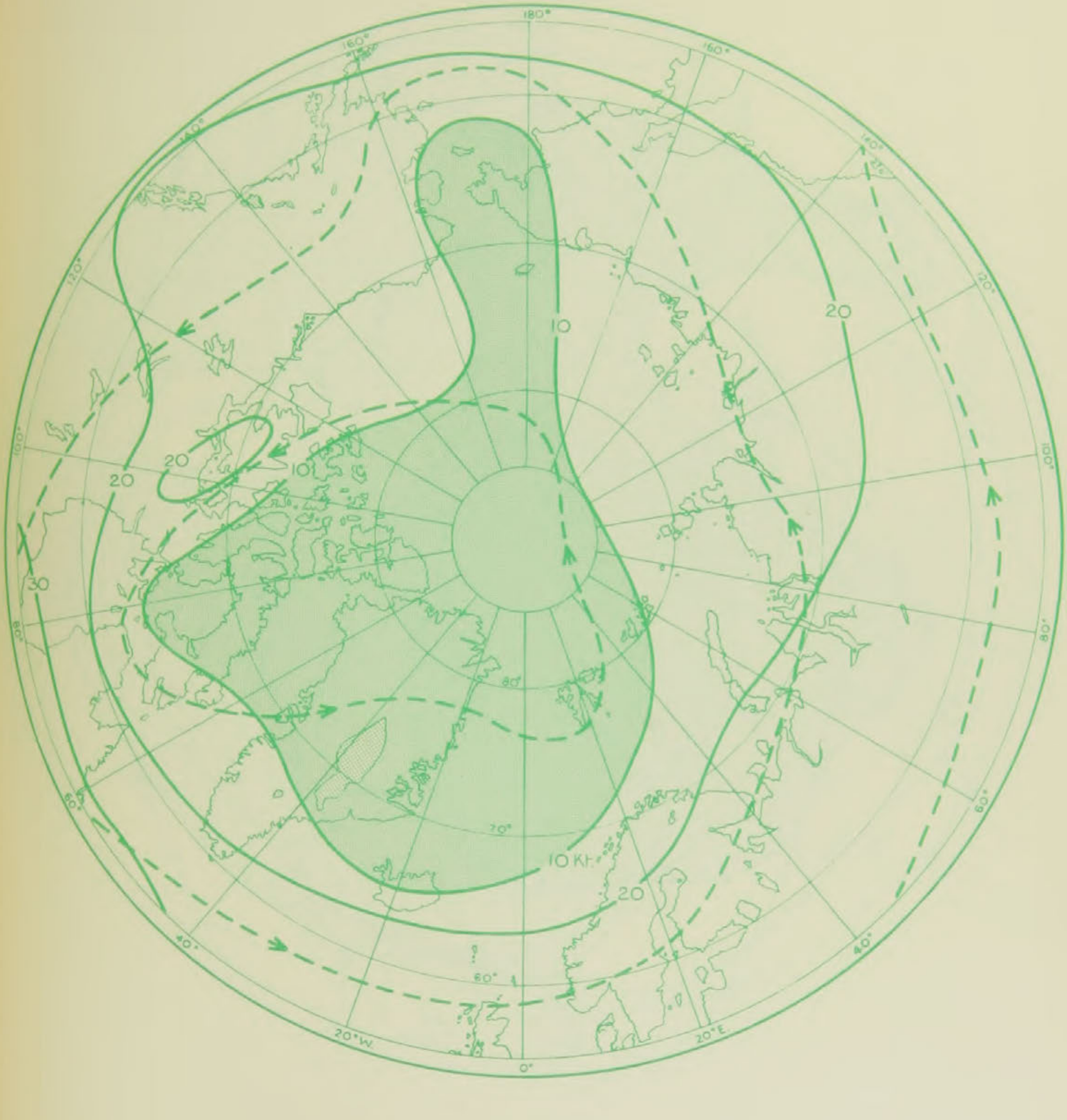


FIGURE 83—AVERAGE 200-MB. WINDS (KT.), JULY 1949–53

I.C.A.O. height = 38,662 ft. = 11,784 m.

Isotachs are shown by continuous lines and streamlines by broken lines

Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

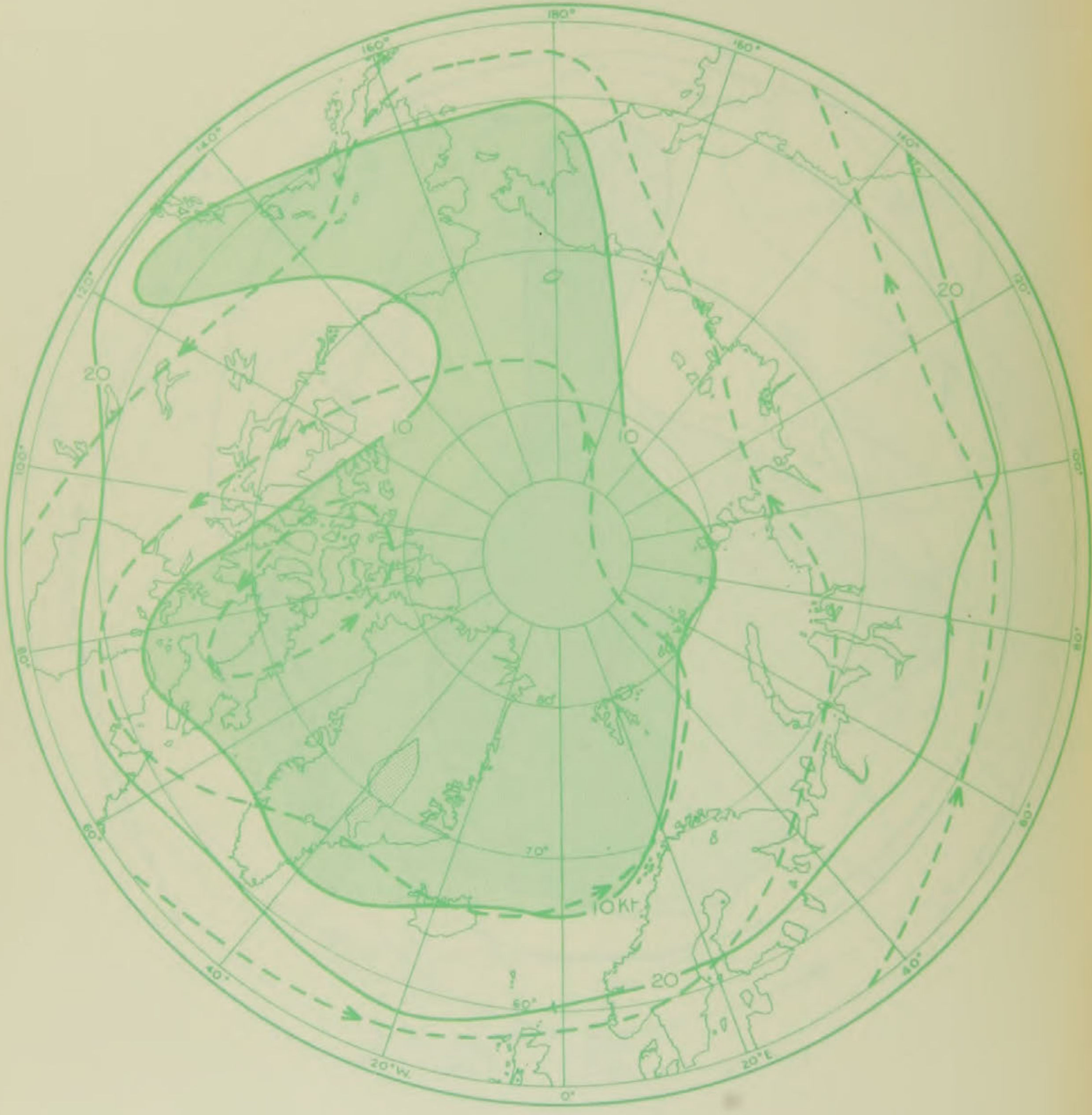


FIGURE 84—AVERAGE 150-MB. WINDS (KT.), JULY 1949–53
I.C.A.O. height = 44,647 ft. = 13,608 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

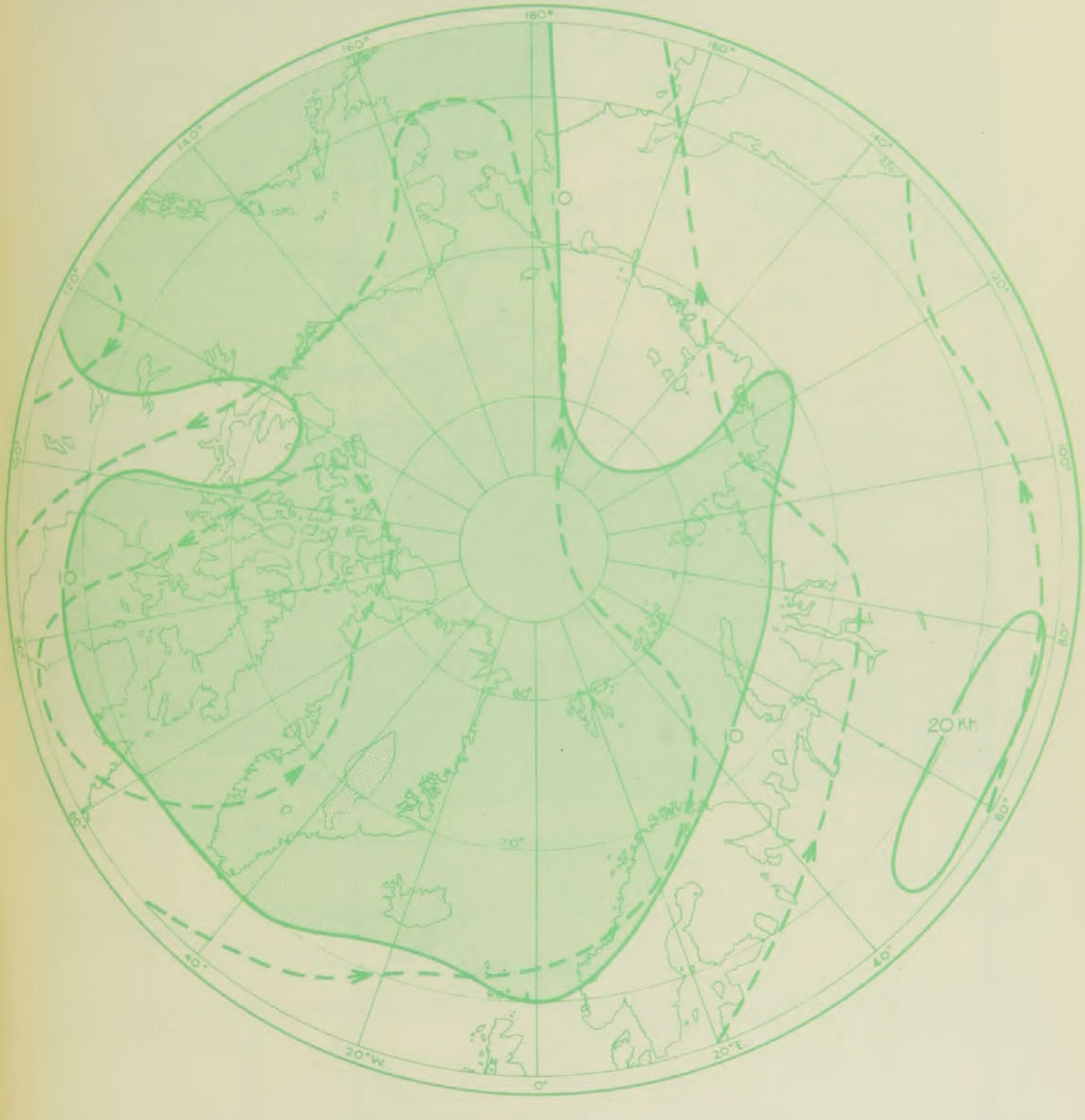


FIGURE 85—AVERAGE 100-MB. WINDS (KT.), JULY 1949–53
I.C.A.O. height = 53,083 ft. = 16,180 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

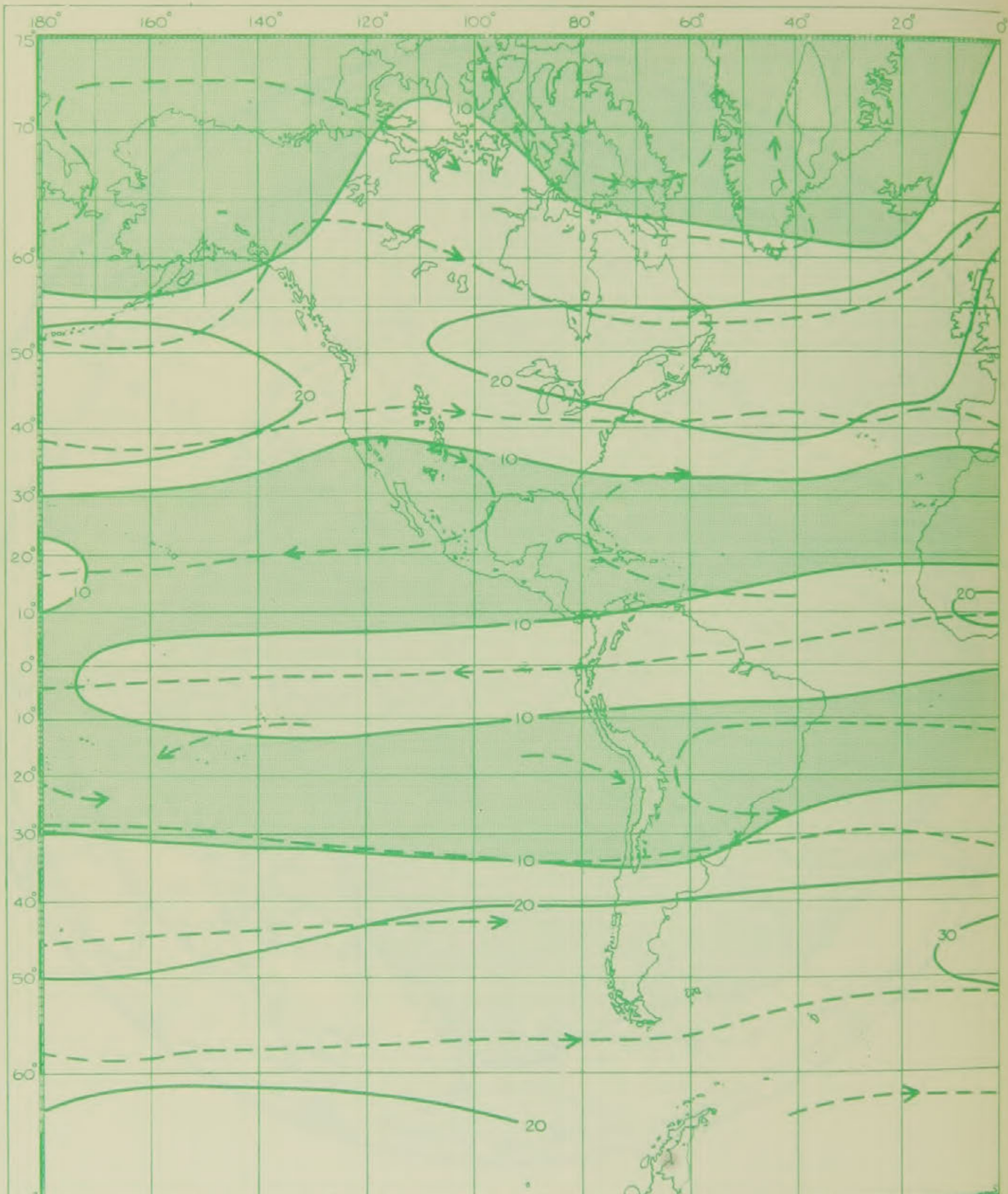


FIGURE 86—AVERAGE 700-MB. WINDS (KT.), OCTOBER 1949–53
I.C.A.O. height = 9,882 ft. = 3,012 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

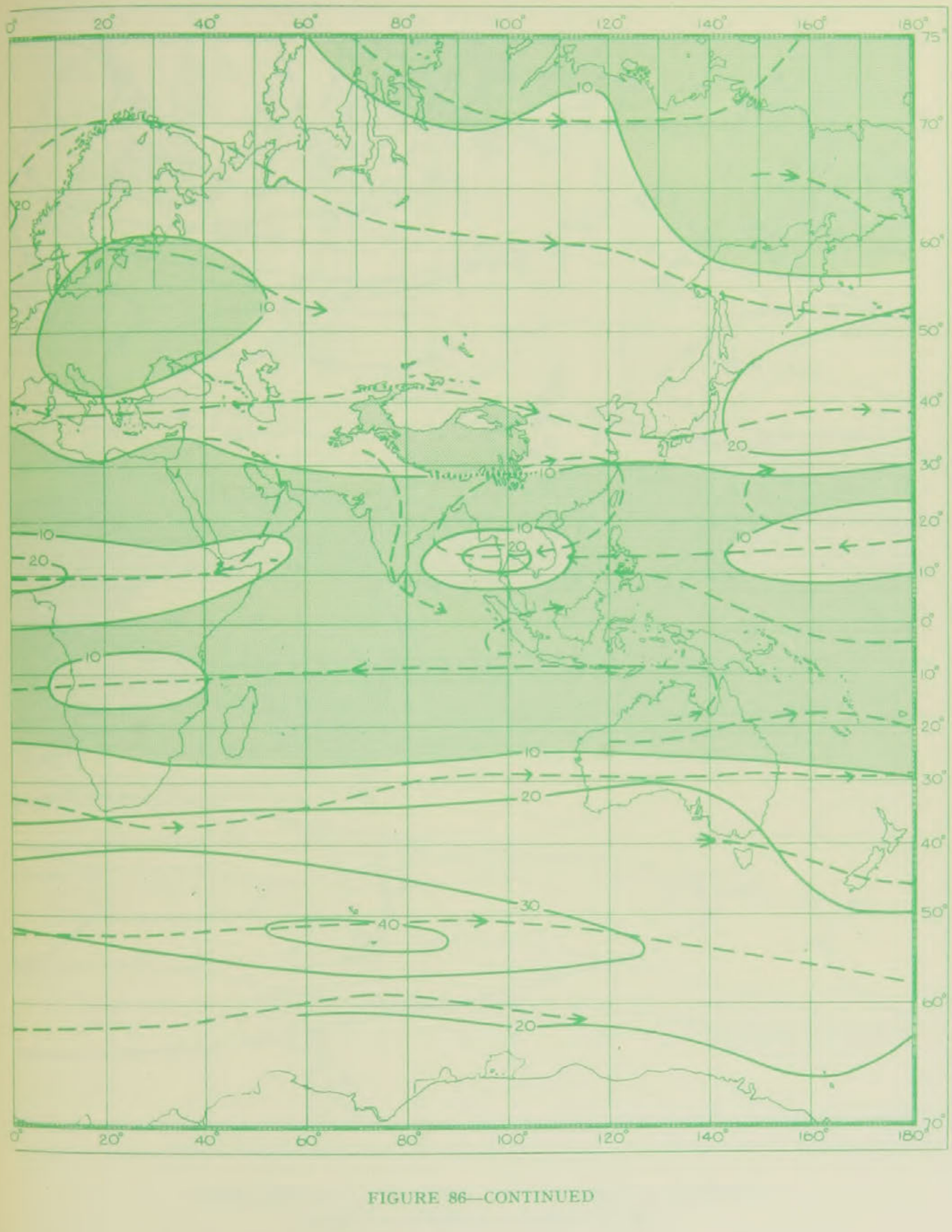


FIGURE 86—CONTINUED

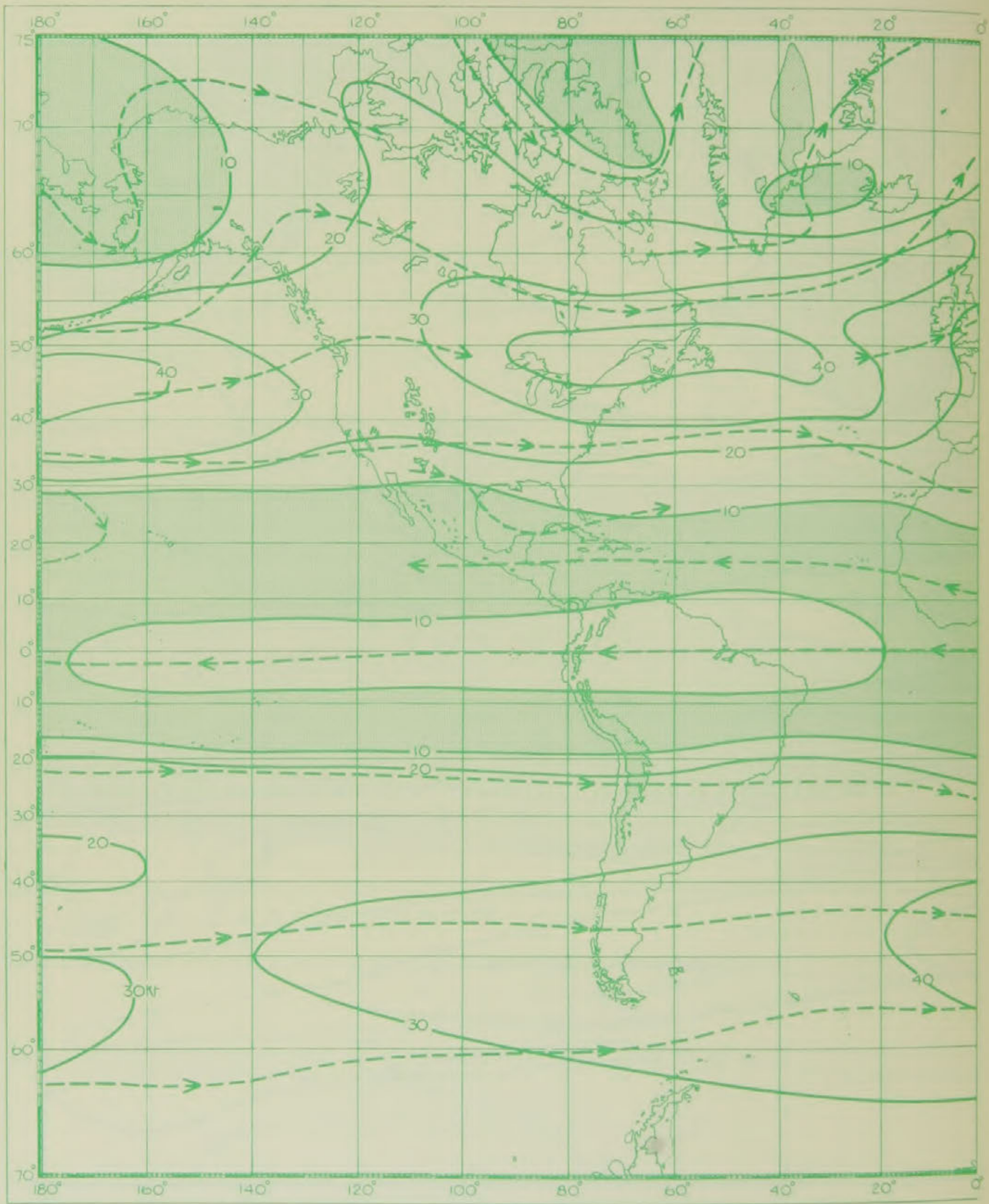


FIGURE 87—AVERAGE 500-MB. WINDS (KT.), OCTOBER 1949–53

I.C.A.O. height = 18,289 ft. = 5,574 m.

Isotachs are shown by continuous lines and streamlines by broken lines

Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

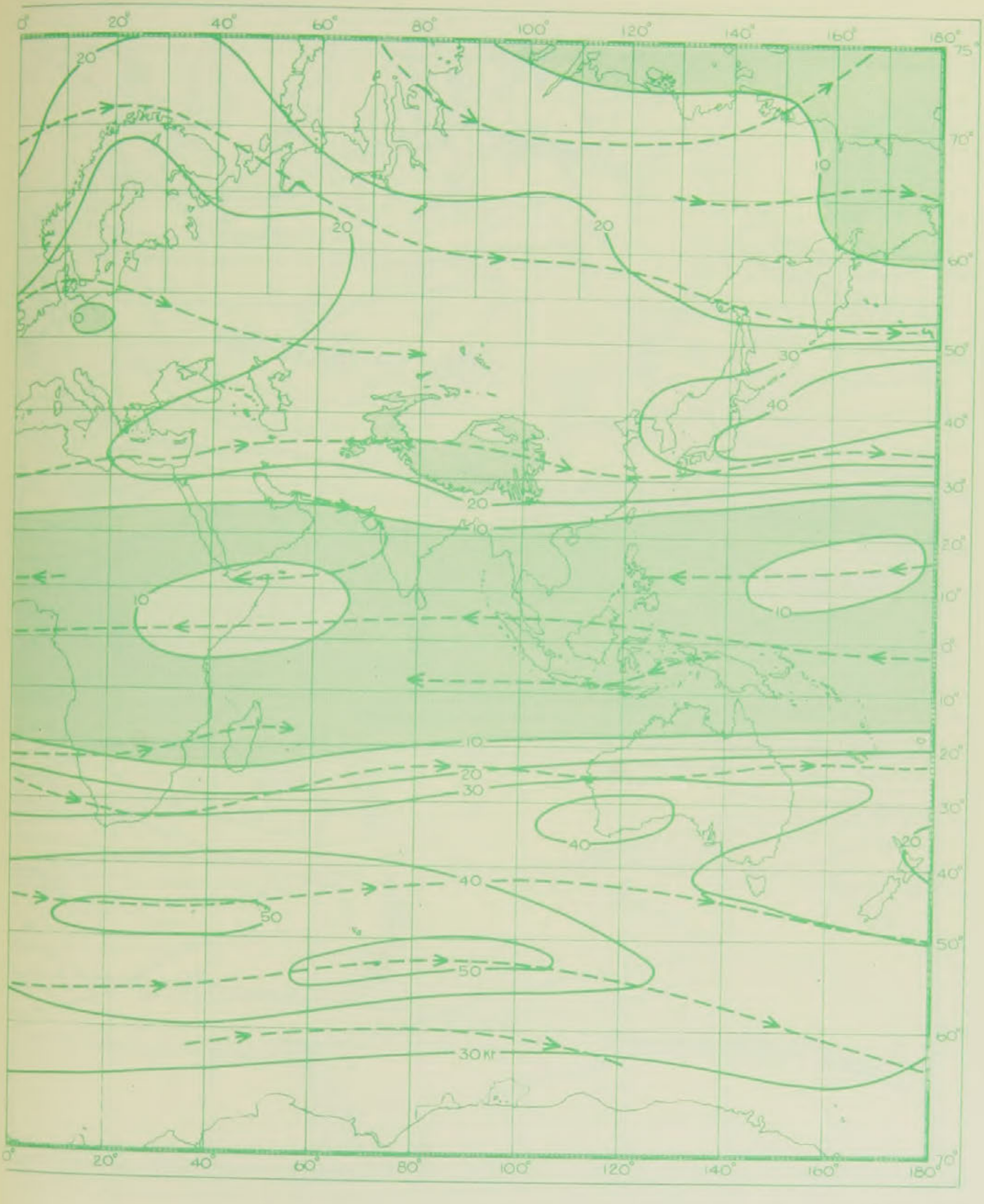


FIGURE 87—CONTINUED

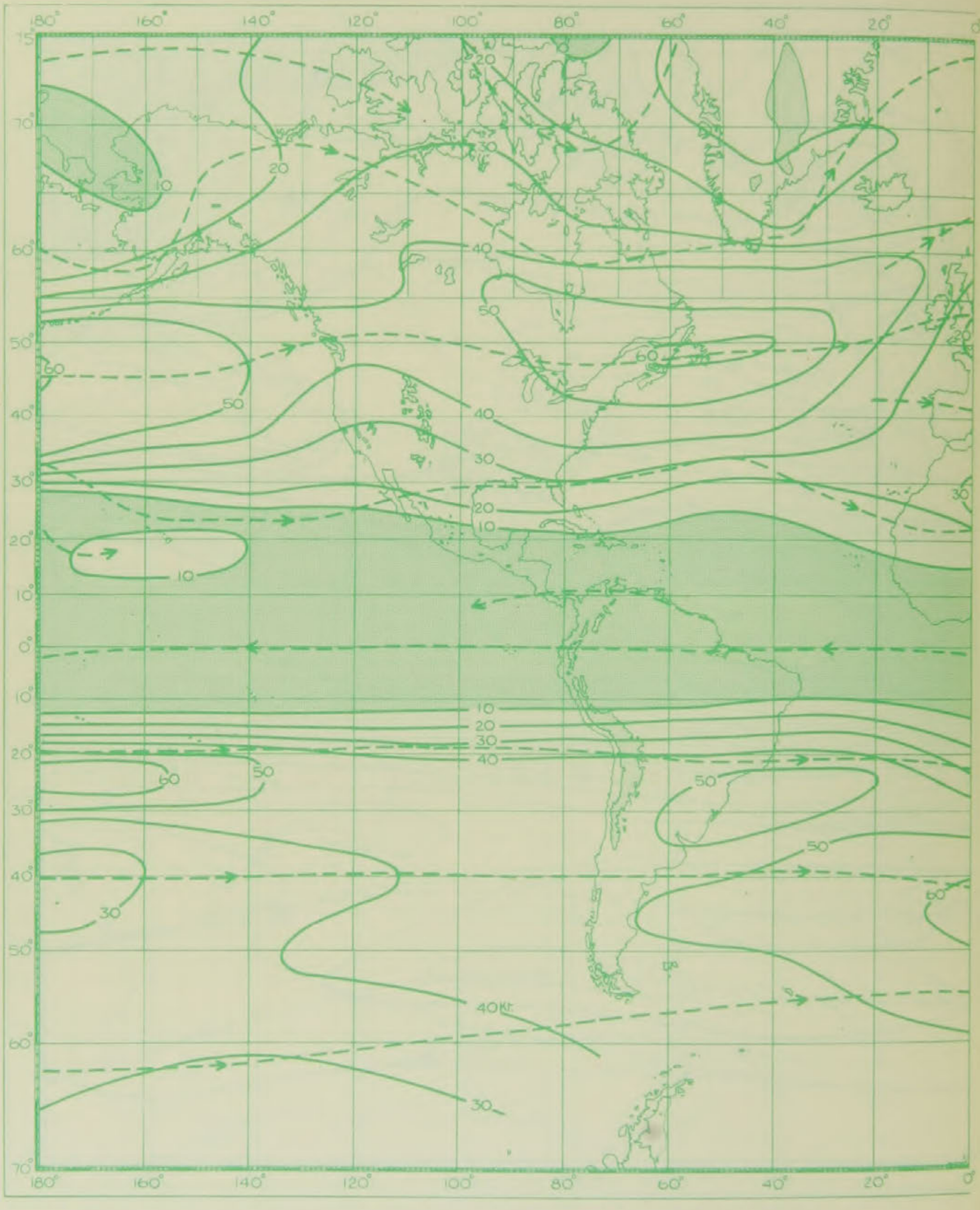


FIGURE 88—AVERAGE 300-MB. WINDS (KT.), OCTOBER 1949–53

I.C.A.O. height = 30,065 ft. = 9,164 m.

Isotachs are shown by continuous lines and streamlines by broken lines

Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

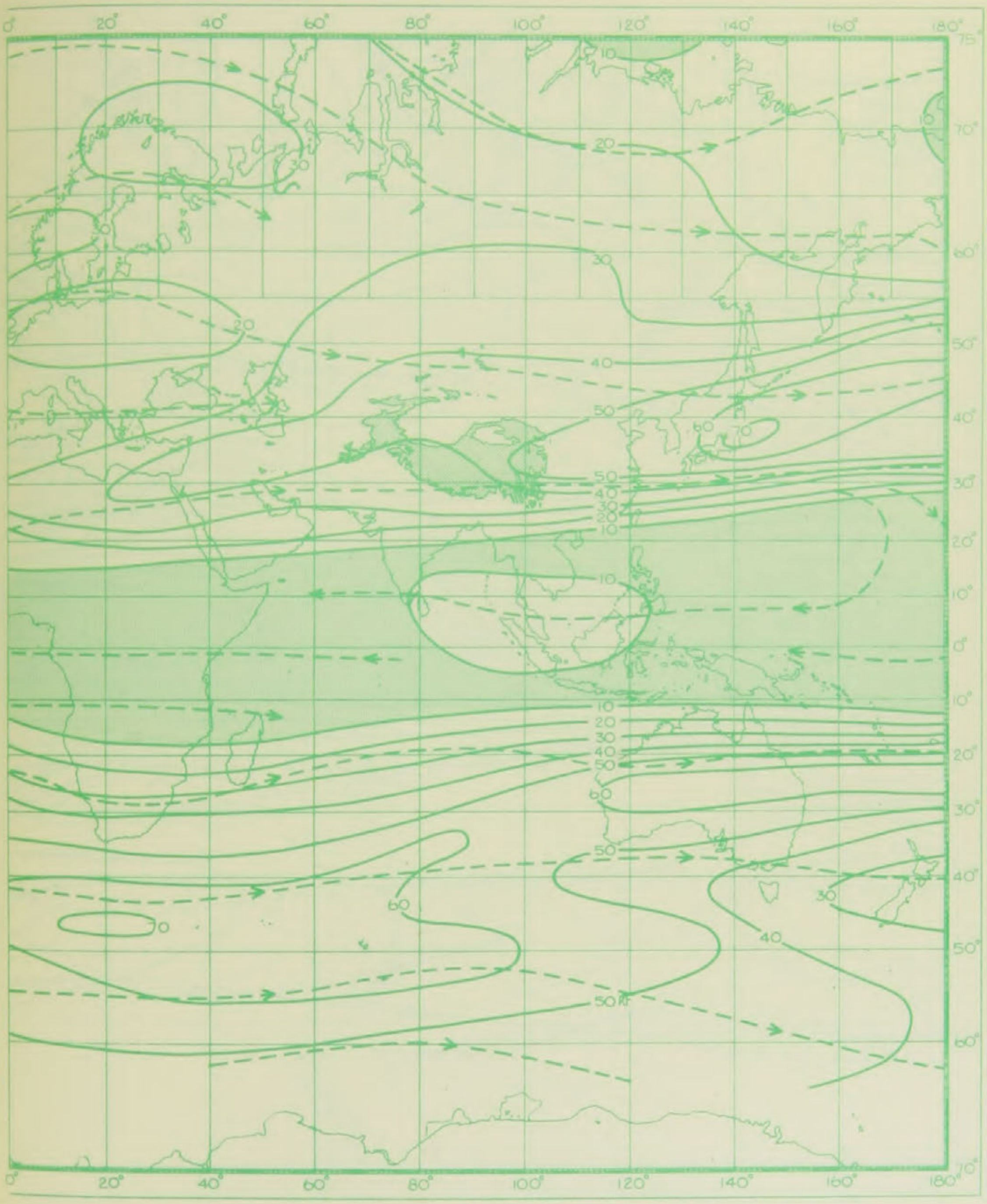


FIGURE 88—CONTINUED

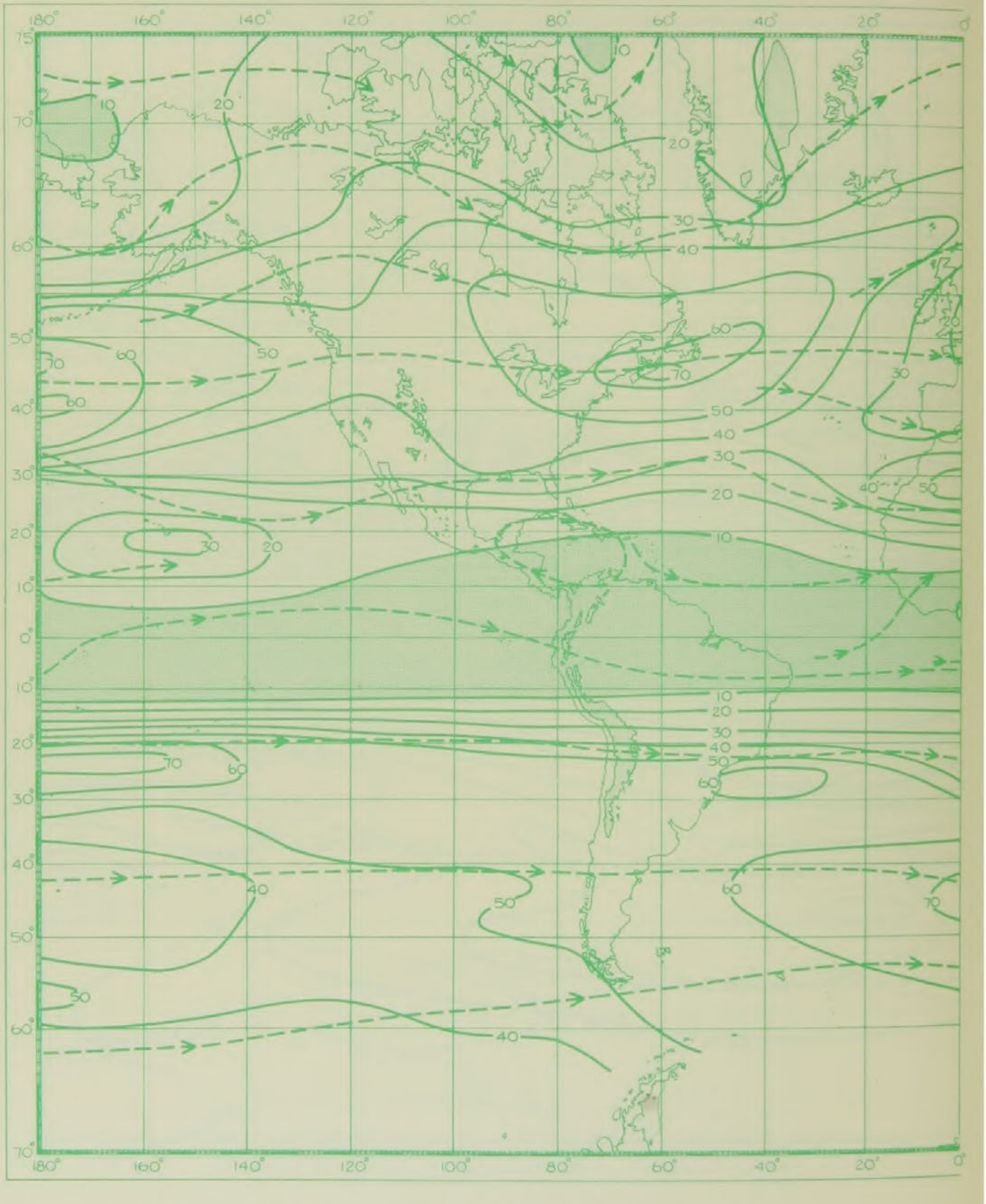


FIGURE 89—AVERAGE 200-MB. WINDS (KT.), OCTOBER 1949–53
I.C.A.O. height = 38,662 ft. = 11,784 m.

Isotachs are shown by continuous lines and streamlines by broken lines

Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

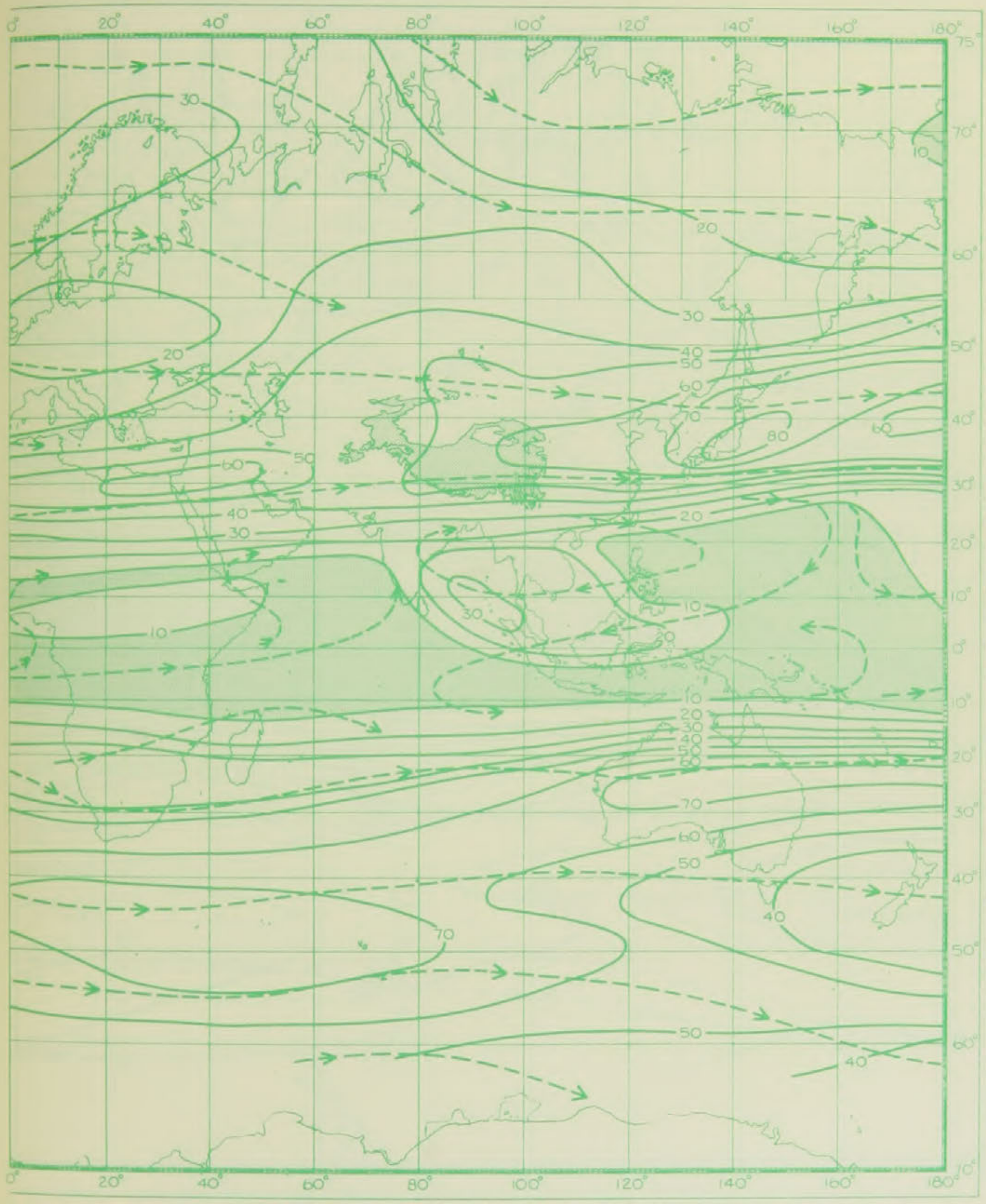


FIGURE 89—CONTINUED

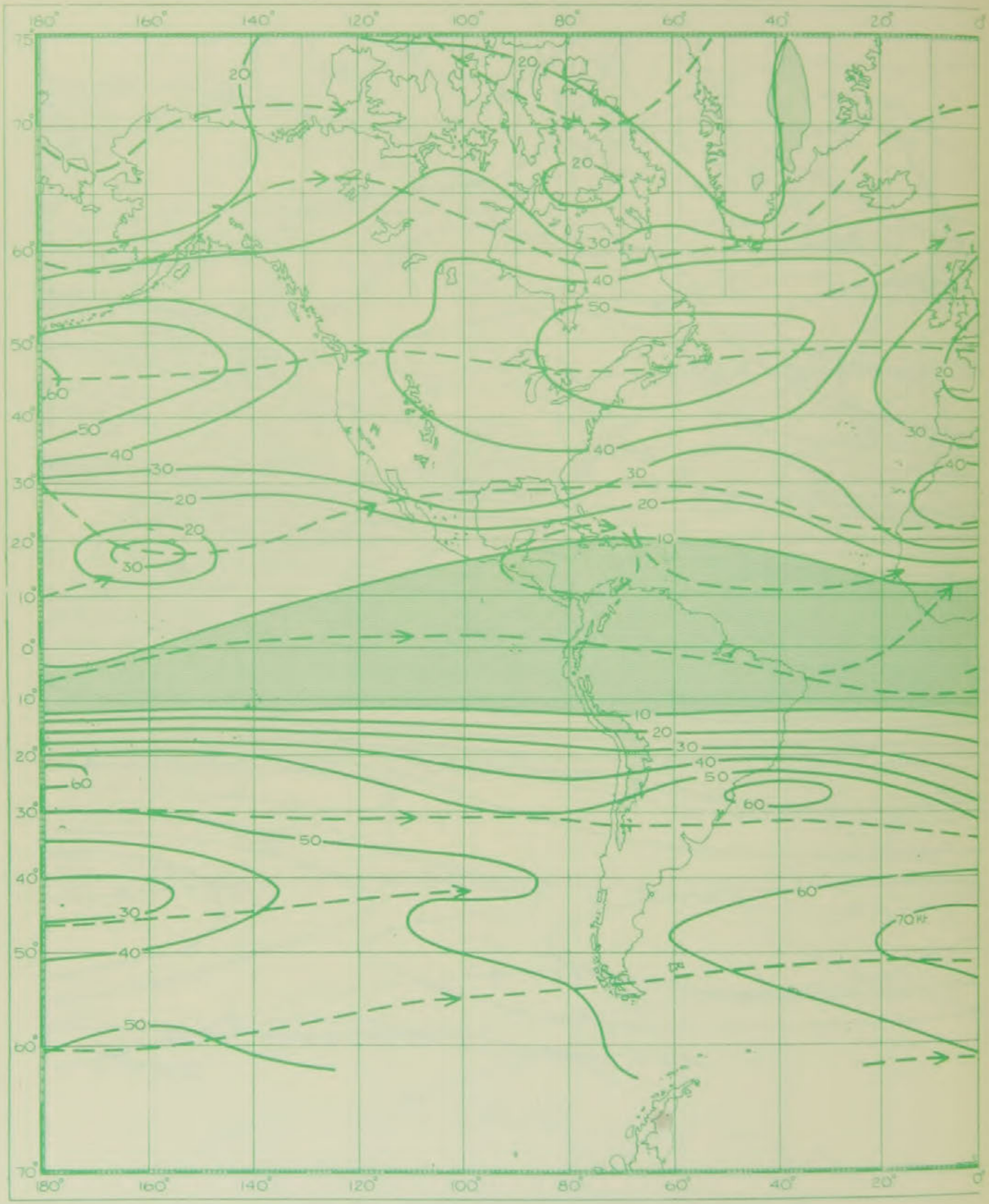


FIGURE 90—AVERAGE 150-MB. WINDS (KT.), OCTOBER 1949–53
I.C.A.O. height = 44,647 ft. = 13,608 m.

Isotachs are shown by continuous lines and streamlines by broken lines

Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

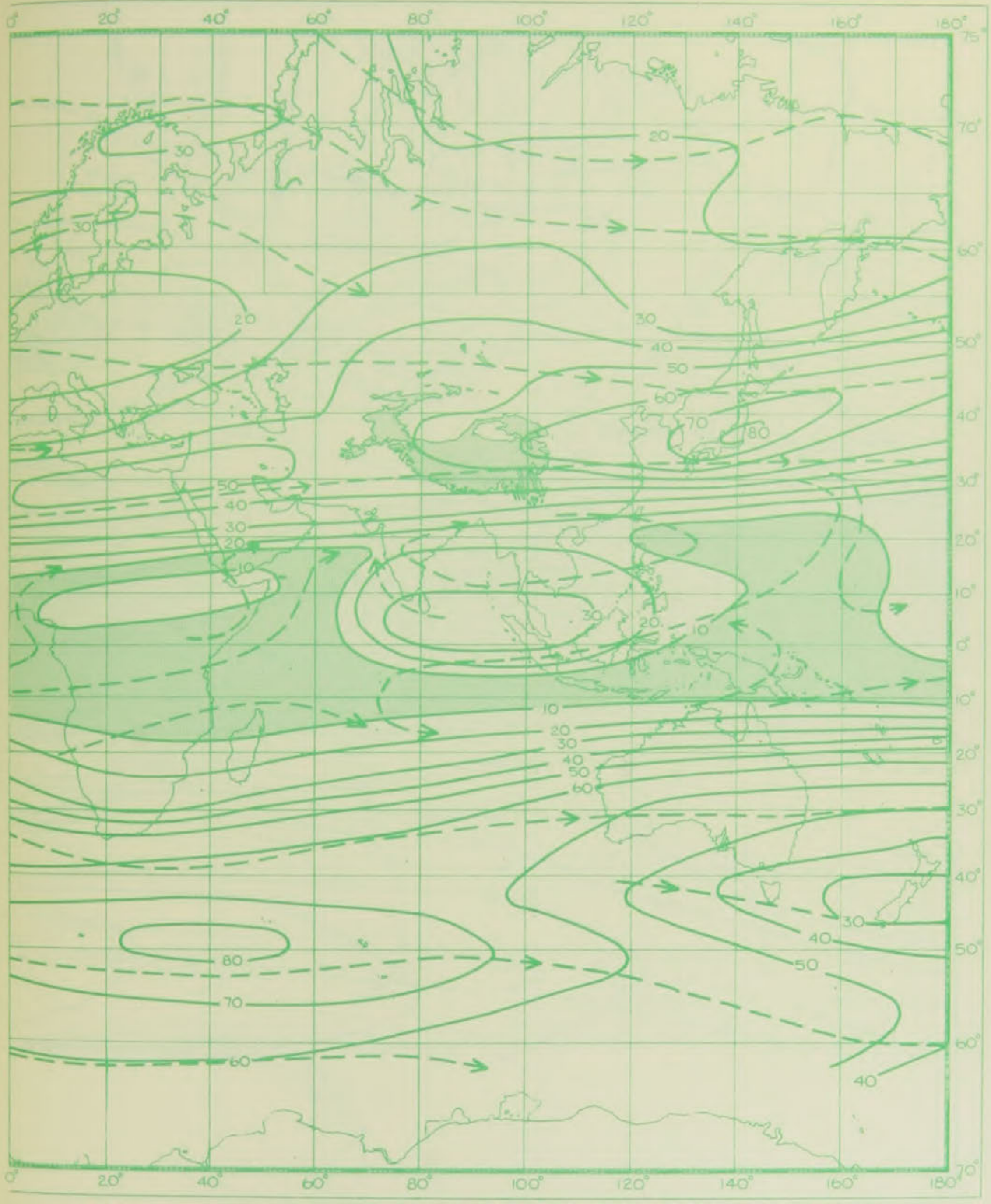


FIGURE 90—CONTINUED

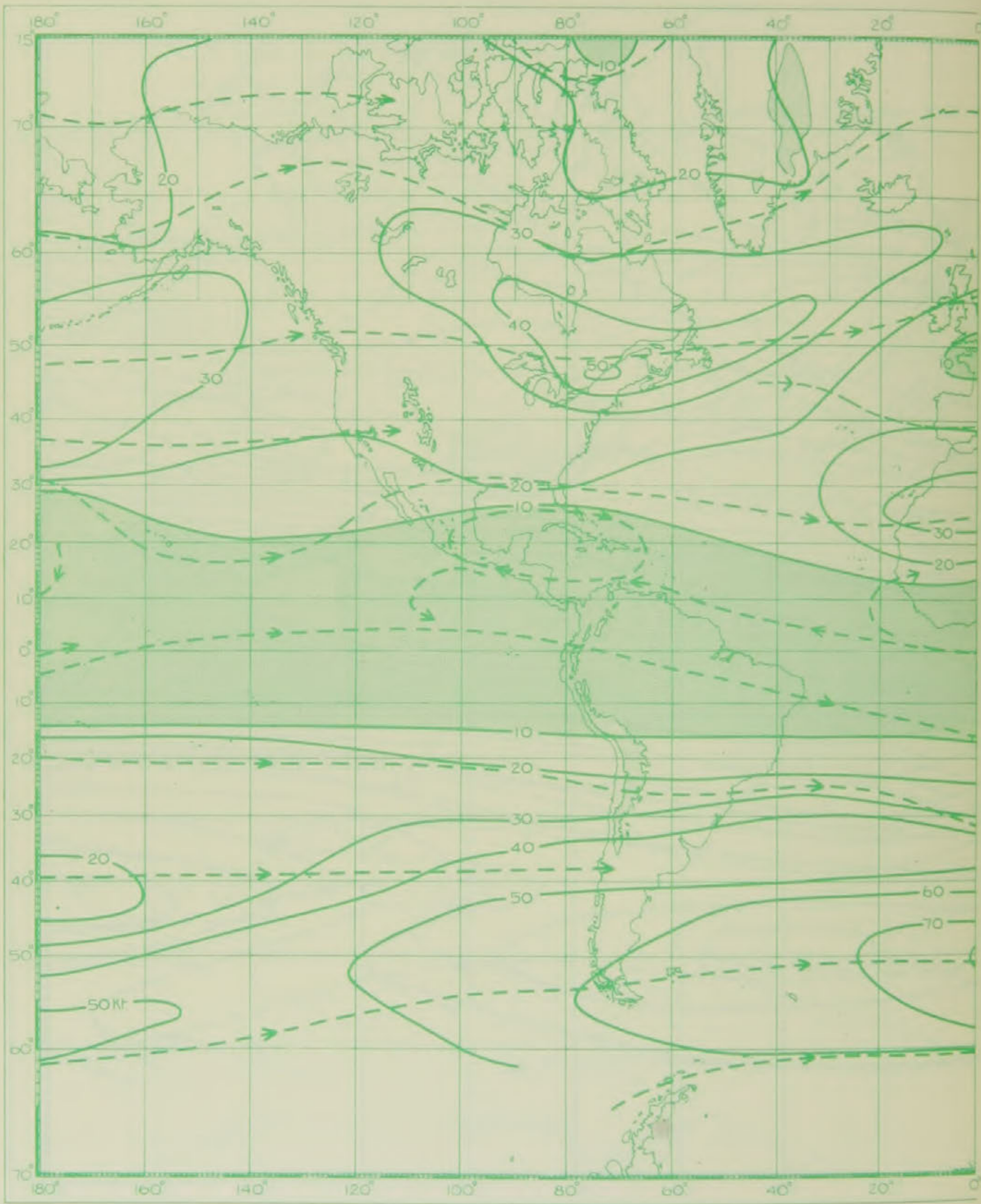


FIGURE 91—AVERAGE 100-MB. WINDS (KT.), OCTOBER 1949–53
I.C.A.O. height = 53,083 ft. = 16,180 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

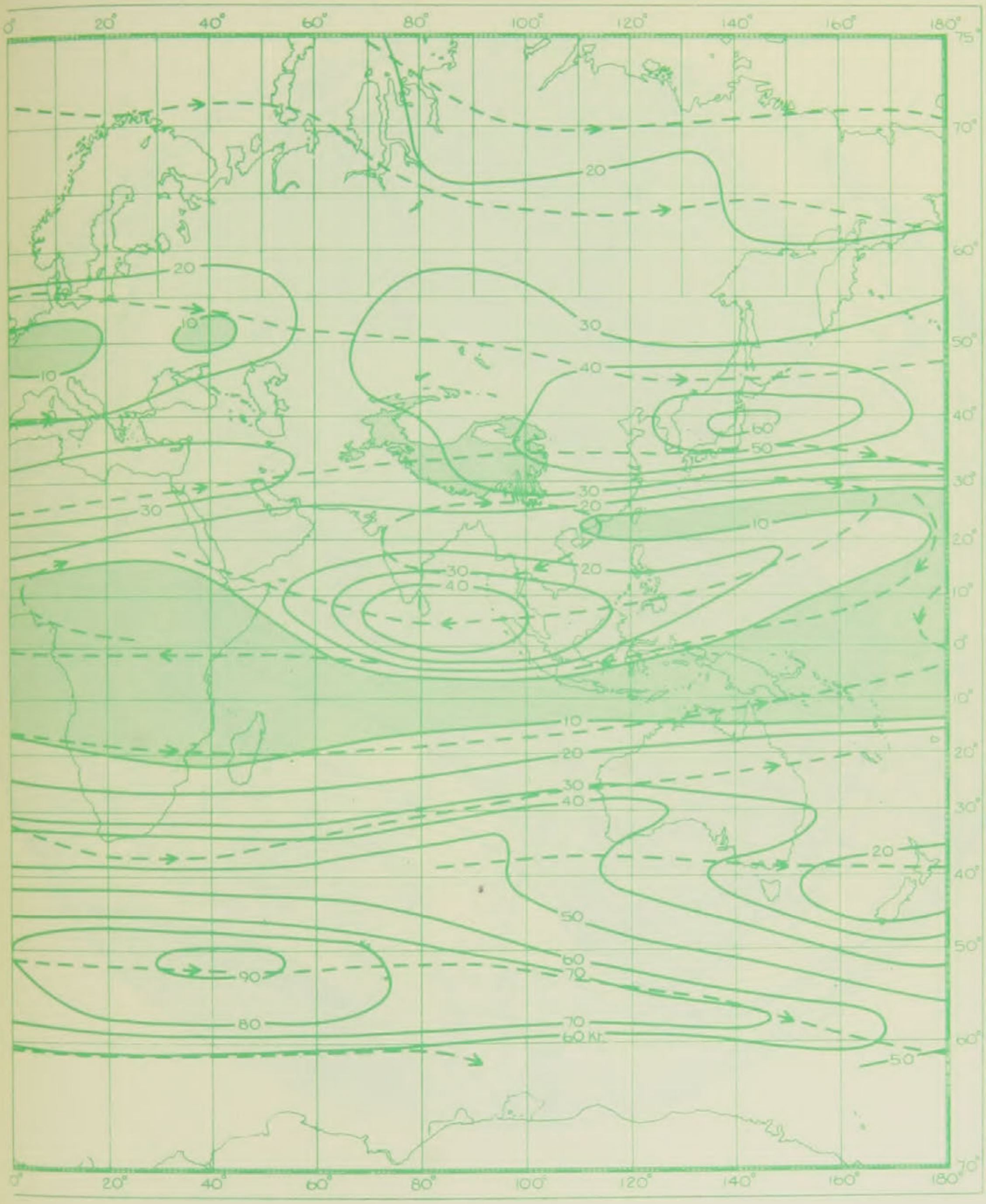


FIGURE 91—CONTINUED

FIGURE 92—AVERAGE 700-MB. WINDS (KT.), OCTOBER 1949–53
I.C.A.O. height = 9,882 ft. = 3,012 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

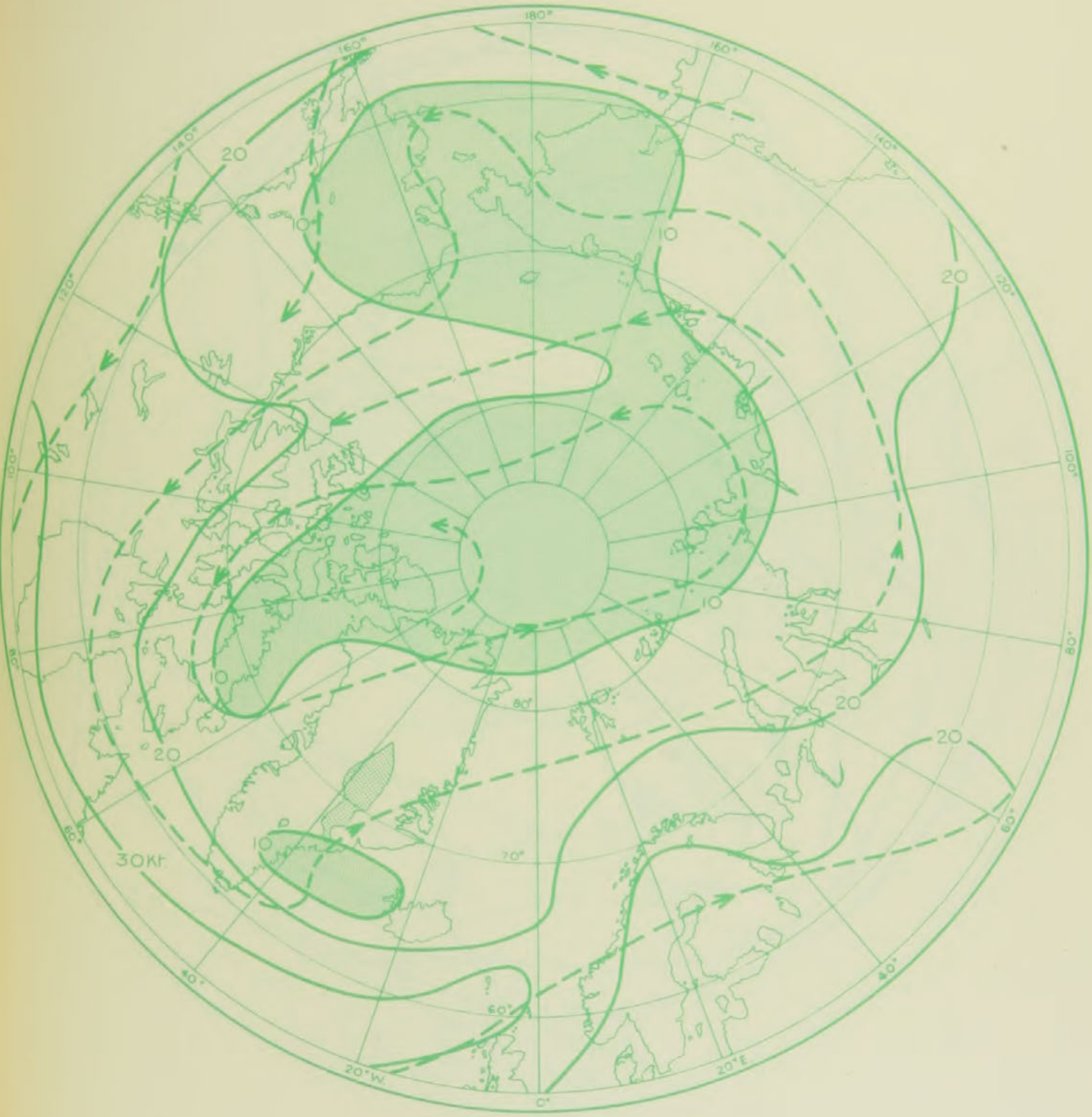


FIGURE 93—AVERAGE 500-MB. WINDS (KT.), OCTOBER 1949–53
I.C.A.O. height = 18,289 ft. = 5,574 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

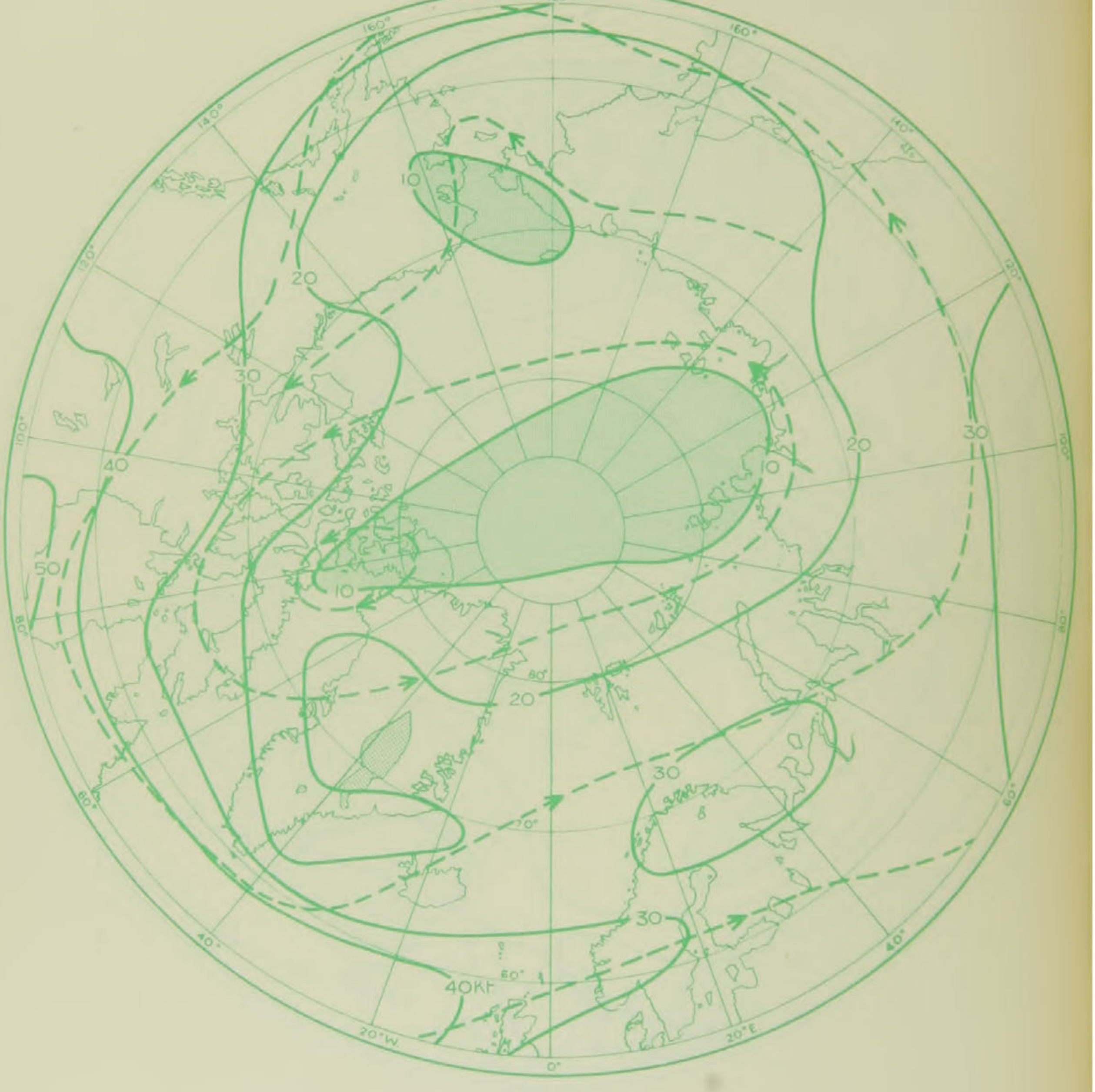


FIGURE 94—AVERAGE 300-MB. WINDS (KT.), OCTOBER 1949–53
I.C.A.O. height = 30,065 ft. = 9,164 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

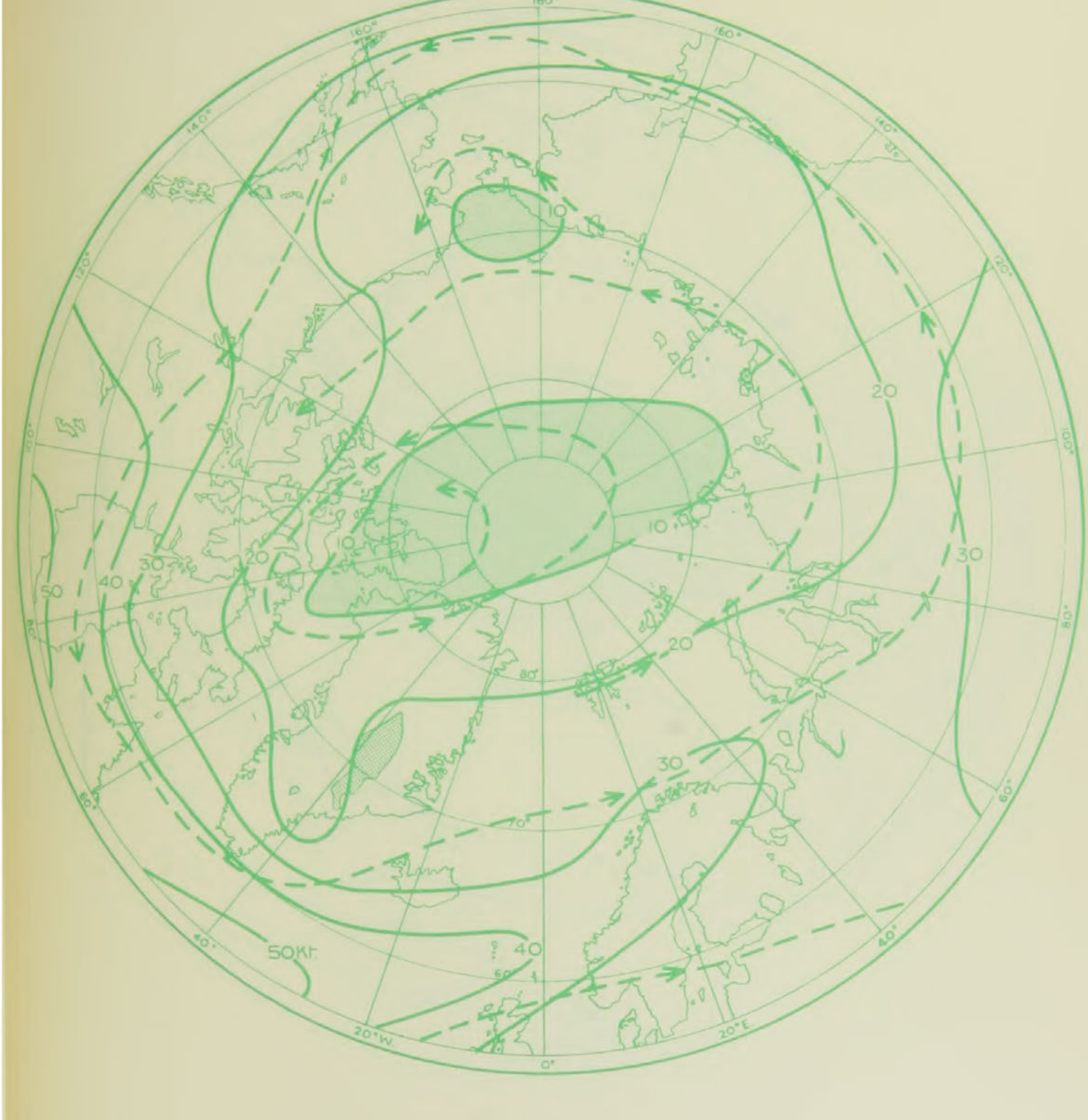


FIGURE 95—AVERAGE 200-MB. WINDS (KT.), OCTOBER 1949–53
I.C.A.O. height = 38,662 ft. = 11,784 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

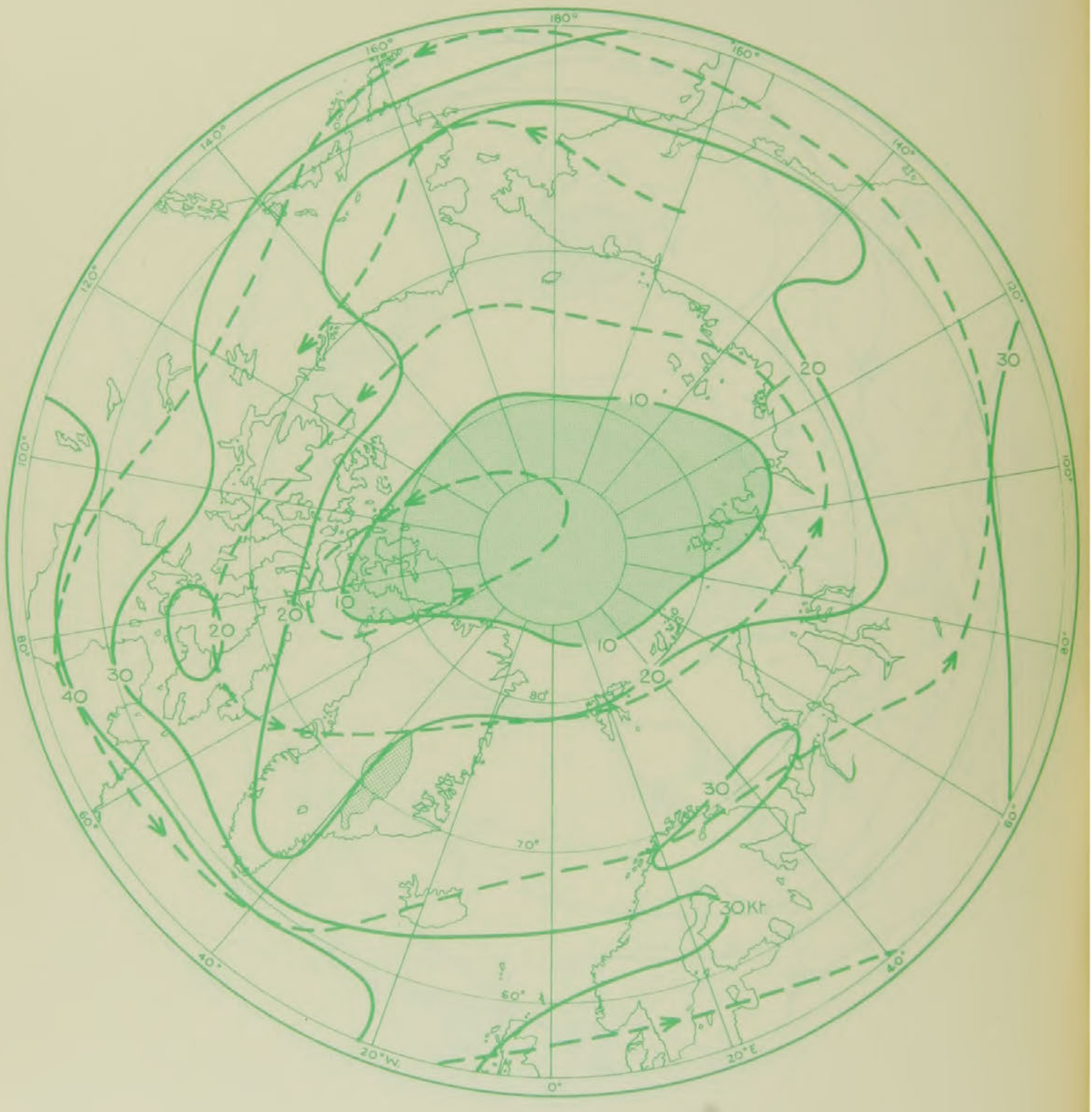


FIGURE 96—AVERAGE 150-MB. WINDS (KT.), OCTOBER 1949-53
I.C.A.O. height = 44,647 ft. = 13,608 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

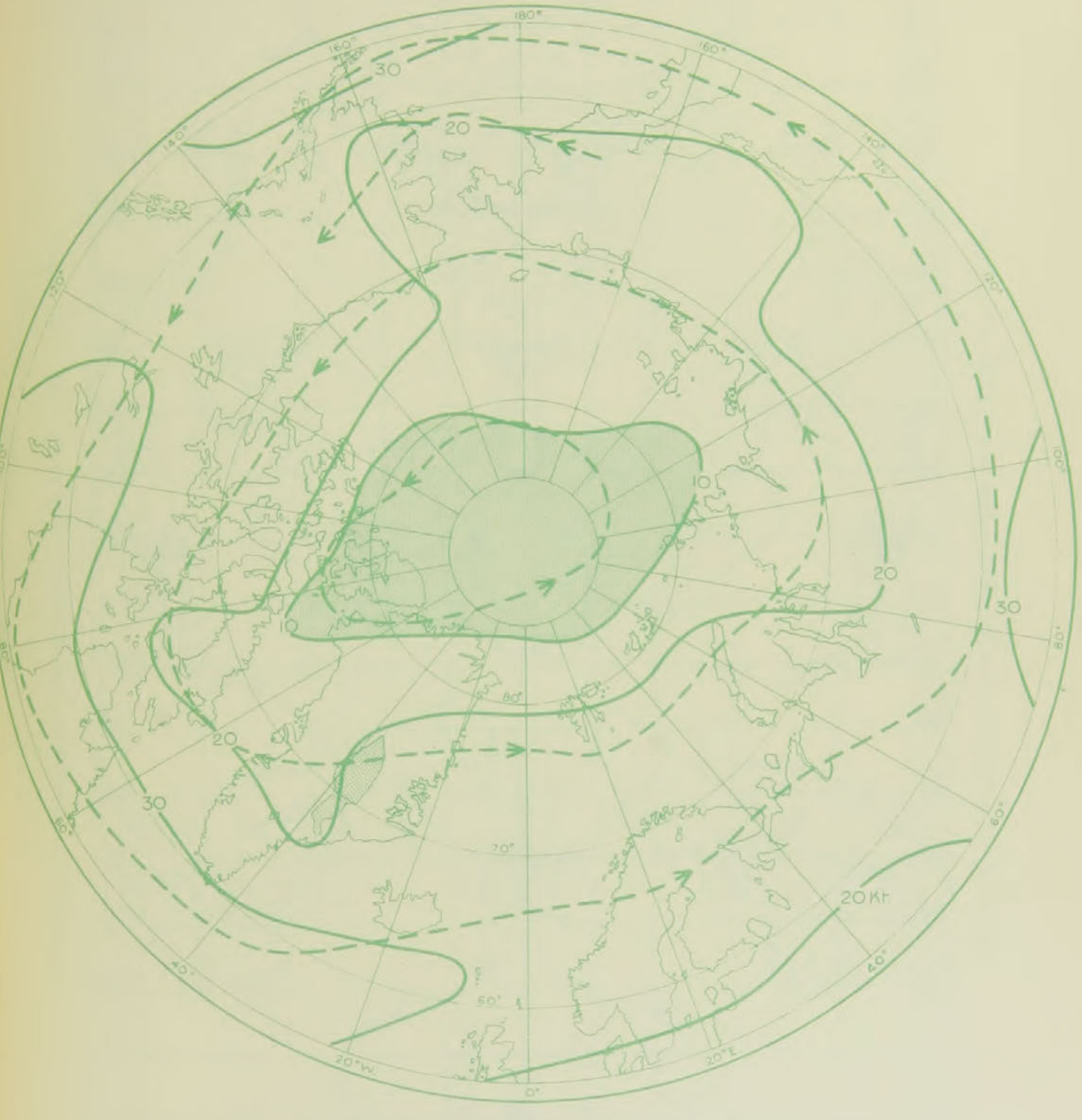


FIGURE 97—AVERAGE 100-MB. WINDS (KT.), OCTOBER 1949–53
I.C.A.O. height = 53,083 ft. = 16,180 m.
Isotachs are shown by continuous lines and streamlines by broken lines
Areas with wind speed less than 10 kt. are lightly shaded; land over 3,000 m. is represented by heavier shading

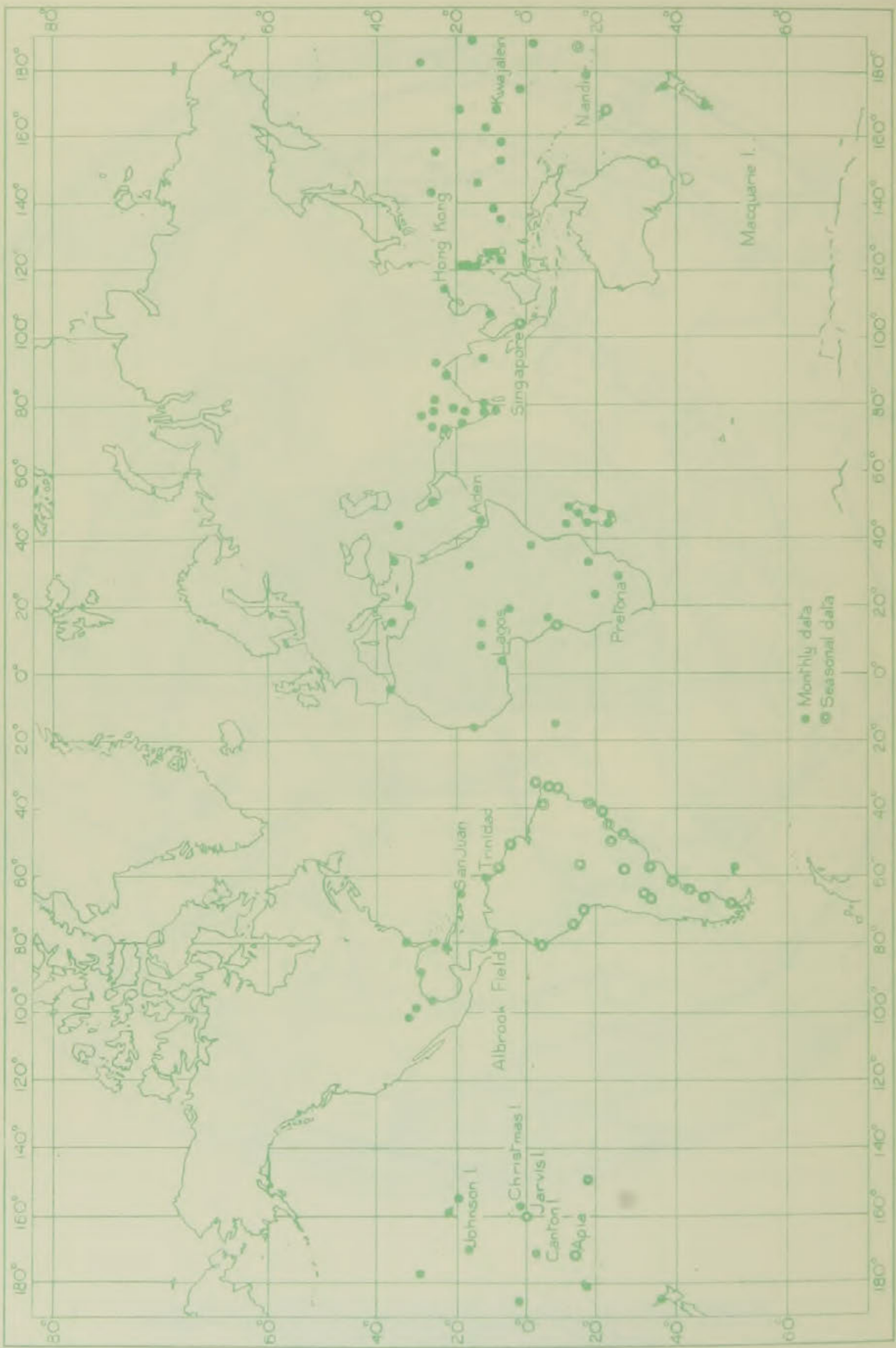


FIGURE 98—STATIONS FOR WHICH 700-MB. WIND DATA WERE AVAILABLE

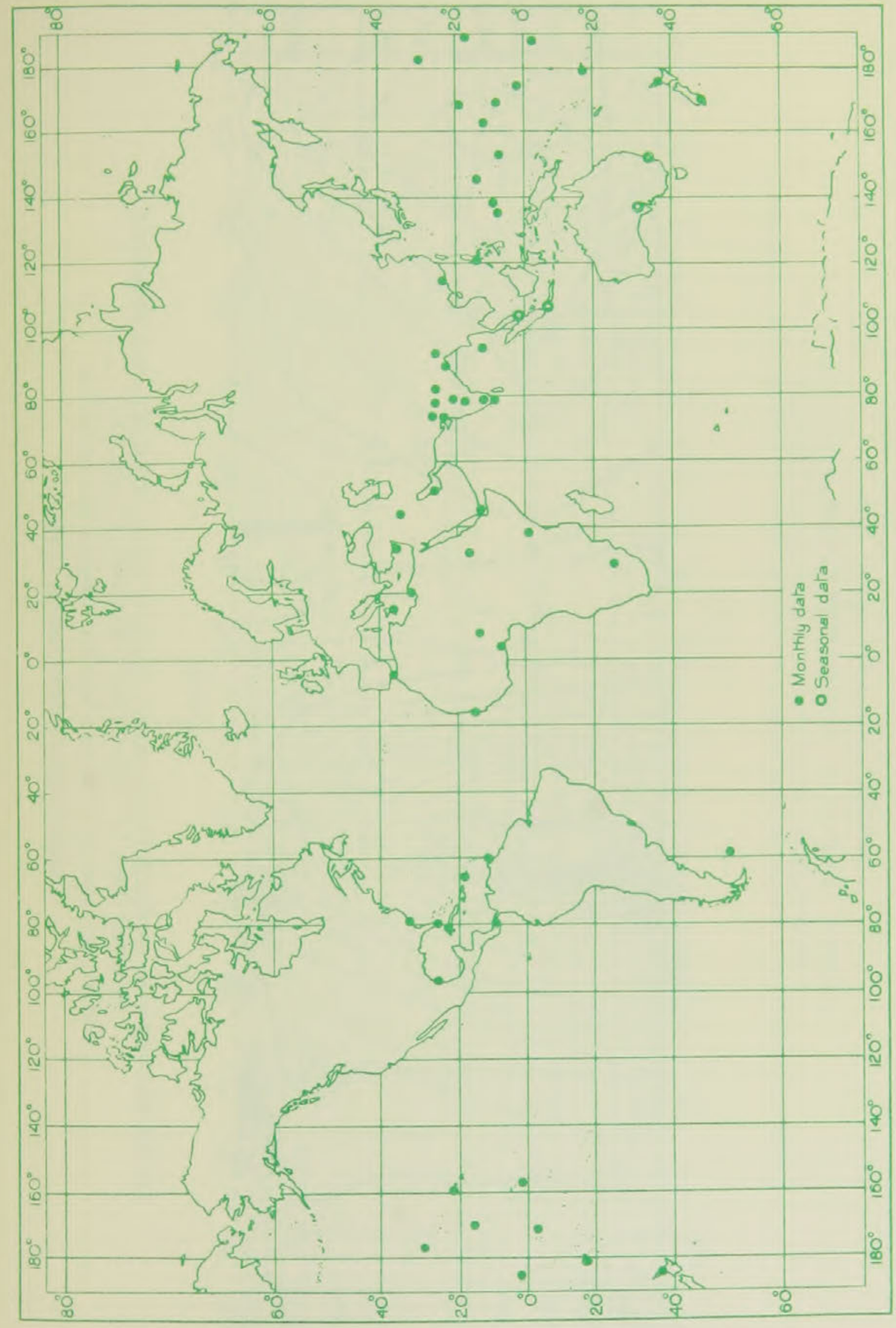


FIGURE 99—STATIONS FOR WHICH 100-MB. WIND DATA WERE AVAILABLE

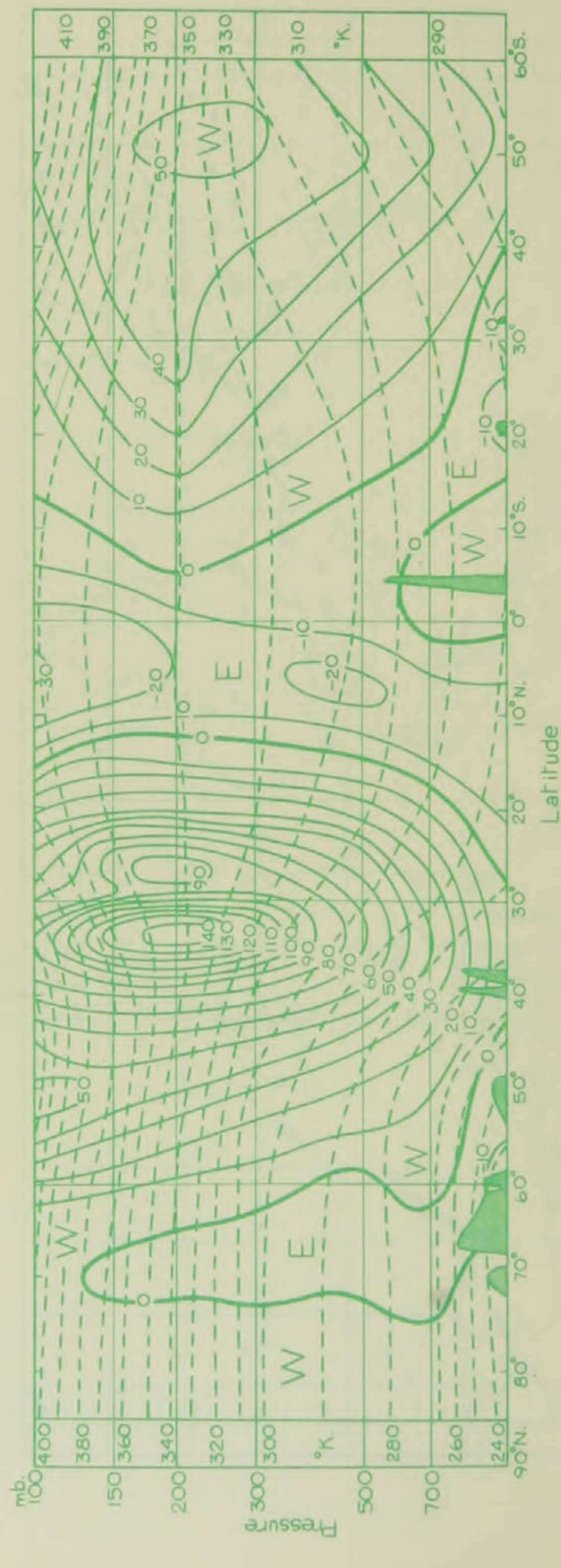


FIGURE 100—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 140°E IN JANUARY

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

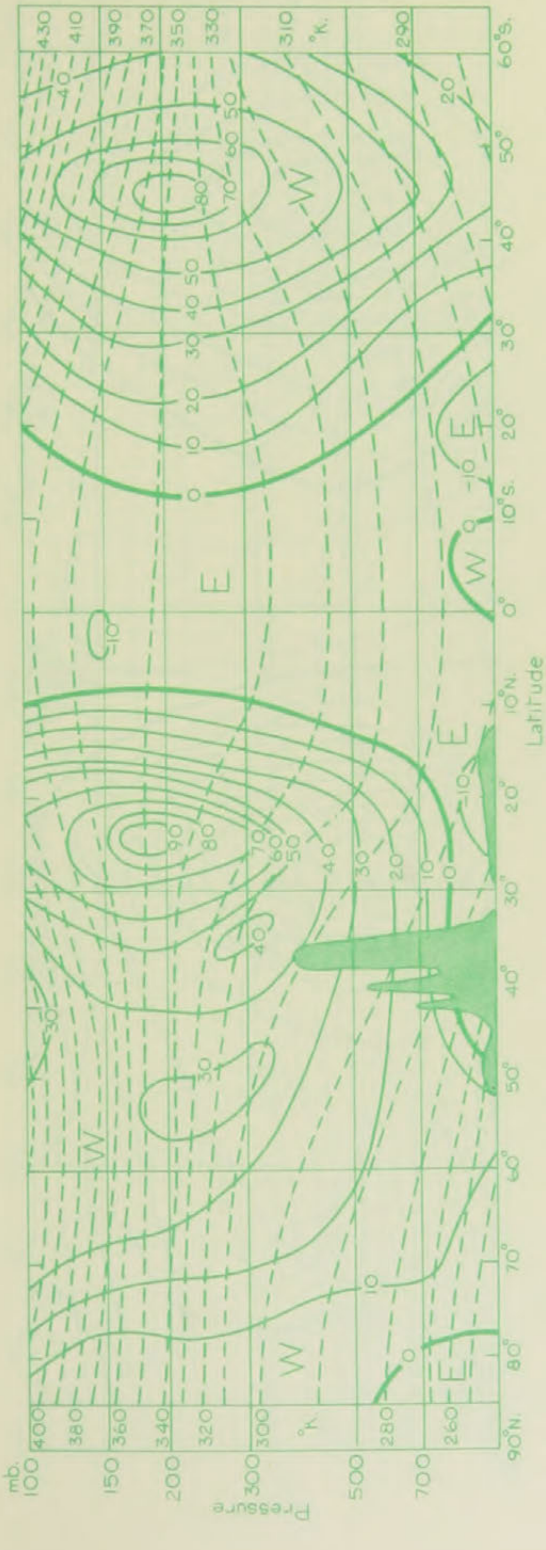


FIGURE 101—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 75°E IN JANUARY

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

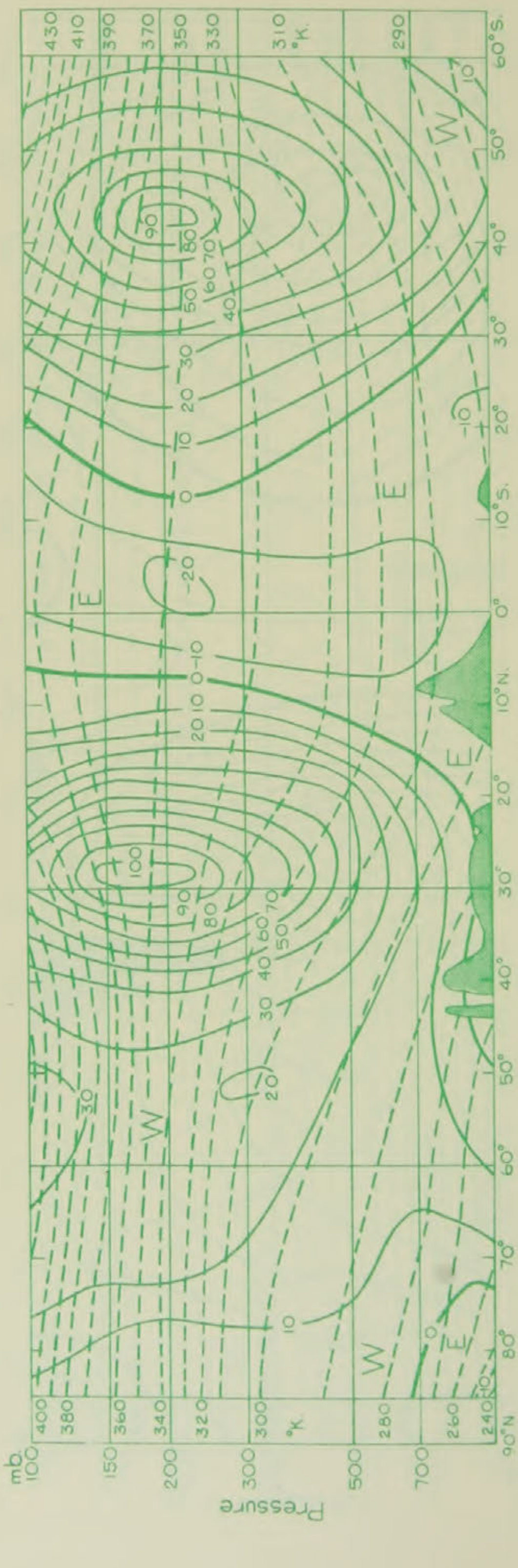


FIGURE 102—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 40°E IN JANUARY

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

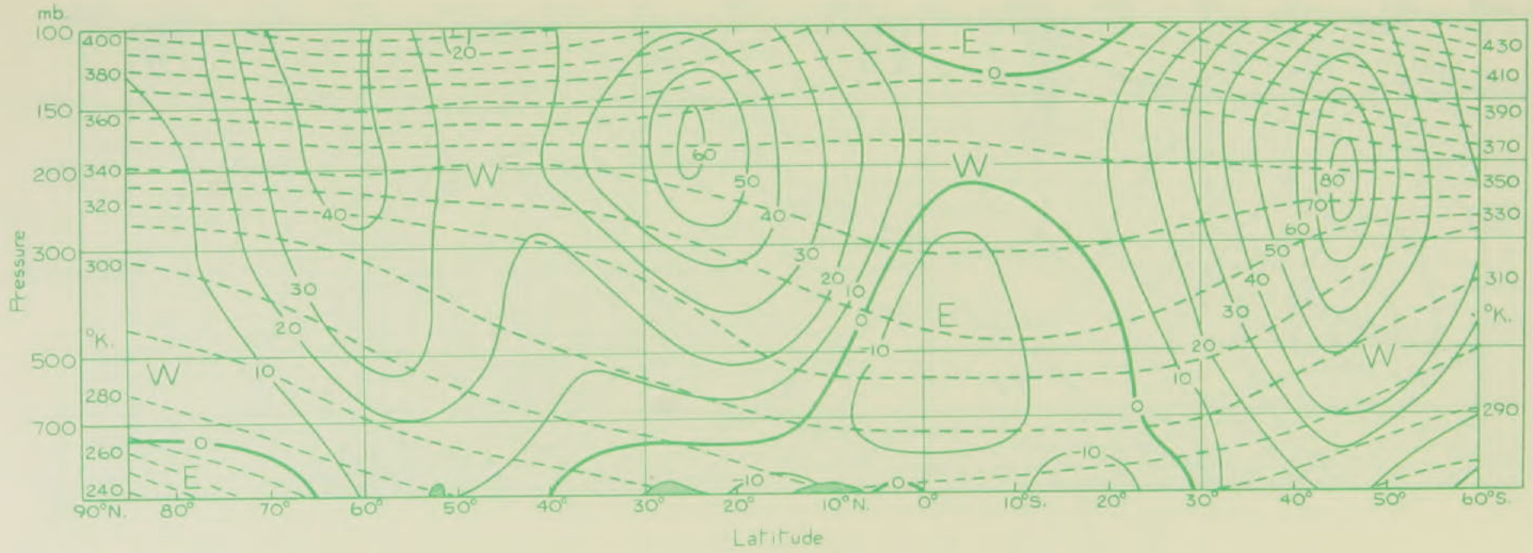


FIGURE 103—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 10°W IN JANUARY

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

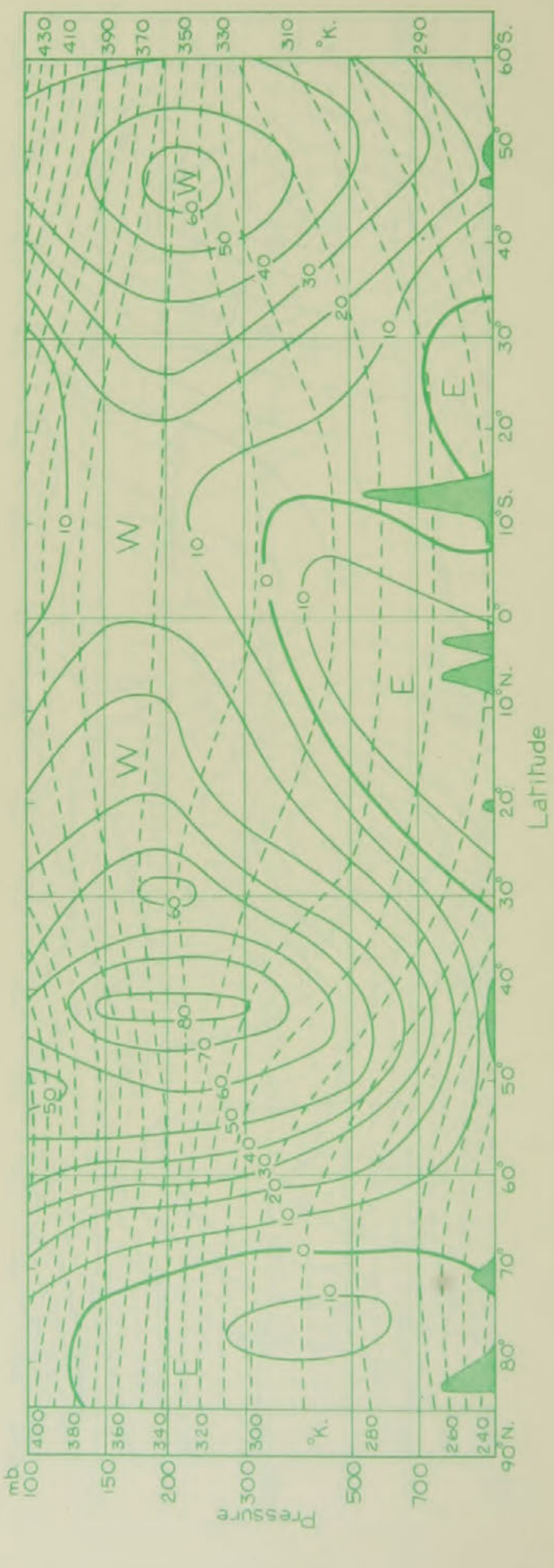


FIGURE 104—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 75°W IN JANUARY

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

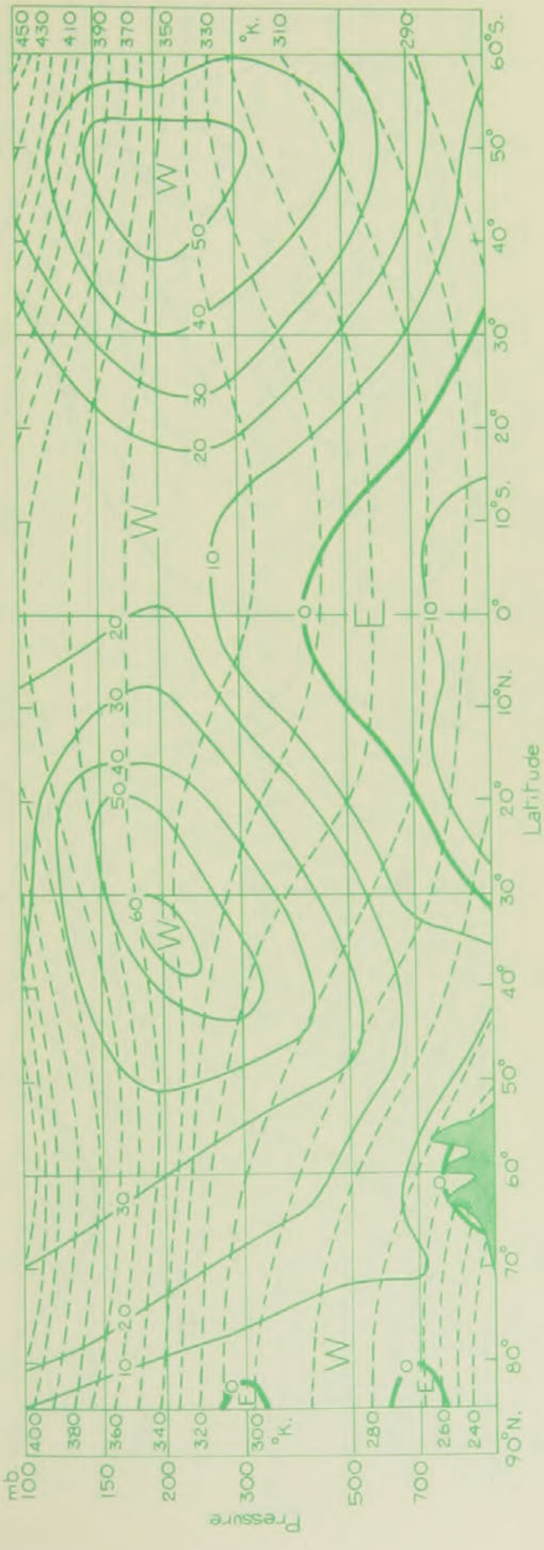


FIGURE 105—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 130°W IN JANUARY

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

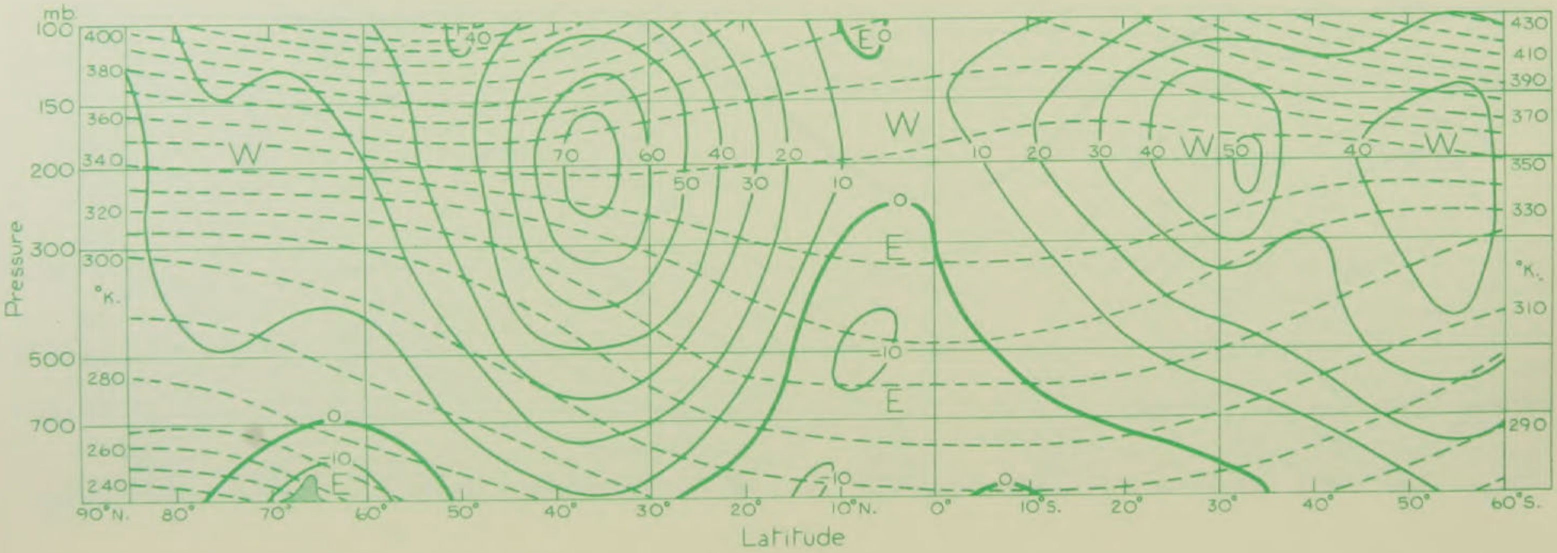


FIGURE 106—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 180° IN JANUARY

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

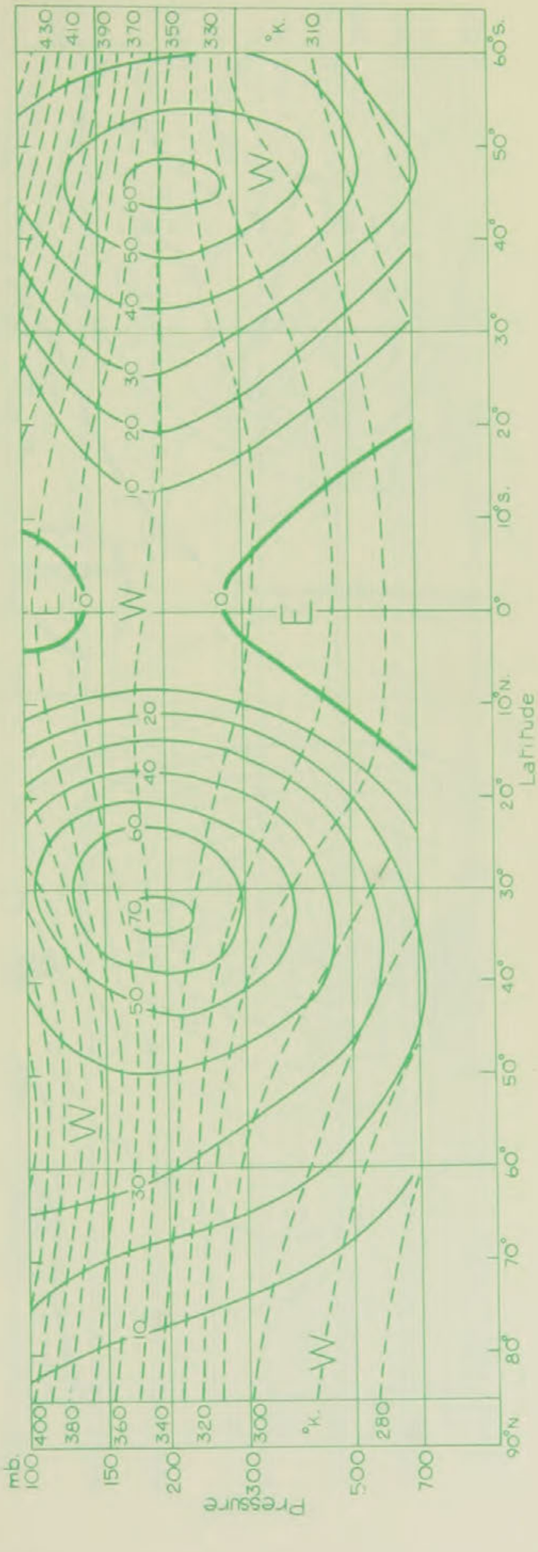


FIGURE 107—MEAN VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) IN JANUARY

This cross-section is based on monthly mean values at 20° intervals of longitude around complete latitude circles

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

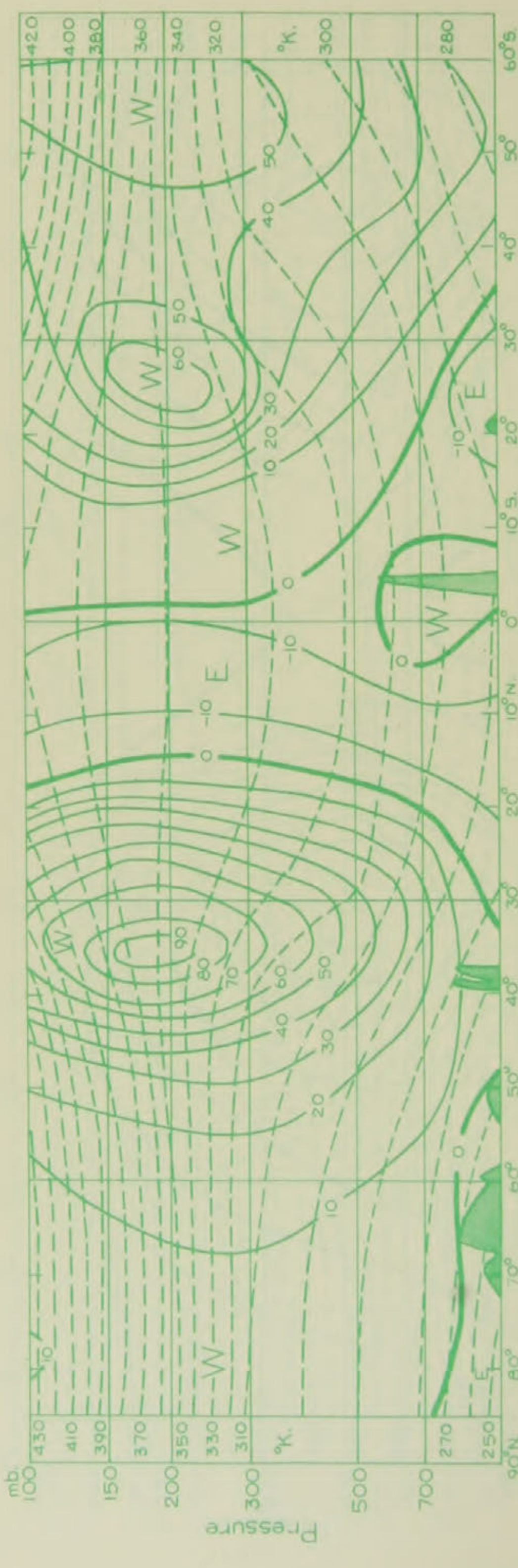


FIGURE 108—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 140°E IN APRIL

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

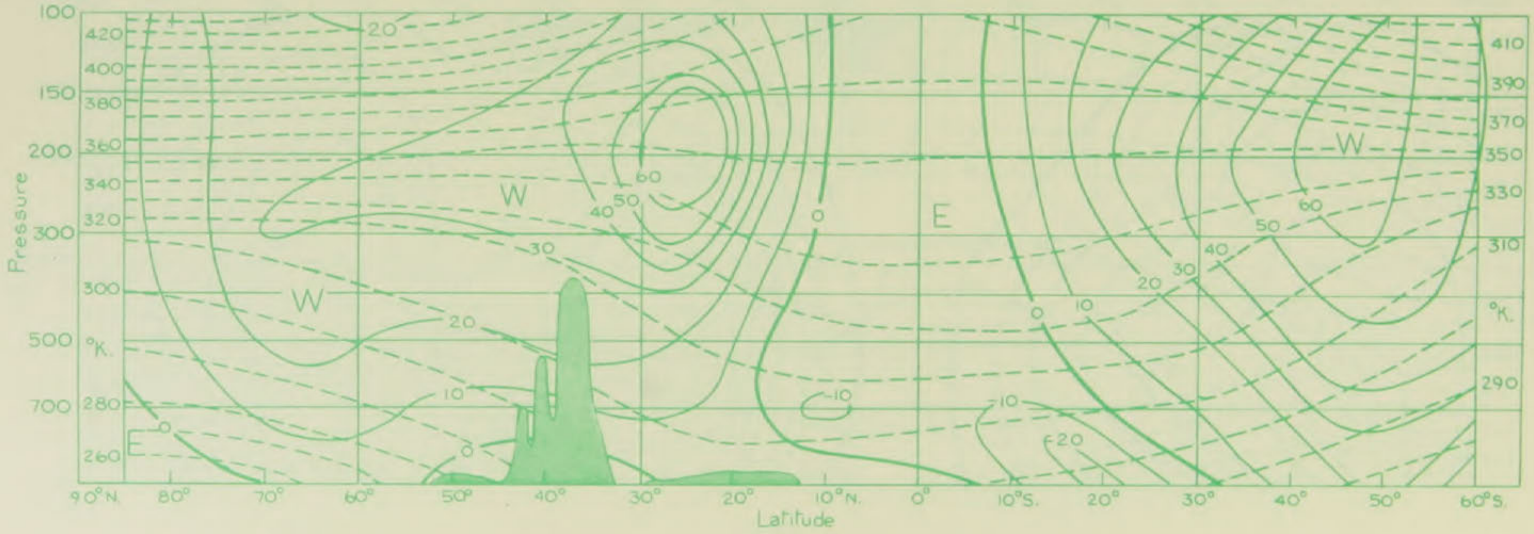


FIGURE 109—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 75°E IN APRIL

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

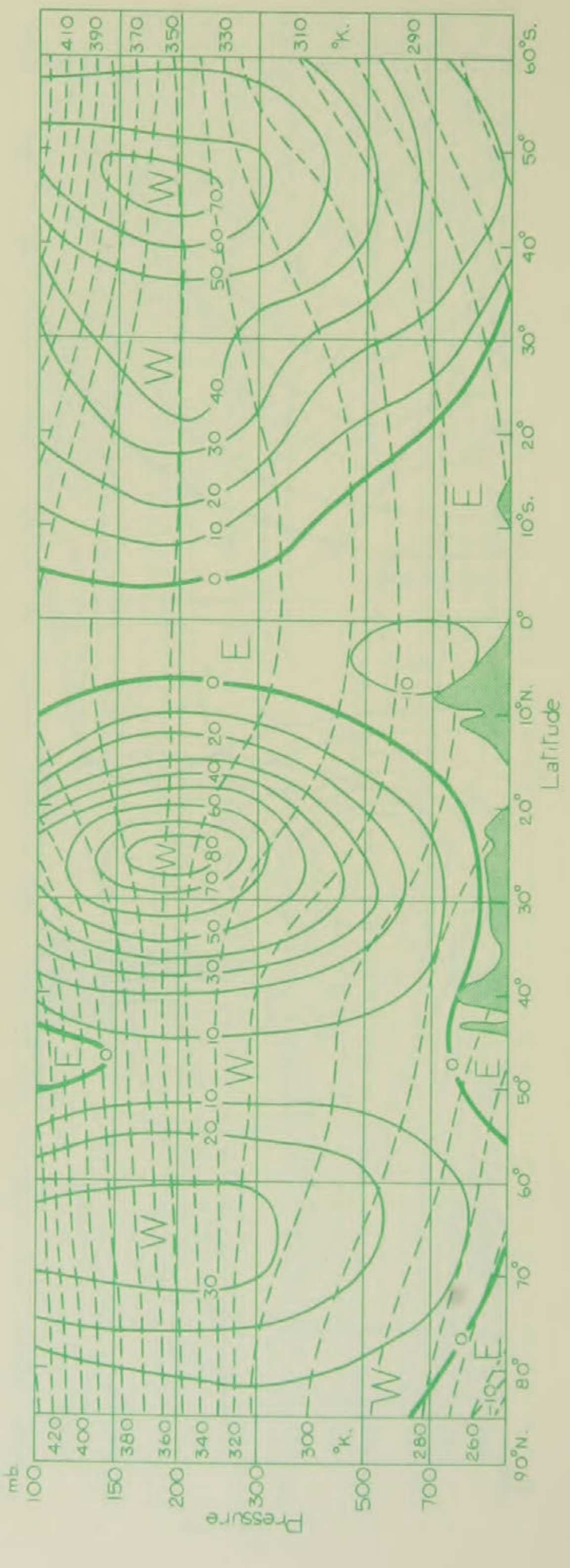


FIGURE 110—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 40°E IN APRIL

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

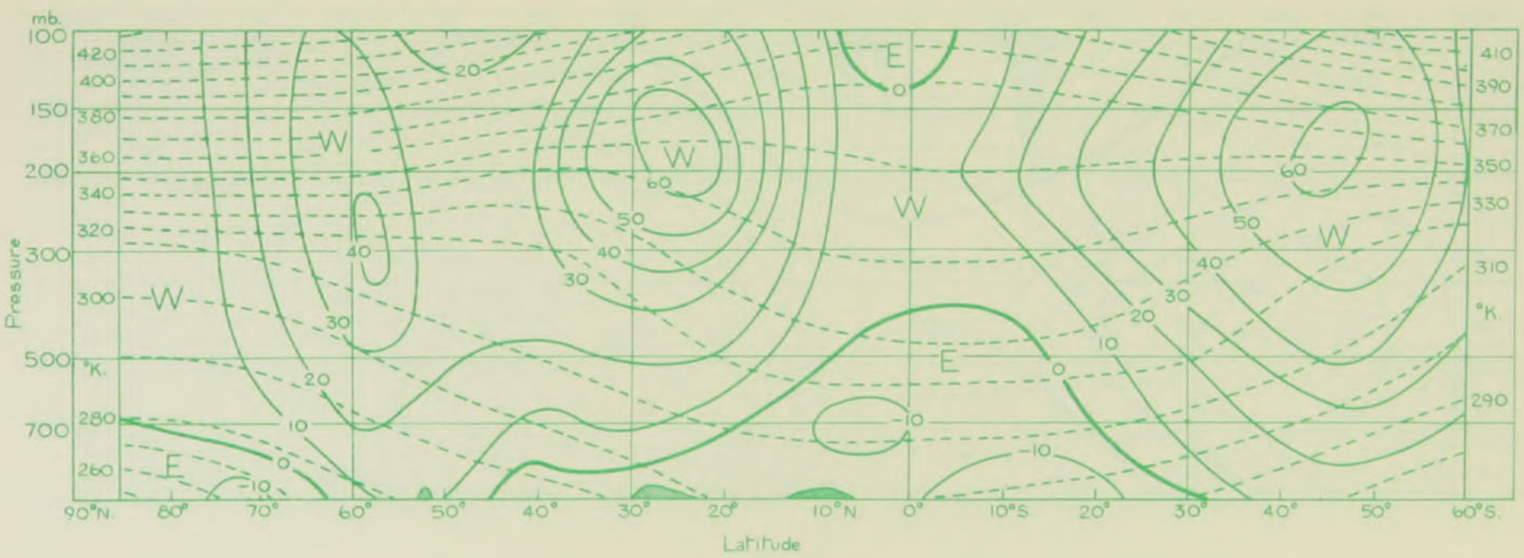


FIGURE 111—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 10°W IN APRIL

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

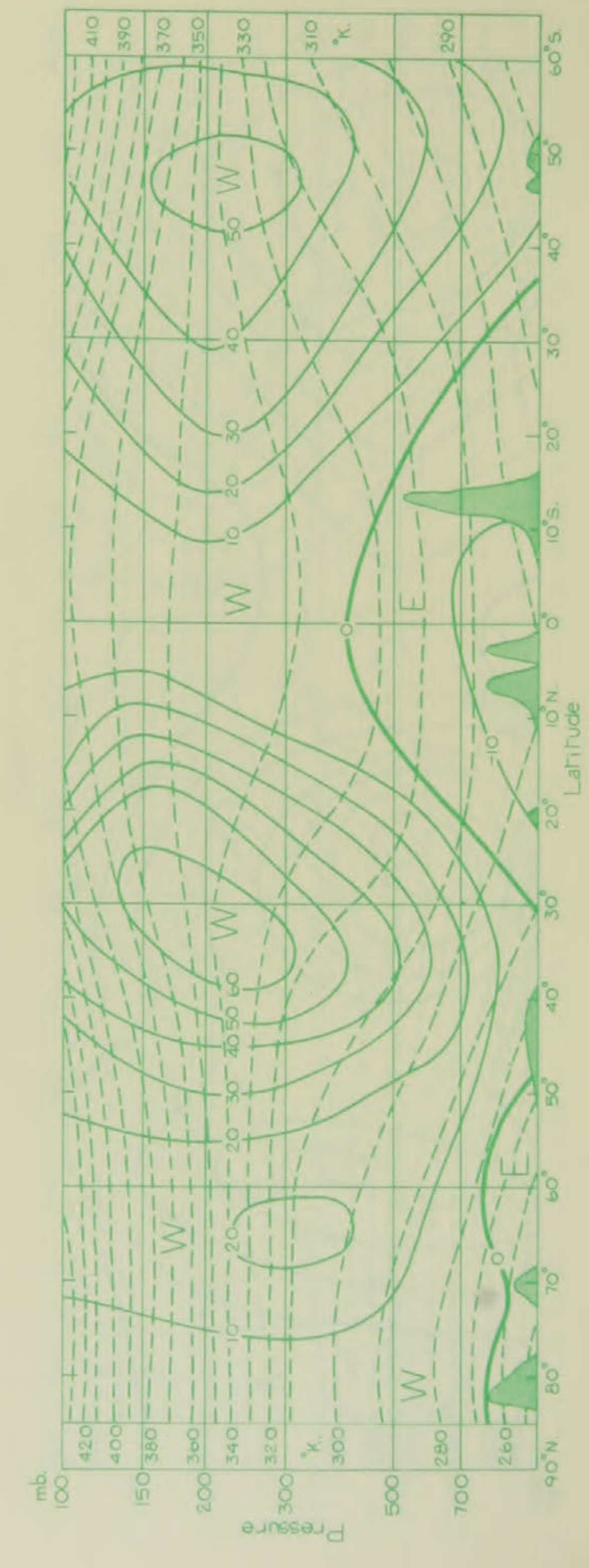


FIGURE 112—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 75°W IN APRIL

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

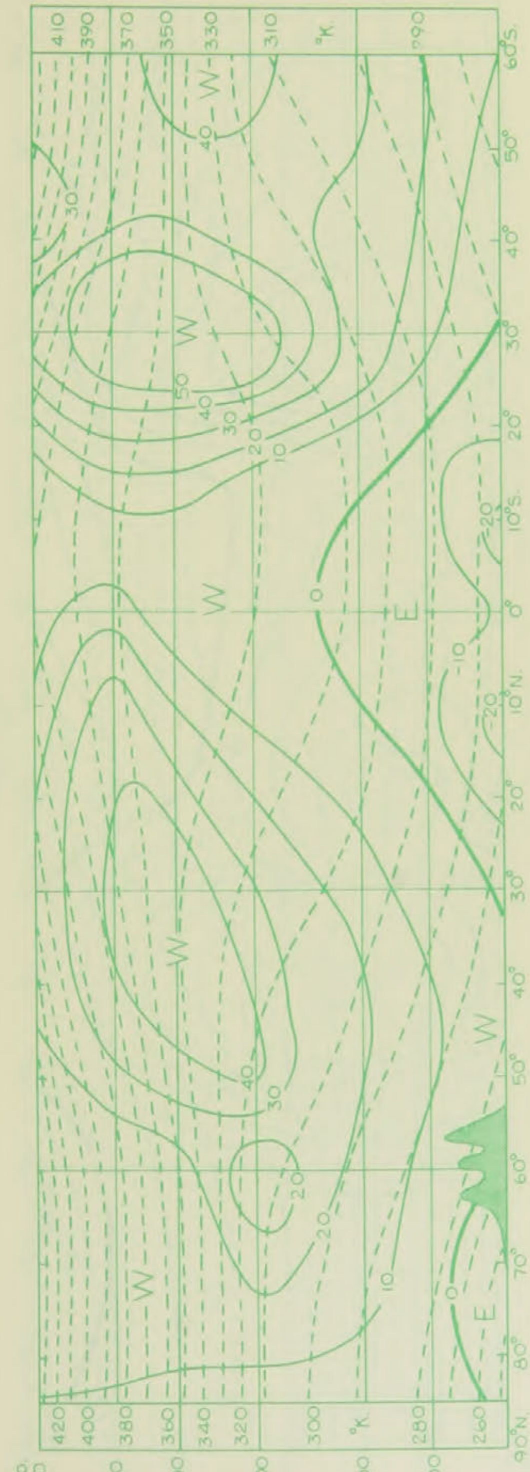


FIGURE 113—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 130°W IN APRIL

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

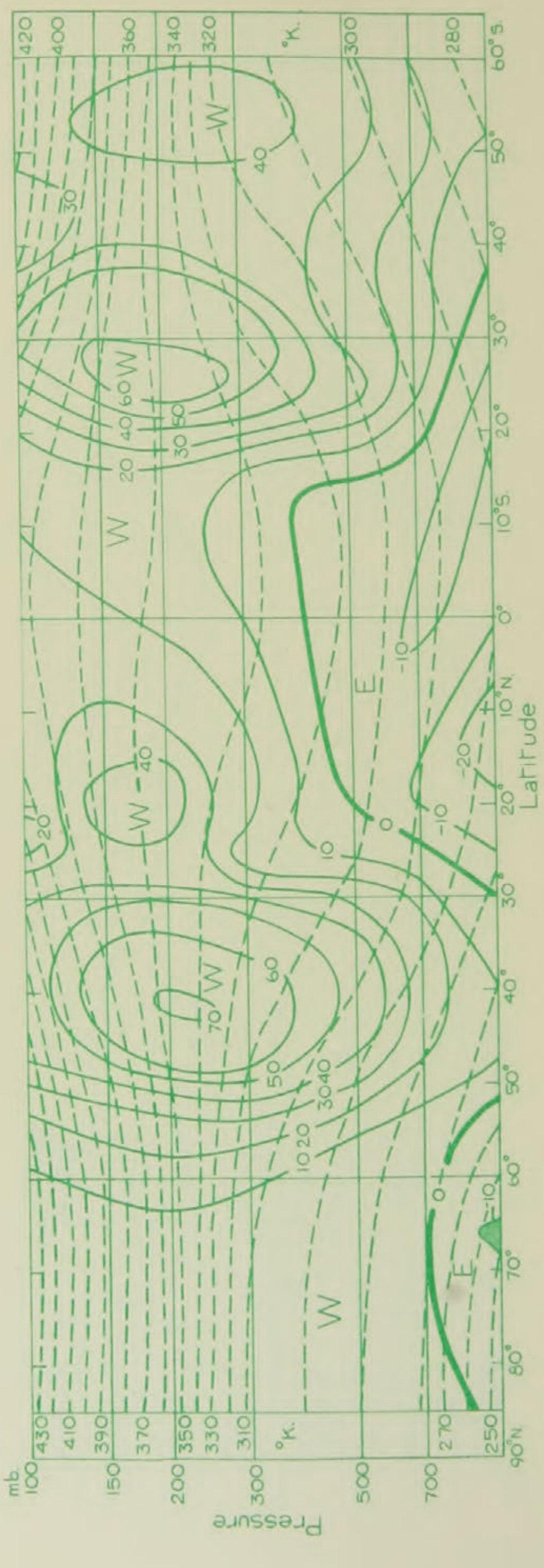


FIGURE 114—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 180° IN APRIL

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

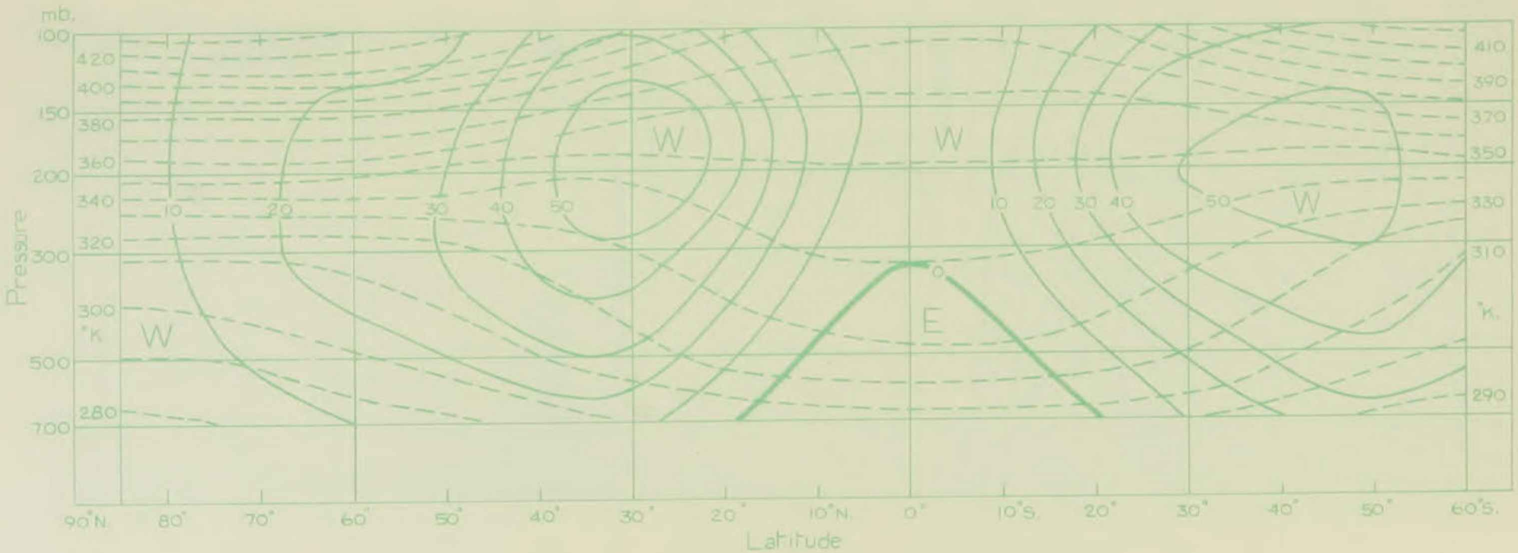


FIGURE 115—MEAN VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) IN APRIL

This cross-section is based on monthly mean values at 20° intervals of longitude around complete latitude circles

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

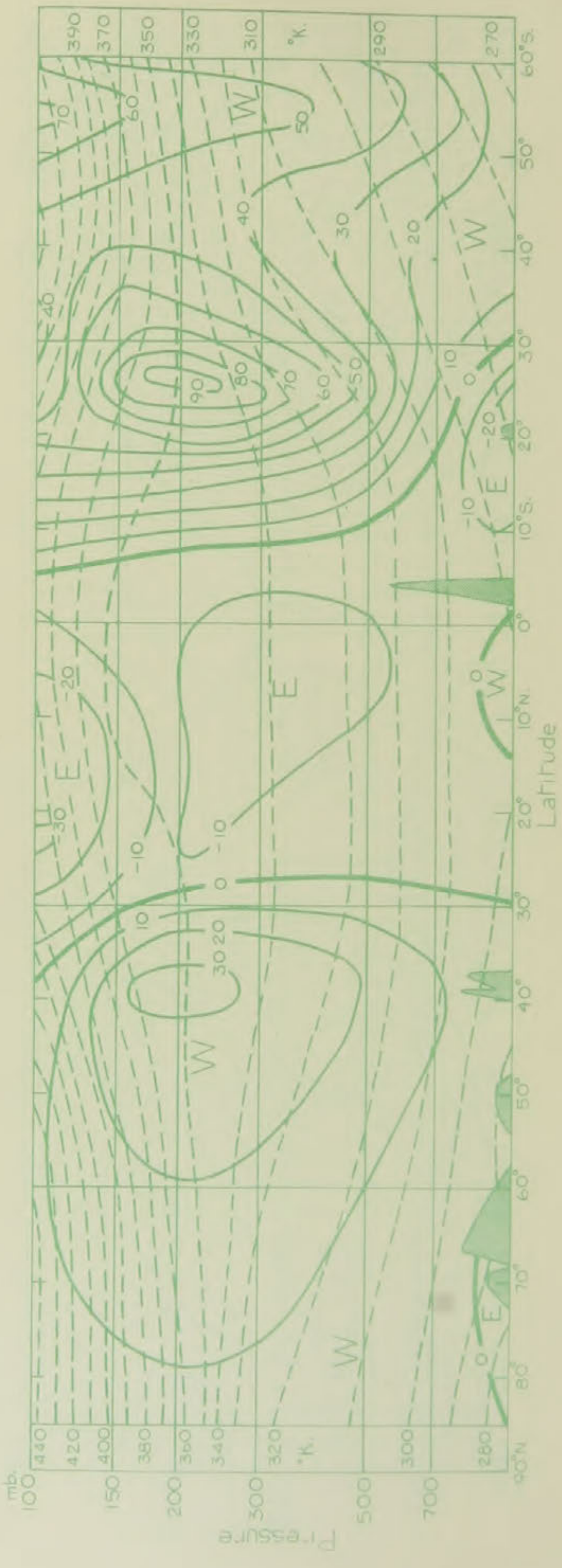


FIGURE 116—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 140°E IN JULY

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

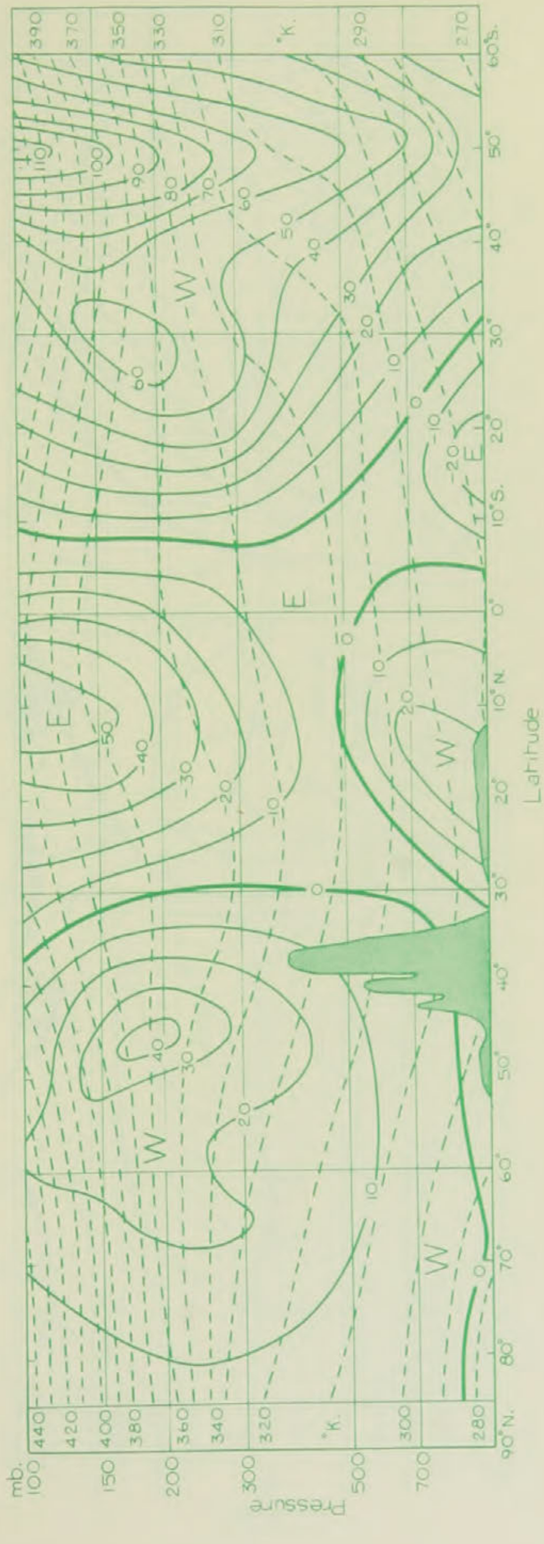


FIGURE 117—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 75°E IN JULY

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

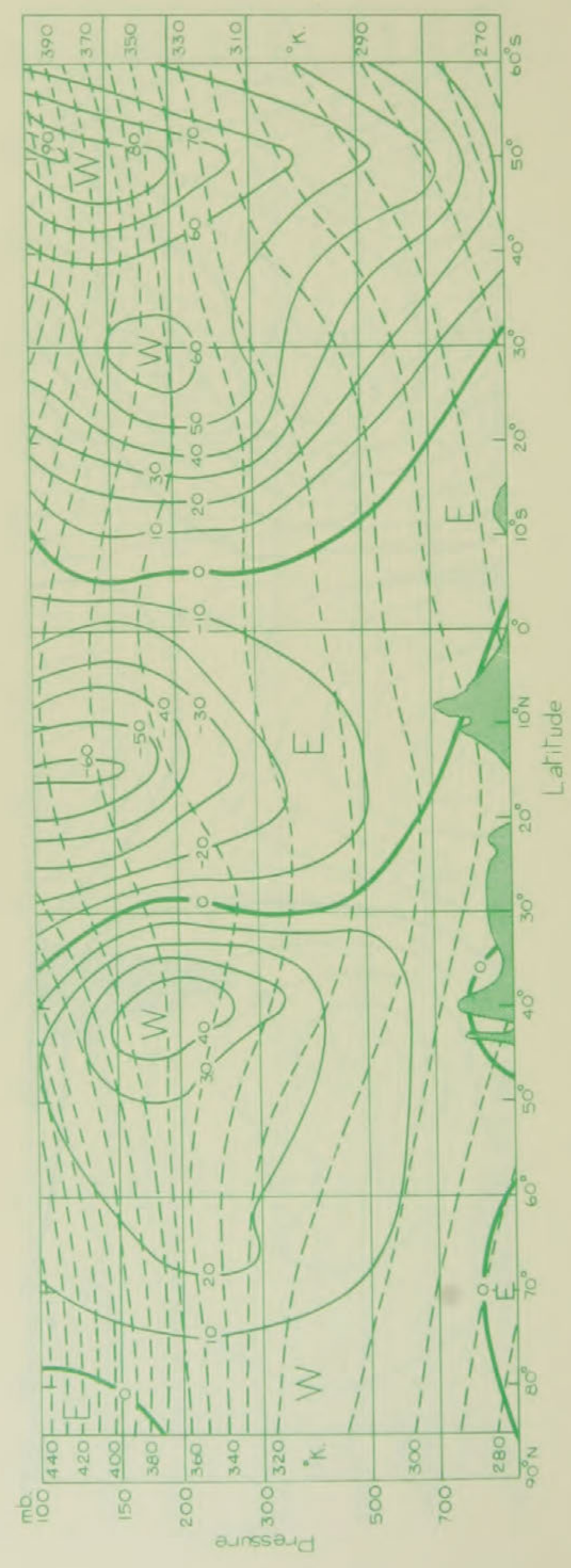


FIGURE 118—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 40°E IN JULY

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

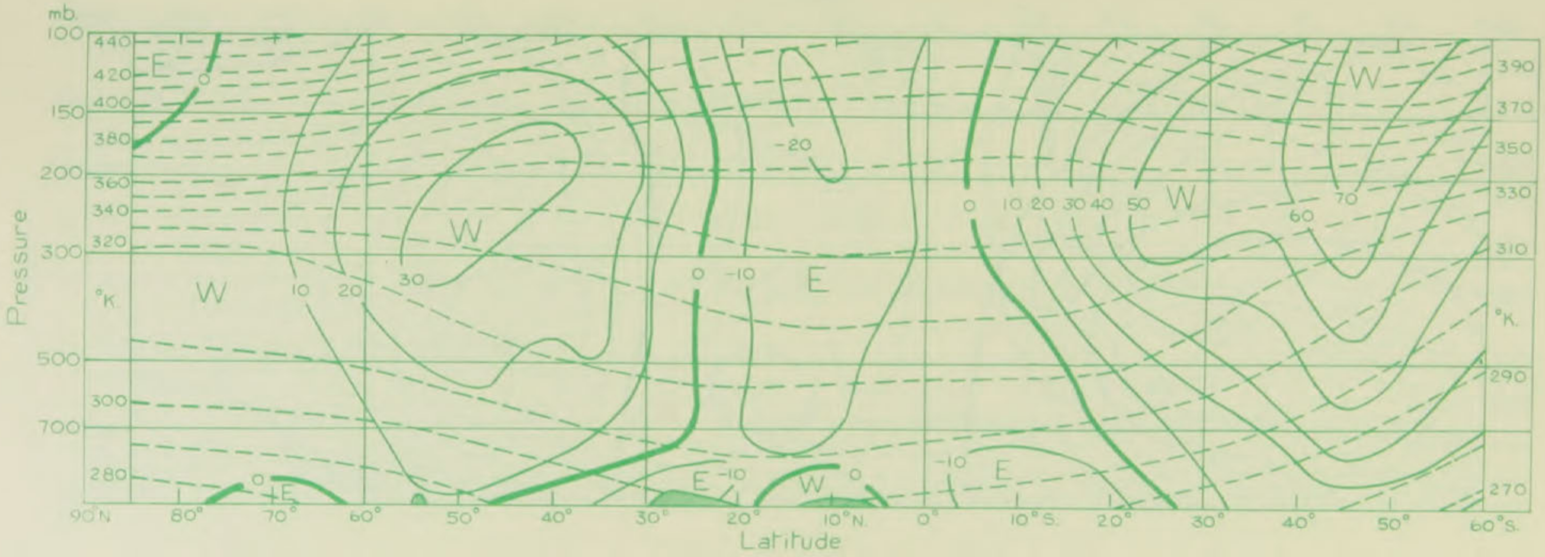


FIGURE 119—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 10°W IN JULY

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

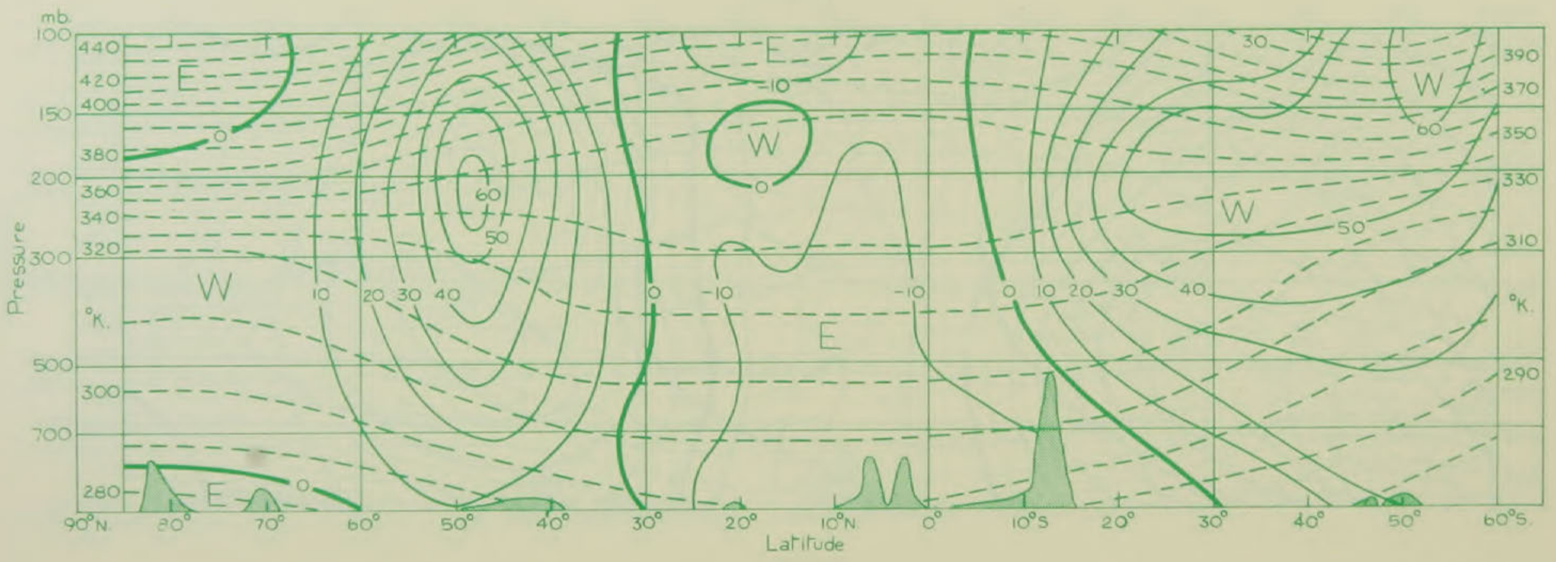


FIGURE 120—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 75°W IN JULY

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

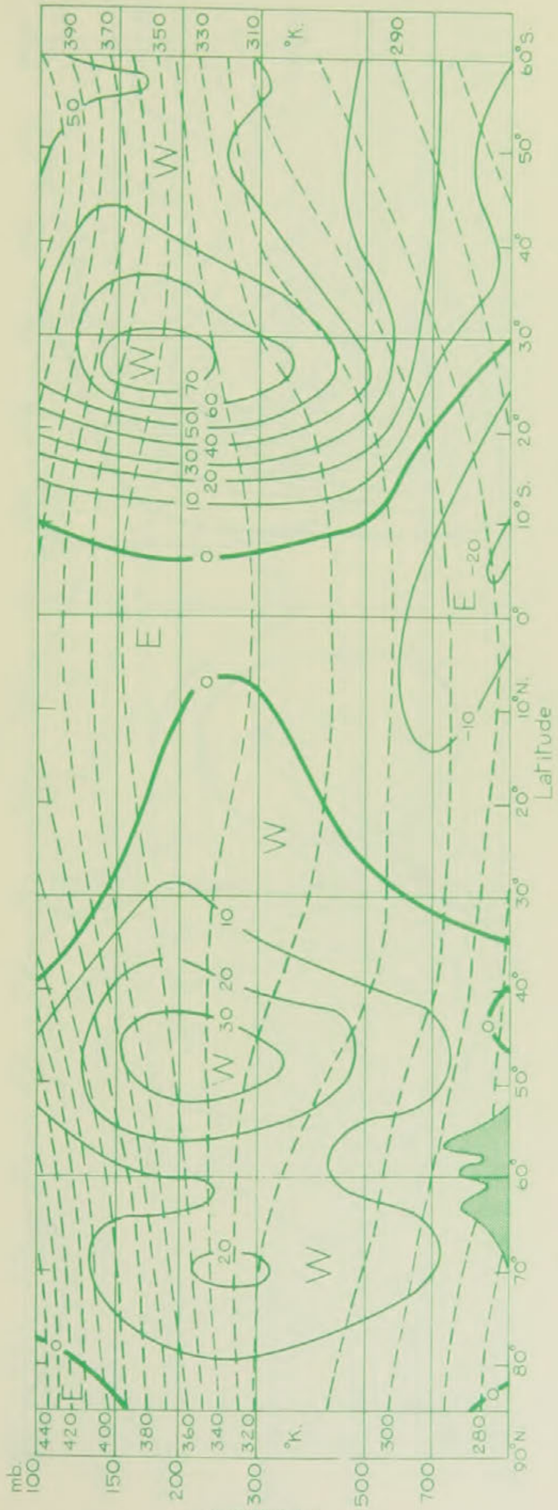


FIGURE 121—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 130°W IN JULY

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

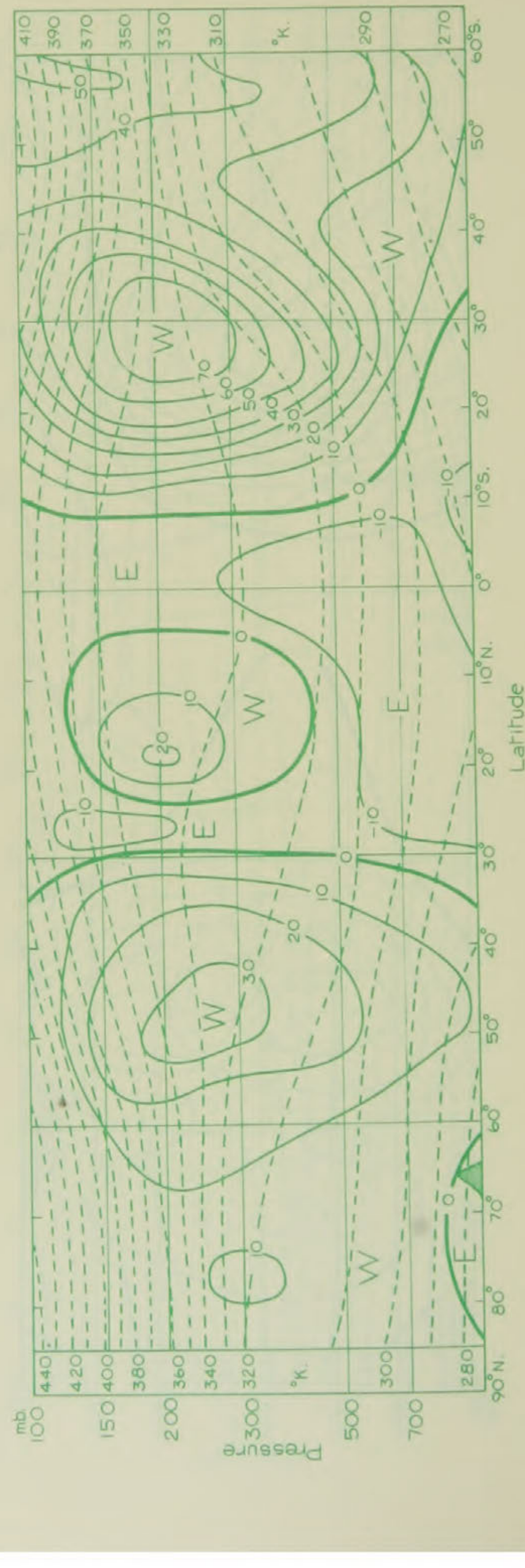


FIGURE 122—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 180° IN JULY

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

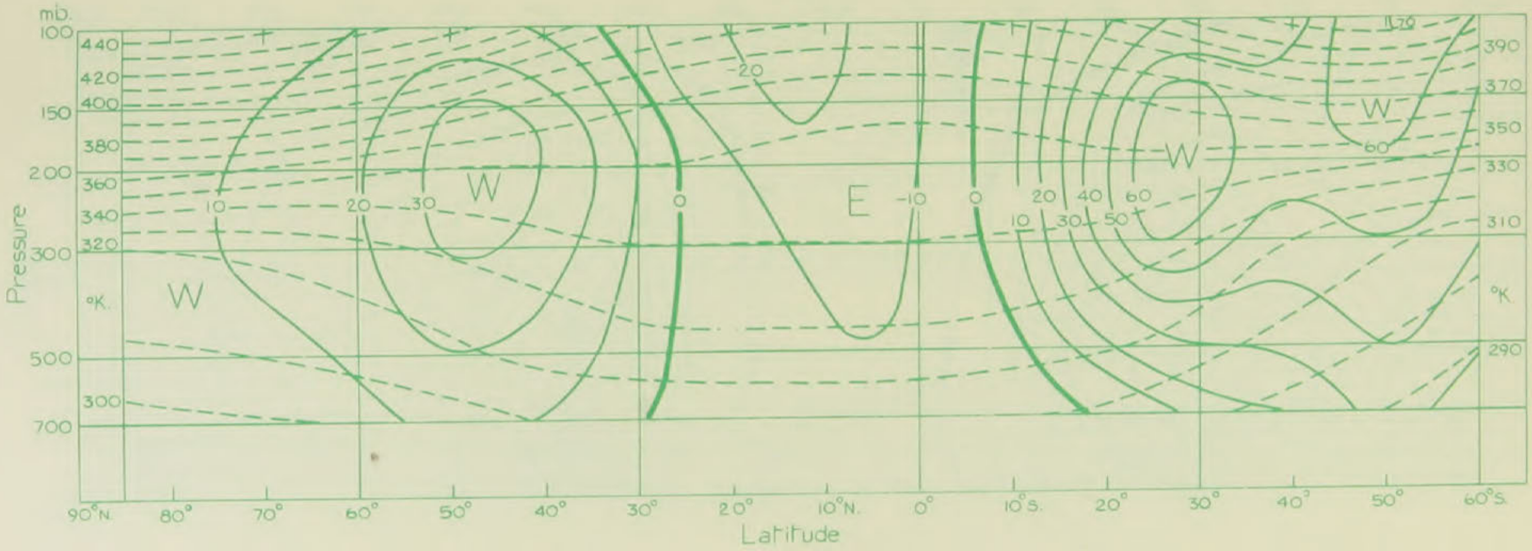


FIGURE 123—MEAN VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) IN JULY

This cross-section is based on monthly mean values at 20° intervals of longitude around complete latitude circles

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

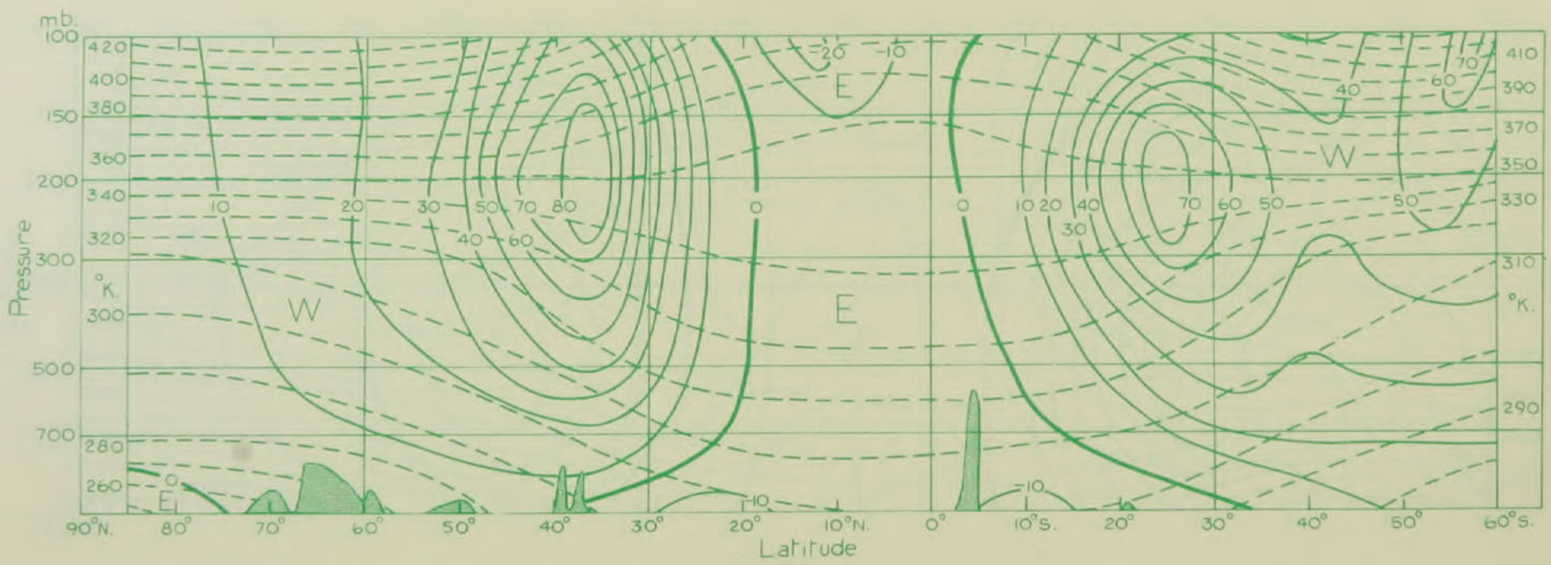


FIGURE 124—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 140°E IN OCTOBER

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

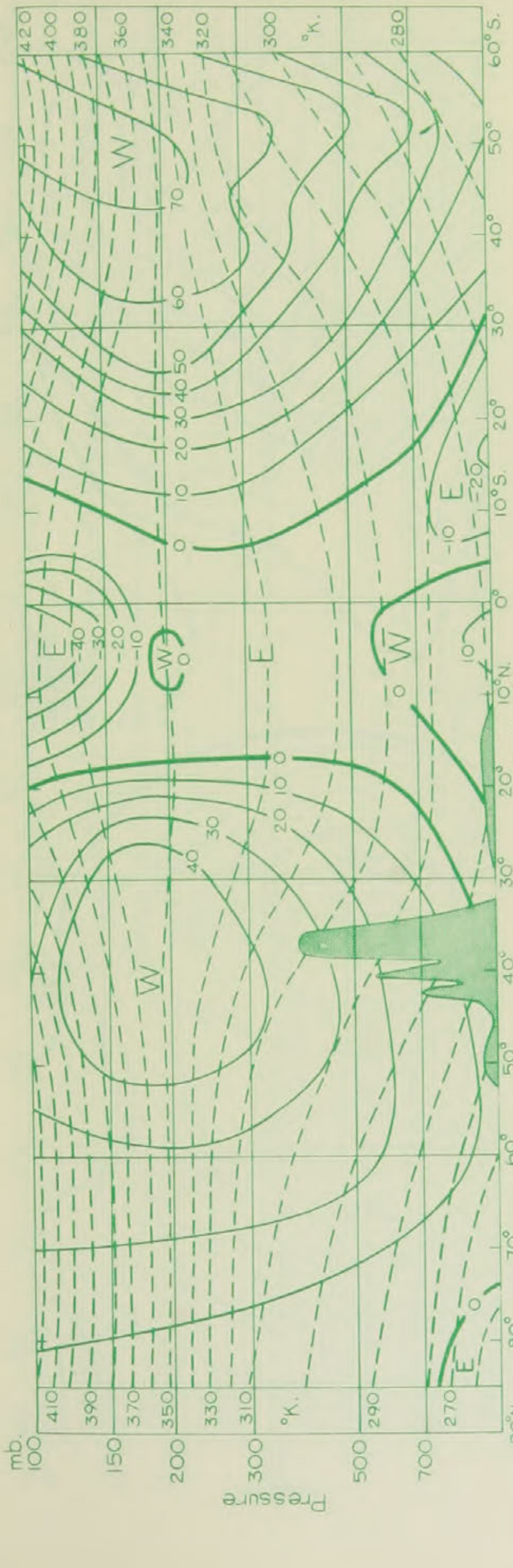


FIGURE 125—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 75°E IN OCTOBER

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

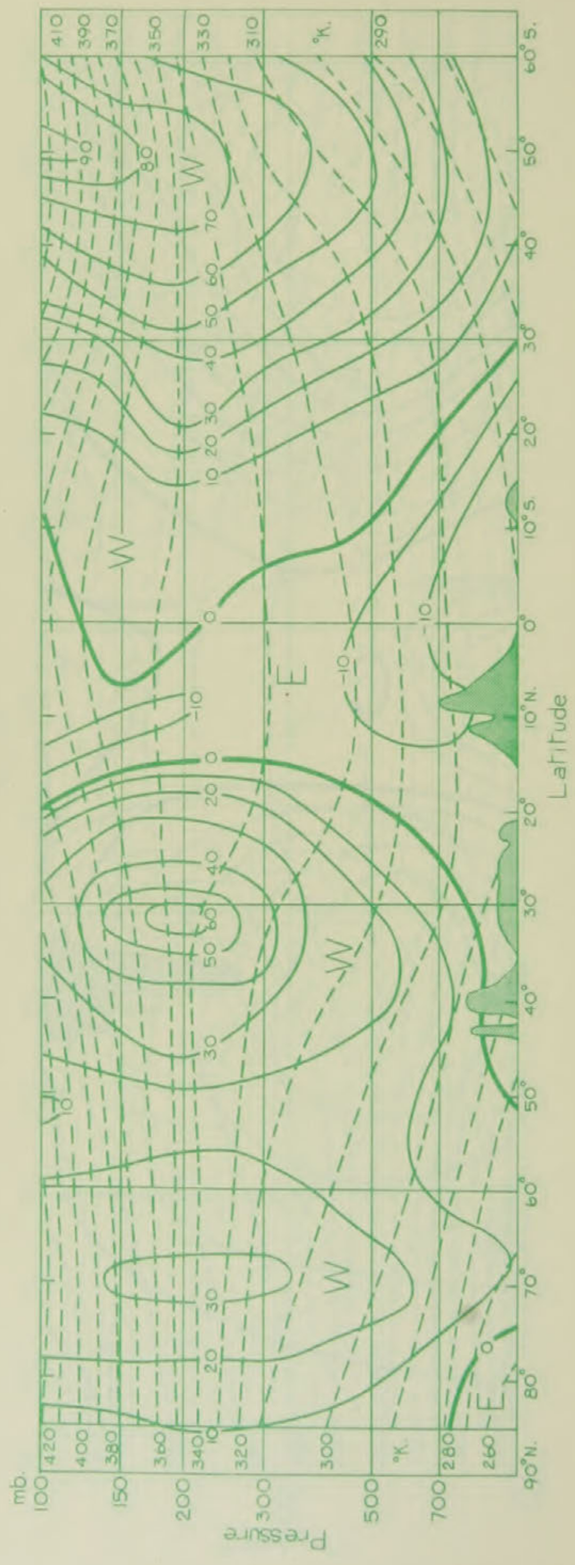


FIGURE 126—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 40°E IN OCTOBER

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

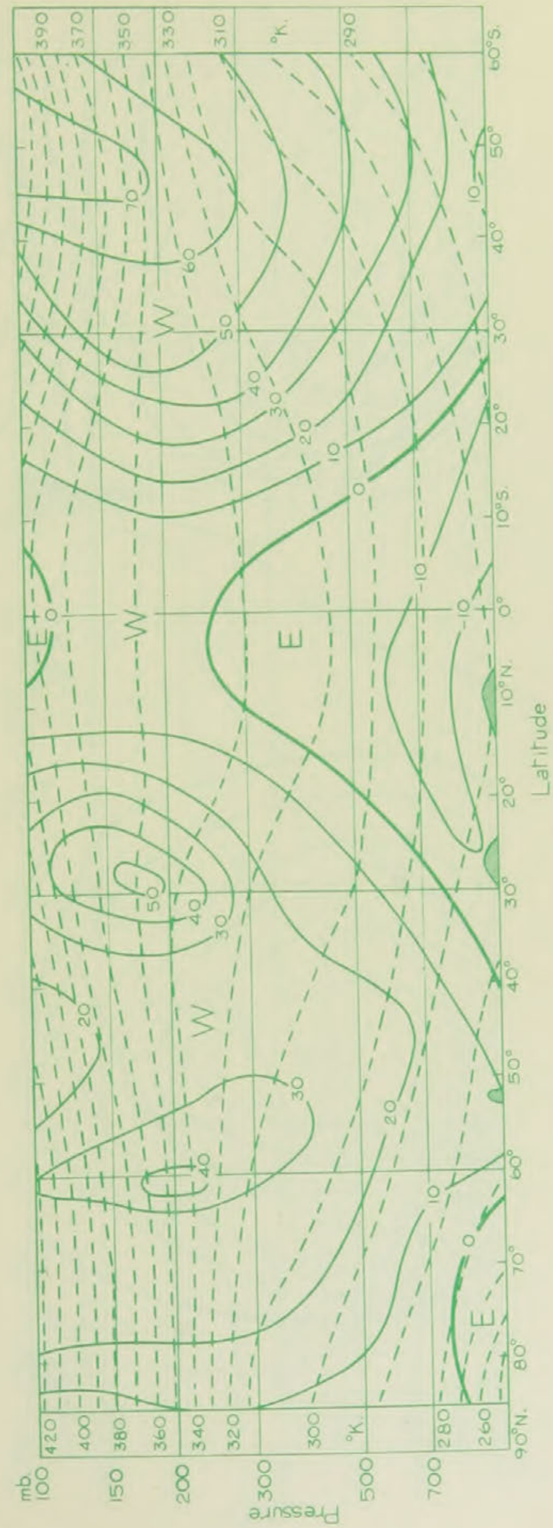


FIGURE 127—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 10°W IN OCTOBER

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

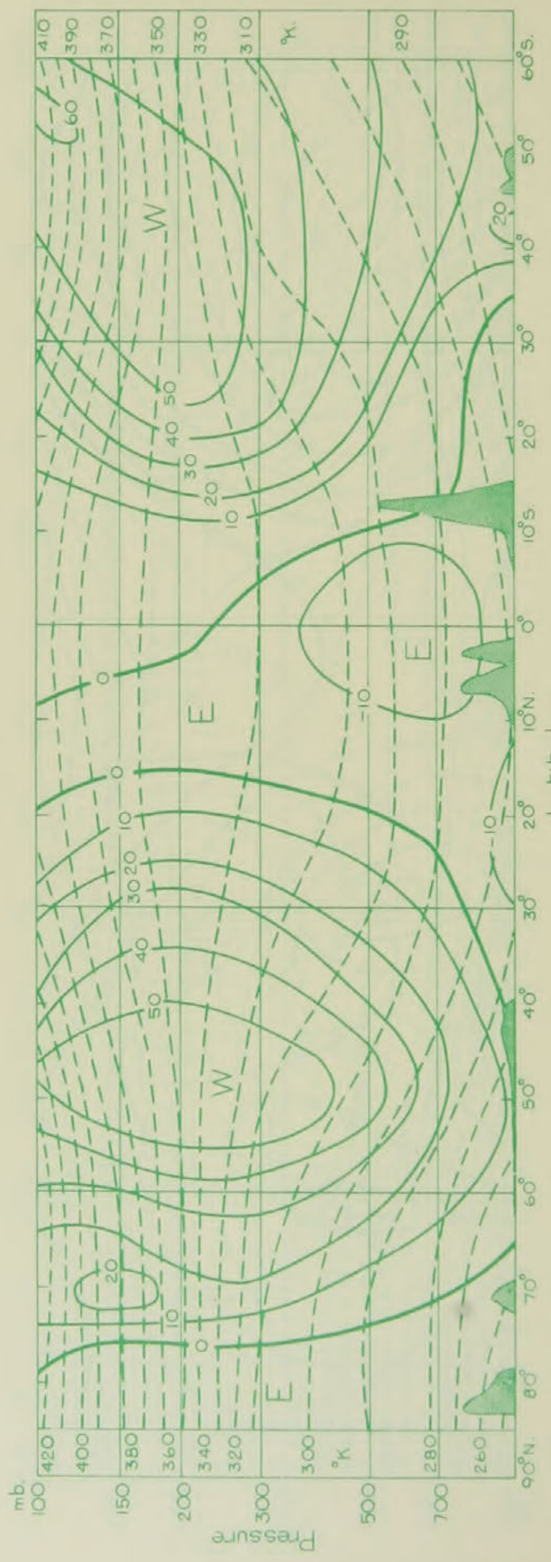


FIGURE 128—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 75°W IN OCTOBER

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

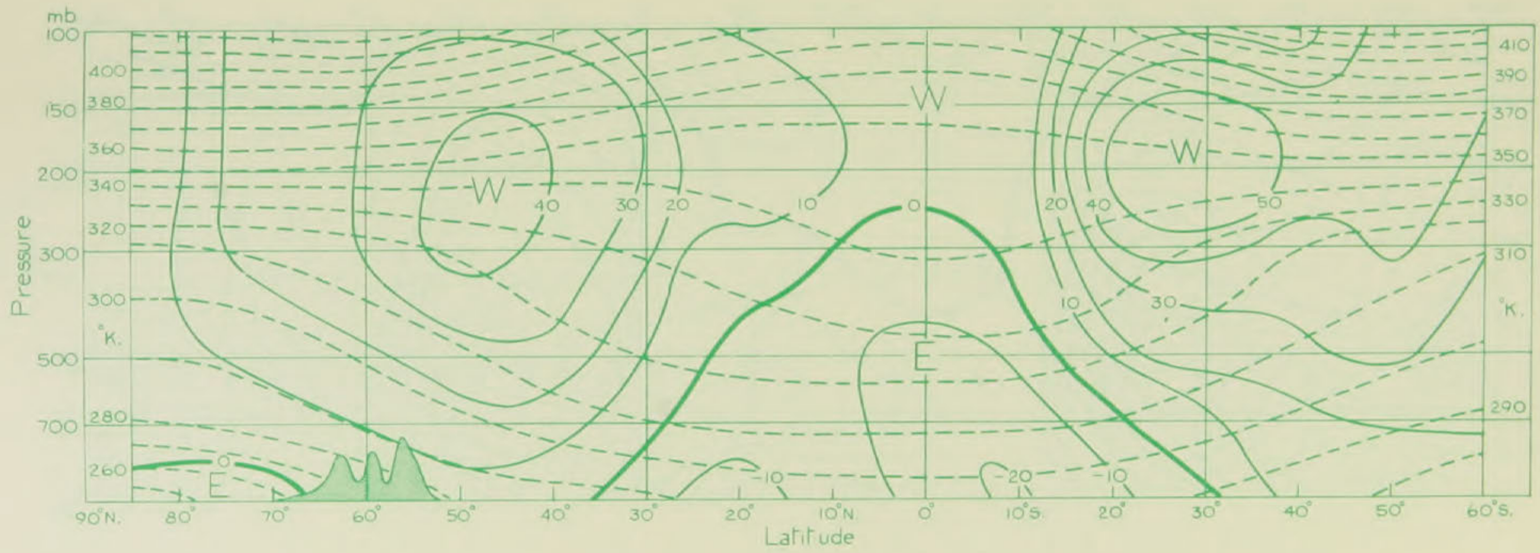


FIGURE 129—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 130°W IN OCTOBER

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

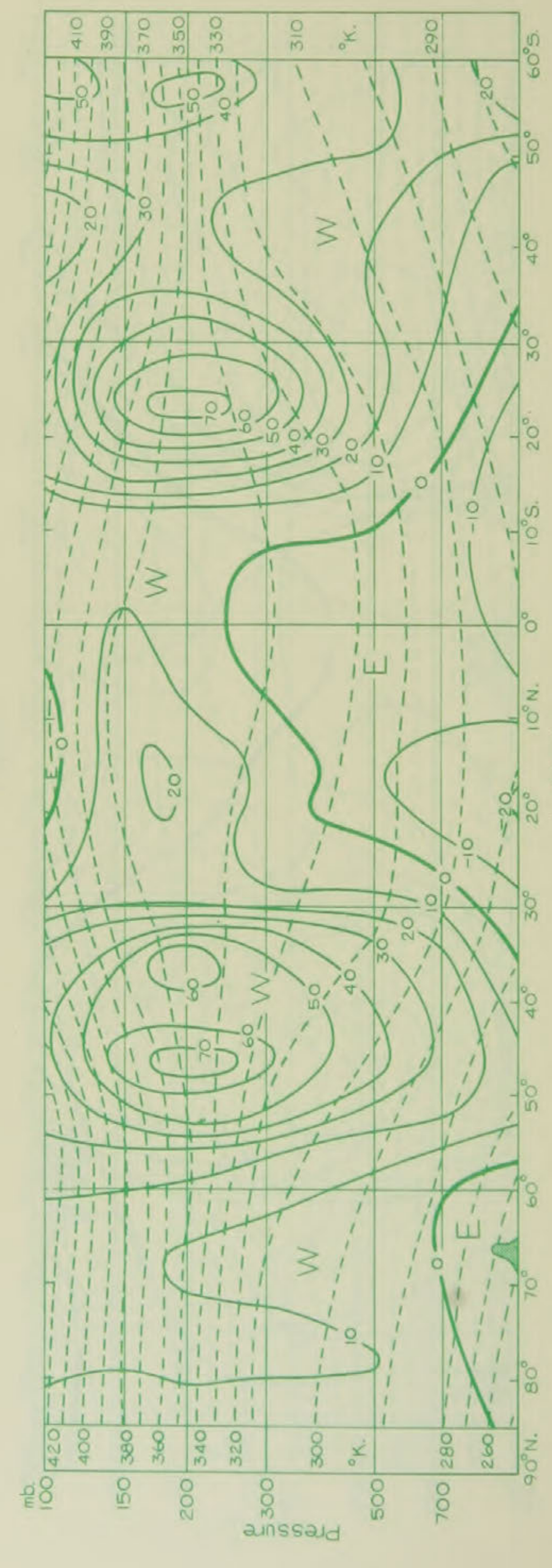


FIGURE 130—VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) ALONG LONGITUDE 180° IN OCTOBER

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

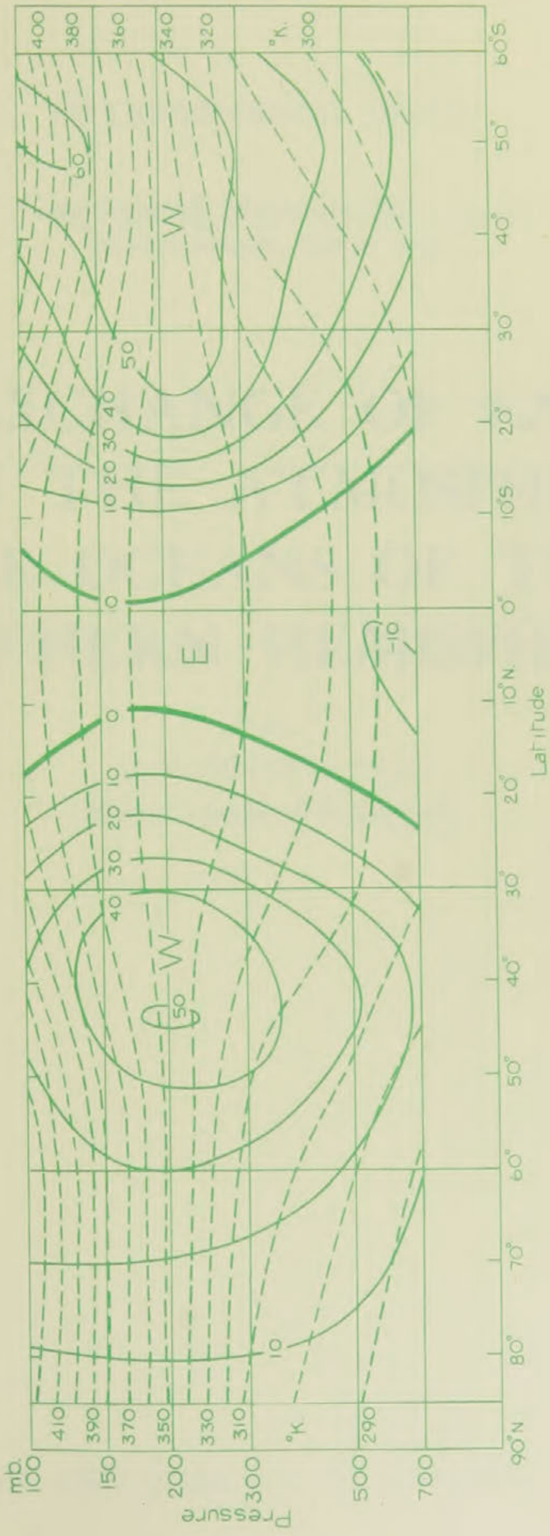


FIGURE 131—MEAN VERTICAL CROSS-SECTION SHOWING AVERAGE ZONAL WIND (KT.) AND POTENTIAL TEMPERATURE (°K) IN OCTOBER

This cross-section is based on monthly mean values at 20° intervals of longitude around complete latitude circles

Isotachs are shown by continuous lines and isotherms by broken lines

Negative values indicate easterly winds

C.B.H. 32990 - Wt. 3150 - Dd. BM.4153 - 1000 - 6/60